HORIZON

AIR MEASUREMENT SERVICES, INC.

Horizon Test #: K18-002-FR
Date Tested: December 2-4, 2008
Report Date: January 28, 2009
Revision Number: 0

MERCURY EMISSIONS FROM VARIOUS TIER II SOURCES

Mercury Retort
Electrowinning
Carbon Kiln
Refinery Furnace

Denton - Rawhide Mine
Class II Permit No. AP1041-1116.02
Facility ID A0406

Prepared for:

Kennecott Rawhide Mining Corporation
Post Office Box 2070
Located 55 Miles Southeast of Fallon
Fallon, Nevada 89407

Prepared by:

Horizon Air Measurement Services, Inc.
996 Lawrence Drive, Suite 108
Newbury Park, California 91320

Regulatory Agency:

State of Nevada-Department of Conservation and Natural Resources
Division of Environmental Protection-Bureau of Air Pollution Control
901 South Stewart Street, Suite 4001
Carson City, Nevada 89701

Richard J. Vacherot
Technical Director

HORIZON

AIR MEASUREMENT SERVICES, INC.

January 28, 2009

Mr. Don Deines
Kennecott Rawhide Mining Corporation
Post Office Box 2070
Fallon, Nevada 89407

Dear Mr. Deines:

Please find enclosed two copies of the final report entitled "Mercury Emissions From Various Tier II Sources". One copy of the report, along with a pdf copy and the required Excel spreadsheet, has been sent to Rob Bamford of NDEPBAPC.

Please call me at (805)498-8781 if you have any questions.

Sincerely,

HORIZON AIR MEASUREMENT SERVICES, INC.

Richard Vacherot
Technical Director

cc: Rob Bamford, NDEPBAPC

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A. COVER

A.1 Plant Name and Location

Denton - Rawhide Mine
Located 55 Miles Southeast of Fallon
Class II Permit No. AP1041-1116.02
Facility ID A0406

A.2 Source Sampled

S2.001	Carbon Regeneration Kiln
S2.002	Mercury Retort
NA	Electrowinning
S2.004	Refinery Furnace

A.3 Testing Company

Horizon Air Measurement Services, Inc.
996 Lawrence Drive, Suite 108
Newbury Park, California 91320

A.4 Certifications

A.4.1 Certification of Team Leader

As field team leader, I certify that all sampling procedures data presented in this report is authentic and accurate to the best of my knowledge.

Joseph M. Bennett
Field Team Leader

A.4.2 Certification of Reviewer

As the final reviewer of this report, I certify that all results herein are accurate as presented to the best of my knowledge.

Richard J. Vacherot
Technical Director

A.4.3 Certification of Facility Representative

As the facility representative, I certify that the production rates, reported herein, during the source test are accurate and representative.

Don Deines
Operations Manager

A.4.4 Laboratory Certification

The certification of the laboratory results is provided on the cover of the lab report in Appendix G-3.

B. DEVIATIONS

B.1 Emission Exceedences or Operating Parameter Exceedences

No emissions exceedences or operating parameter exceedences were encountered during the test program.

B.2 Process Upset or Anomalies

All processes operated under normal operating conditions during testing.

B.2.1 Carbon Regeneration Kiln

There were no process upsets during mercury testing.

B.2.2 Mercury Retort

There were no process upsets during mercury testing.

B.2.3 Electrowinning

There were no process upsets during mercury testing.

B.2.4 Refinery Furnace

There were no process upsets during mercury testing.

B.3 Deviation From Reference Methods

There were no deviations from the applicable Reference Methods utilized. All field

solution blanks values were below the detectable limit. Since these values were considered negligible, field blank values were not subtracted from the sample concentrations.

B.4 Deviations From Standard Analytical Procedures

There were no deviations from the standard analytical procedures for the EPA Method 29 total mercury analyses.

B.5 Quality Assurance/Quality Control Errors

There were no quality assurance or quality control errors during the field testing or analytical phase of the test program.

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D. INTRODUCTION

D.1 Test Purpose

The purpose of the test program was to determine total mercury emissions from various thermal units to address the Nevada mercury control program's 2008 testing requirements. Horizon Air Measurement Services, Inc. (Horizon) was retained to conduct the emission testing program.

D.2 Test Location - Type of Process

The testing program was conducted at the Kennecott Rawhide Mining Corporation - Denton-Rawhide Mine facility located 55 miles southeast of Fallon, Nevada. The effluent gas streams of various thermal sources (outlined in Table D-1) were tested at their associated exhaust stacks for total mercury emissions.

D.3 Test Dates

The test dates for each source are shown in Table D-2, Test Log.

D.4 Pollutants Tested

The pollutants tested for, each source of interest, and the associated testing methods utilized are provided in Table D-3:

D.5 Observers Names

The testing program was conducted by Mr. Joseph Bennett, Mr. Craig Moran, and Mr. William Jones of Horizon from December 2 through 4, 2008. NDEPBAPC was not present to observe the testing program. Coordination of the testing program was the responsibility of Mr. Don Deines of the Denton-Rawhide Mine.

Table D-1
Source and Parameters of Interest
Denton-Rawhide Mine

Permit ID#	Source Identification	Parameter	Test Method
S2.001	Carbon Regeneration Kiln	Total Mercury	US EPA Method 29
S2.002	Mercury Retort	Total Mercury	US EPA Method 29
NA	Electrowinning	Total Mercury	US EPA Method 29
S2.004	Refinery Furnace	Total Mercury	US EPA Method 29

NOTE: US EPA Method 1, 2, 3, 4 and 5 were conducted for flow rate, fixed gases, moisture and particulate matter determination in conjunction with all Method 29 mercury testing.

Table D-2
Test Log
Denton-Rawhide Mine

Source ID	Permit ID#	Run#	Date	Start Time	End Time	Test Method*
Carbon Regeneration Kiln	(S2.001)	1	12/3/08	1351	1529	M29
Carbon Regeneration Kiln	(S2.001)	2	12/4/08	0725	0903	M29
Carbon Regeneration Kiln	(S2.001)	3	12/4/08	0921	1103	M29
Mercury Retort	(S2.002	1	12/2/08	0943	1120	M29
Mercury Retort	(S2.002)	2	12/2/08	1135	1312	M29
Mercury Retort	(S2.002)	3	12/2/08	1325	1502	M29
Electrowinning	NA	1	12/4/08	0758	0939	M29
Electrowinning	NA	2	12/4/08	0958	1140	M29
Electrowinning	NA	3	12/4/08	1146	1326	M29
Refinery Furnace	(S2.004)	1	12/3/08	0745	0927	M29
Refinery Furnace	(S2.004)	2	12/3/08	0938	1117	M29
Refinery Furnace	(S2.004)	3	12/3/08	1129	1308	M29

* US EPA Method 29

Table D-3
Reference Test Methods
Denton-Rawhide Mine

Parameter	Test Method
Traverse Points	EPA Method 1/1A
Flow Rate	EPA Method 2
Fixed Gases	EPA Method 3
Moisture	EPA Method 4
Particulate Matter	EPA Method 5
Total Mercury	EPA Method 29

D.6 Additional Information

The results of the test program are provided in Section E. Sampling and analyses procedures are detailed in Section F. Section G provides a brief description of each process, control devices and the operating conditions during testing. All field data, laboratory reports, production data, calibration data, example calculations and other pertinent documentation can be found in the Appendices.

E. SUMMARY OF RESULTS

The results of the total mercury testing are summarized in Table E-1. The reported mercury emission rate for each source is the average of three test runs. The stack gas characteristics and mercury emissions are provided for each source in more detail in the following subsections. All computer printout of results calculations are provided in Appendix G-1.

E.1 Carbon Regeneration Kiln (S2.001)

The results of the total mercury testing on the Carbon Kiln are provided in Table E-2. No sampling or operational problems were encountered during the testing.

E.2 Mercury Retort (S2.002)

The results of the total mercury testing on the Mercury Retort are provided in Table E-3. No sampling or operational problems were encountered during the testing.

E.3 Electrowinning

The results of the total mercury testing on the Electrowinning stack are provided in Table E-4. No sampling or operational problems were encountered during the testing.

E.4 Refinery Furnace (S2004)

The results of the total mercury testing on the Refinery Furnace are provided in Table E-5. No sampling or operational testing problems were encountered during the testing.

Table E-1
Summary of Results
Total Mercury Emissions
Denton - Rawhide Mine

Permit ID #	Source Identification	Mercury Average Emission Rate
		(lb/hr)
S2.001	Carbon Regeneration Kiln	0.00000782
S2.002	Mercury Retort	0.000000487
NA	Electrowinning	0.00001073
S2.004	Refinery Furnace	0.157

Table E-2
Stack Gas Characteristics-Total Mercury Emissions
Kennecott Rawhide Mining Company
Denton-Rawhide Mine
Carbon Kiln

Run Number	******	1	2	3	
Date	******	12/03/08	12/04/08	12/04/08	
Run Start Time	******	1351	725	921	
Run End Time	******	1529	903	1103	
Stack Gas Characteristics					Average
Stack Temperature	F	86	73	74	78
Moisture	%	3.9	3.1	4.3	3.8
Fixed Gases,					
CO_2	%	1.1	0.8	0.7	0.9
O_2	%	17.9	19.2	19.3	18.8
N_2	%	81.0	80.0	80.0	80.3
Stack Gas Velocity	afpm	4279	4165	4113	4186
Volumetric Flow Rate	dscfm	257	258	251	255
Volumetric Flow Rate	acfm	327	318	314	320
Isokinetic Ratio	%	101	101	101	101
Total Mercury,					
Concentration	mg/dscf	0.000396	0.000222	0.0000731	0.000230
Concentration	g/dscm	0.0000140	0.00000784	0.00000258	0.00000814
Emission Rate	lb/hr	0.00001347	0.00000758	0.00000242	0.00000782
Particulate Matter,					
Concentration	gr/dscf	0.00054	0.00217	0.00156	0.00142
Emission Rate	lb/hr	0.0012	0.0048	0.0034	0.0031

Table E-3
Stack Gas Characteristics-Total Mercury Emissions
Kennecott Rawhide Mining Company
Denton-Rawhide Mine
Retort

Run Number	******	1	2	3	
Date	******	12/02/08	12/02/08	12/02/08	
Run Start Time	******	943	1135	1325	
Run End Time	******	1120	1312	1502	
Stack Gas Characteristics					Average
Stack Temperature	F	83	61	53	66
Moisture	%	1.1	0.5	0.5	0.7
Fixed Gases,					
CO_2	%	0.4	0.3	0.3	0.3
O_2	%	19.6	20.1	20.1	19.9
N_2	%	80.0	79.6	79.6	79.7
Stack Gas Velocity	afpm	439	430	426	432
Volumetric Flow Rate	dscfm	31	32	32	32
Volumetric Flow Rate	acfm	38	37	37	38
Isokinetic Ratio	%	99	97	97	98
Total Mercury,					
Concentration	mg/dscf	0.0002171	0.0000695	0.0000643	0.0001170
Concentration	g/dscm	0.00000767	0.00000245	0.00000227	0.00000413
Emission Rate	lb/hr	0.000000895	0.000000293	0.000000274	0.000000487
Particulate Matter,					
Concentration	gr/dscf	0.00018	0.00032	0.00038	0.00029
Emission Rate	lb/hr	0.000047	0.000088	0.00010	0.000080

Table E-4
Stack Gas Characteristics-Total Mercury Emissions
Kennecott Rawhide Mining Company
Denton-Rawhide Mine
Electrowinning

Run Number	******	1	2	3	
Date	******	12/04/08	12/04/08	12/04/08	
Run Start Time	******	758	958	1146	
Run End Time	******	939	1140	1326	
Stack Gas Characteristics					Average
Stack Temperature	F	68	73	75	72
Moisture	%	1.8	2.0	1.5	1.8
Fixed Gases,					
CO_2	%	0.0	0.1	0.0	0.0
O_2	%	20.9	20.8	20.9	20.9
N_2	%	79.1	79.1	79.1	79.1
Stack Gas Velocity	afpm	1522	1572	1635	1576
Volumetric Flow Rate	dscfm	561	573	596	577
Volumetric Flow Rate	acfm	676	699	726	701
Isokinetic Ratio	%	97	97	98	97
Total Mercury,					
Concentration	mg/dscf	0.0003052	0.0000560	0.0000669	0.0001427
Concentration	g/dscm	0.00001078	0.00000198	0.00000236	0.00000504
Emission Rate	lb/hr	0.00002267	0.00000425	0.00000527	0.00001073
Particulate Matter,					
Concentration	gr/dscf	0.0015	0.0016	0.0024	0.0018
Emission Rate	lb/hr	0.0070	0.0077	0.0121	0.0089

Table E-5
Stack Gas Characteristics-Total Mercury Emissions
Kennecott Rawhide Mining Company
Denton-Rawhide Mine
Refinery Furnace

Run Number	******	1	2	3	
Date	******	12/03/08	12/03/08	12/03/08	
Run Start Time	******	745	938	1129	
Run End Time	******	927	1117	1308	
Stack Gas Characteristics					Average
Stack Temperature	F	62	70	76	70
Moisture	%	1.2	1.7	0.7	1.2
Fixed Gases,					
CO_2	%	0.3	0.2	0.6	0.4
O_2	%	19.7	19.8	19.3	19.6
N_2	%	80.0	80.0	80.1	80.0
Stack Gas Velocity	afpm	4255	4222	4254	4244
Volumetric Flow Rate	dscfm	14275	13880	13972	14042
Volumetric Flow Rate	acfm	16919	16788	16916	16874
Isokinetic Ratio	%	99	100	99	99
Total Mercury,					
Concentration	mg/dscf	0.0527	0.1126	0.0898	0.0850
Concentration	g/dscm	0.00186	0.00398	0.00317	0.00300
Emission Rate	lb/hr	0.0995	0.2068	0.1659	0.1574
Particulate Matter,					
Concentration	gr/dscf	0.00077	0.00094	0.00045	0.00072
Emission Rate	lb/hr	0.094	0.112	0.054	0.087

F. SAMPLING METHODS AND TEST DATA

F.1 Raw Field Data

The raw field data sheets including sampling data sheets, moisture recovery sheets, and Orsat analyzer data sheets are provided in Appendix G-2. Computer printouts of results calculations are provided in Appendix G-1. Laboratory reports are provided in Appendix G-3.

F.2 Excel Spreadsheet (PM SOURCE TEST DATA TEMPLATE)

Completed Excel spreadsheets (PM Source Test Data Template) provided by the NDEP-BAPC are also included in Appendix G-2 for each source.

F.3 Process Description

A brief process description is provided for each process of interest in the following subsections. Each processes' permitted or rated throughput is provided in Table F-1.

F.3.1 Carbon Regeneration Kiln (S2.001)

System 01 Carbon Kiln (electric) is a Summit Valley Equipment & Engineering Inc. Model #1T1817 E1B, Serial #1T1817E1B. The kiln exhaust is ducted to a control system consisting of a condenser and sulfur-impregnated charcoal filter.

The process was operated under normal, steady state conditions during testing. The process throughput over the test period is provided in Section G.1.1

F.3.2 Mercury Retort (S2.002)

The Mercury Retort is a Model #1000, Serial number #89-709. The exhaust is vented to a control system consisting of dual mercury condensers, in a series, with a sulfur-impregnated carbon

Table F-1
Permitted/Rated Throughput
Denton - Rawhide Mine

Permit ID#	Source Identification	Permitted Process Throughput
S2.001	Carbon Regeneration Kiln	0.042 tons/hr
S2.002	Mercury Retort	0.05 tons/hr
NA	Electrowinning	NA
S2.004	Refinery Furnace	0.15 tons/hr

filter. Run 1 was conducted during the final temperature ramp from 900^{0}F to 1150^{0}F. Test Runs 2 and 3 were conducted after the retort had achieved the temperature of 1150^{0}F. The retort charge weight during testing is provided in Section G.1.2.

F.3.3 Electrowinning

Steam is collected from the electrowinning cells and the strip tank and vented to a condenser and sulfur-impregnated charcoal filter. The electrowinning cells were continuously operated under normal, steady-state, process throughput during the mercury testing. The electrowinning cells were operated at an average throughput of 22.6 gallons/minute (See Section G.1.3).

F.3.4 Refinery Furnace (S2.004)

The Refinery Furnace is vented to a baghouse (BH-01). The refinery furnace was charged with 853 pounds of dry sludge and 299 pounds of flux for the 5 hour melt cycle. Run 1 was conducted during the material charging and initial melt; Test Run 2 was conducted during the middle of the melt cycle; Run 3 was conducted during the end of the melt cycle and the pouring of charge material.

F.4 Cyclonic Flow Check

All sources tested exhibited an average cyclonic flow angle within the EPA Method 1 acceptable limit of 20°, as displayed in Table F-2. The actual field data sheets of the preliminary velocity traverse and cyclonic flow check are provided in Appendix G-2.

F.5 Process Start-Ups, Shut Downs and Operational Changes During Testing

F.5.1 Carbon Regeneration Kiln (S2.001)

During the testing of the Carbon Regeneration Kiln, no process shut downs, upsets or anomalous operational changes were experienced during testing.

Table F-2

Average Cyclonic Flow Cycle

Denton - Rawhide Mine

Permit ID#	Source Identification	Average Cylonic Flow Cycle (degrees)
S2.001	Carbon Regeneration Kiln	1.6
S2.002	Mercury Retort	0
NA	Electrowinning	5.4
S2.004	Refinery Furnace	2.3

F.5.2 Mercury Retort (S2.002)

During the testing of the Mercury Retort, no process shut downs, upsets or anomalous operational changes were experienced during testing.

F.5.3 Electrowinning

During the testing of the Electrowinning cells, no process shutdowns, upsets, or anomalous operational changes were experienced during testing.

F.5.4 Refinery Furnace (S2.004)

The Refinery Furnace did not experience any shutdowns, process upsets or significant operational changes during testing.

F.6 Sample Calculation

A sample calculation for total mercury emissions is provided at the end of Appendix G-1.

F.7 Sampling and Analytical Procedures

F.7.1 Sampling Locations

All sampling locations complied with US EPA Method 1/1A requirements.

F.7.1.1 Carbon Regeneration Kiln (S2.001)

The condenser and in-series carbon filter controlling carbon kiln emissions are vented to the atmosphere through an 3.75-inch diameter stack. The mercury sample collection ports are 16 inches (4.3 duct diameters) downstream of fan and 16 inches (4.3 duct diameters) upstream of the flow rate sample ports. The flow rate sampling location is 16 inches (4.3 diameters) downstream of the mercury

collection ports and 84 inches (22.4 diameters) upstream of the stack exit. Sixteen traverse points (8 per diameter) were utilized.

F.7.1.2 Mercury Retort (S2.002)

Emissions from the mercury retort are exhausted through a 4-inch diameter duct. Mercury sample collection ports are located 6.3 diameters (25 inches) downstream of a bend in the duct and 4 diameters (16 inches) upstream of the flow rate sample ports. The flow rate sample ports were located 4 diameters (16 inches) upstream of the stack exit and 4 diameters (16 inches) downstream from the sample collection ports. Sample was collected at the center of the stack.

F.7.1.3 Electrowinning

The electrowinning cells are exhausted through a 8-inch by 8 inch square stack. Three sample ports are located 24 inches (3 diameters) downstream of the fan and 12 inches (1.5 diameters) upstream of the stack exit. Twenty-four sample points (8 per port) were utilized for sampling

F.7.1.4. Refinery Furnace (S2.004)

The refinery induction furnace is vented through a 27 inch-diameter stack. The sample ports are located 240 inches (8.9 diameters) downstream of the fan and 4 feet (.56 diameters) upstream of the stack exit. Eight traverse points (4 per diameter) were utilized for sampling.

F.7.2 Flow Rate

Flow rate was measured in conjunction with all mercury testing, in accordance with EPA Method 2 "Stack Gas Velocity and Volumetric Flow Rate." A description of this method is presented in Appendix G-10.

Flow rate from the 3.75-inch diameter carbon kiln and the 4-inch diameter mercury retort exhaust stack were determined using a standard pitot tube in accordance with Method 1A.

F.7.3 Fixed Gases (CO_2, O_2, N_2)

Fixed gas (O_2, CO_2, N_2) concentrations were determined using EPA Method 3 "Gas Analysis for Dry Molecular Weight and Excess Air" as described in Appendix G-10.

F.7.4 Moisture

Moisture content was measured in conjunction with all mercury testing in accordance with EPA Method 4 "Determination of Moisture in Stack Gases." A description of this method is provided in Appendix G-10.

F.7.5. Total Mercury

Total mercury emissions were determined using US EPA Method 29. Three test runs were conducted for each source. A minimum of 60 cubic feet of sample was collected for each source. A description of US EPA Method 29 is provided in Appendix G-10.

F.8 Quality Control/Quality Assurance Summary

A strict quality assurance program was adhered to throughout the source sampling and analytical phases of the program. Below is a summary of the QA/QC results.

F.8.1 Field Equipment Calibration

All sampling equipment was in proper calibration in accordance within the EPA procedures specified in APTD-0576, 40 CFR 60, Appendix A prior to field use for the test program. All post-test equipment calibration check results were within specific method requirements including dry gas meter/orifice, pitot tubes, thermocouples and sample nozzles.

F.8.2 Sample Equipment Operation

All Method 29 and ASTM D674-02 sample trains and pitot tubes passed the required leak checks prior to and at the conclusion of each test run and prior to and following the changing or disconnecting of any sample train component. All sample train operating temperatures (probe, filter, impinger exit) were within the specifications of each respective method.

F.8.3 Source Sample Chain of Custody Procedures

All proper chain-of-custody and sample storage procedures were adhered to between sample collection and submission to the laboratory.

F.8.4 Laboratory Data

As specified in the laboratory report narratives, all lab samples were analyzed in accordance with the specific US EPA Method 29 procedures with no deviations.

All Method 29 field solution blanks were below the detection limit; thus, a solution blank correction was not applied to the sample analytical results. All sample fractions were analyzed in duplicate. All duplicate analyses were within laboratory internal control limit of 20% relative percent difference (RPD). All QC samples were within the Method 29 control limit of 15% of predicted value. All valid meaningful matrix spikes were within 75% to 125% of the predicted value.

G. OPERATIONAL / PROCESS DATA

G.1 Process Throughput

G.1.1 Carbon Regeneration Kiln (S2.001)

The Carbon Regeneration Kiln throughput during testing was 100% of the permitted throughput of 0.042 tons/hour. The operating parameters data sheet, provided by the facility, can be found in Appendix G-4.

G.1.2 Mercury Retort (S2.002)

The Mercury Retort was charged with 1372 pounds (0.686 tons) of material for Runs 1, 2 and 3 over the 24 hour cycle time. This is 0.0286 tons/hour which is 57.2 percent of the permitted throughput of 0.05 tons per hour. The operating parameters data sheet, provided by the facility, can be found in Appendix G-4.

G.1.3 Electrowinning

The electrowinning cells throughput during the testing period was 22.6 gallons per minute (gpm). There is no permitted electrowinning throughput limit. The operating parameters data sheet, provided by the facility, can be found in Appendix G-4.

G.1.4 Refinery Furnace (S2.004)

The Refinery Furnace was charged with 853 pounds of dry sludge and 299 pounds of flux over the 5 hour melt cycle. This is 0.085 tons/hour or 57% of the permitted throughput of 0.15 tons of concentrate (dry sludge) per hour.

G.2 System and Control Device Operating Parameters

G.2.1 Carbon Regeneration Kiln (S2.001)

The Carbon Regeneration Kiln temperature for each run was as follows:

Run 1	1298°F / 1304°F
Run 2	1301°F / 1301°F
Run 3	1304°F / 1294°F

The kiln temperature readings were recorded by Horizon on the Method 29 field data sheets (see Appendix G-2).

G.2.2 Mercury Retort (S2.002)

The Mercury Retort temperature set point was 1150°F for each run. Testing was initiated at the start of the final temperature ramp from 900°F to 1150°F. The remaining two test runs were conducted at a temperature of 1150°F. Raw production data can be found in Appendix G-4.

G.2.3 Electrowinning

The electrowinning feed temperature for Run 1 and 2 was 180°F; the electrowinning feed cell temperature for Run 3 was 181°F.

G.2.4 Refinery Furnace (S2.004)

Testing (Run 1) was initiated upon the charging of the furnace. Run 2 was completed during the middle of the melting cycle and during a pour of the melted charge. Run 3 was completed at the end of the melt cycle and during a pour of the melted charge. Baghouse pressure drop during each test run was greater than 2 inches of water gauge (See Field Data Sheets - Appendix G-2).

G.3 Raw Material

All raw material used in each respective process/source tested was typical of normal operations. The raw material of each process tested was sampled to determine mercury concentration. The results of this raw material mercury analyses is provided in Table G-1. The raw material mercury sampling was completed by Kennecott Rawhide Mining Company.

The mercury analyses lab reports, as provided by Kennecott Rawhide, are included in Appendix G-5-Raw Materials-Mercury Analyses. Also included in Appendix G-4 are the copies of the operating data sheets provided by Kennecott Rawhide.

Table G-1
Raw Material Mercury Concentration
Denton - Rawhide Mine

Source	Run#	Raw Material	Mercury Concentration
Carbon Regeneration Kiln	1	Carbon Feed	33 ppm
		Carbon Out	5 ppm
	2	Carbon Feed	33 ppm
		Carbon Out	5 ppm
	3	Carbon Feed	33 ppm
		Carbon Out	5 ppm
Mercury Retort	1	Retort Feed	3640 ppm
		Retort Out	1730 ppm
	2	Retort Feed	3640 ppm
		Retort Out	1730 ppm
	3	Retort Feed	3640 ppm
		Retort Out	1730 ppm
Electrowinning	1	Inlet	0.19 ppm
		Outlet	0.037 ppm
	2	Inlet	0.19 ppm
		Outlet	0.037 ppm
	3	Inlet	0.19 ppm
		Outlet	0.037 ppm
Refinery Furnace	1	Dry Sludge	1730 ppm
	2	Dry Sludge	1730 ppm
	3	Dry Sludge	1730 ppm

APPENDIX G-1 - Complete Results With Example Calculations

Facility: Kennecott - Rawhide
Source: Carbon Kiln
Job No.: K18-002

EPA Method 29 Mercury Results

RUN NUMBER	******	1	2	3
DATE OF RUN	******	12/03/08	12/04/08	12/04/08
CLOCK TIME: INITIAL	******	1351	725	921
CLOCK TIME: FINAL	******	1529	903	1103
AVG. STACK TEMPERATURE	Degrees F	86	73	74
AVG. SQUARE DELTA P	Inches H20	0.9675	0.9549	0.9390
NOZZLE DIAMETER	Inches	0.212	0.212	0.212
BAROMETRIC PRESSURE	Inches HG	25.26	25.26	25.26
SAMPLING TIME	Minutes	96	96	96
SAMPLE VOLUME	Cubic Feet	94.173	90.884	89.816
AVG. METER TEMP.	Degrees F	75	54	62
AVG. DELTA H	Inches H20	2.91	2.84	2.76
DGM CALIB. FACTOR [Y]	******	1.009	1.009	1.009
WATER COLLECTED	Milliliters	68	54	75
CO 2	Percent	1.1	0.8	0.7
O 2	Percent	17.9	19.2	19.3
CO	Percent			
CH4	Percent			
N 2	Percent	81.00	80.00	80.00
STACK AREA	Square Inches	11.0	11.0	11.0
STATIC PRESSURE	Inches WG.	0.28	0.28	0.28
PITOT COEFFICIENT	******	0.99	0.99	0.99
SAMPLE VOLUME DRY	DSCF	79.90	80.17	78.03
WATER AT STD.	SCF	3.2	2.5	3.5
MOISTURE	Percent	3.9	3.1	4.3
MOLE FRACTION DRY GAS	******	0.96	0.97	0.96
MOLECULAR WT.DRY	lb/lb Mole	28.89	28.90	28.88
MOLECULAR WT. WET	lb/lb Mole	28.47	28.56	28.41
STACK GAS PRESSURE	Inches HG	25.28	25.28	25.28
STACK VELOCITY	AFPM	4279	4165	4113
VOLUMETRIC FLOWRATE, DRY ST	DSCFM	257	258	251
VOLUMETRIC FLOWRATE, ACTUAI	ACFM	327	318	314
ISOKINETIC RATIO	Percent	101	101	101

STD TEMP: 68

CALCULATIONS FOR GRAIN LOADING AND EMISSION RATES

TOTAL MERCURY	mg	0.03167	0.01779	0.00570
MERCURY CONCENTRATION	mg/dscf	0.0003964	0.0002219	0.0000731
MERCURY CONCENTRATION	g/dscm	0.0000140	0.00000784	0.00000258
MERCURY EMISSION RATE	lb/hr	0.00001347	0.00000758	0.00000242
TOTAL PARTICULATE	mg	2.8	11.3	7.9
PARTICULATE CONCENTRATION	gr/dscf	0.00054	0.00217	0.00156
PARTICULATE EMISSION RATE	lb/hr	0.0012	0.0048	0.0034

Particulate Emissions - Source Test Data

Source Name:	Kennecott Rawhide
Permit no.	AP 1041-1116.02
System tested:	System no. 01. Emission unit S 2.001
Description:	Carbon Kiln
Pollutants sampled:	Mercury
Test Date:	12/03/08
Testing Firm:	Horizon Air Measurement Services

Run no. 1

Traverse Point	Time (sampling interval)	Stack velocity (pitot head)		Dry Gas Meter - Orifice pressure	Dry Gas Meter Reading	Stack Temp.	Dry Gas Meter	Dry Gas Meter
		Δp in. H_2O	sqrt Δp (in. $H_2O)^{1/2}$	ΔH in. H_2O	(Vol.) ft^3	T_s °F	T_{in} °F	T_{out} °F
				initial reading:	506.873			
A8	0.0	1.100	1.0488	3.40	506.87	86	59	59
7	6.0	1.000	1.0000	3.10	513.10	85	80	63
6	12.0	1.000	1.0000	3.10	519.10	85	81	65
5	18.0	0.960	0.9798	3.00	525.80	86	83	68
4	24.0	0.980	0.9899	3.00	531.30	85	83	69
3	30.0	0.880	0.9381	2.70	537.10	86	85	70
2	36.0	0.860	0.9274	2.70	543.60	87	84	72
1	42.0	0.860	0.9274	2.70	548.50	87	84	72
B8	48.0	1.200	1.0954	3.70	554.352	87	83	72
7	54.0	1.000	1.0000	3.10	560.80	87	84	74
6	60.0	0.960	0.9798	3.00	567.90	86	81	74
5	66.0	0.880	0.9381	2.70	574.50	86	80	73
4	72.0	0.880	0.9381	2.70	579.10	86	79	73
3	78.0	0.840	0.9165	2.60	584.50	85	78	71
2	84.0	0.800	0.8944	2.50	590.10	85	76	70
1	90.0	0.820	0.9055	2.50	595.90	84	74	68
End	96.0				601.046			
	Average		0.9675	2.91	94.173	85.8		74.6

O_2 % dry 17.9

CO_2 % dry 1.1

Particulate Emissions - Source Test Data

Source Name:	Kennecott Rawhide
Permit no.	AP 1041-1116.02
System tested:	System no. 01. Emission unit S 2.001
Description:	Carbon Kiln
Pollutants sampled:	Mercury
Test Date:	12/04/08
Testing Firm:	Horizon Air Measurement Services

Run no. 2

Traverse Point	Time (sampling interval)	Stack velocity (pitot head)		Dry Gas Meter - Orifice pressure	Dry Gas Meter Reading	Stack Temp.	Dry Gas Meter	Dry Gas Meter
		Δp in. H_2O	sqrt Δp $(in. H_2O)^{1/2}$	ΔH in. H_2O	(Vol.) ft^3	T_s °F	T_{in} °F	T_{out} °F
				initial reading:	602.660			
A8	0.0	0.960	0.9798	3.00	602.66	72	40	40
7	6.0	1.000	1.0000	3.10	608.50	74	53	42
6	12.0	0.980	0.9899	3.00	614.40	74	59	44
5	18.0	0.920	0.9592	2.90	620.20	74	61	46
4	24.0	0.860	0.9274	2.70	625.90	74	62	47
3	30.0	0.840	0.9165	2.60	631.40	73	63	49
2	36.0	0.820	0.9055	2.50	636.90	73	63	50
1	42.0	0.800	0.8944	2.50	642.30	74	63	51
B8	48.0	1.100	1.0488	3.40	647.704	75	60	51
7	54.0	1.000	1.0000	3.10	653.90	75	64	53
6	60.0	0.990	0.9950	3.10	659.90	73	62	53
5	66.0	0.960	0.9798	3.00	665.90	73	61	53
4	72.0	0.900	0.9487	2.80	672.50	72	60	51
3	78.0	0.860	0.9274	2.70	677.40	66	60	51
2	84.0	0.820	0.9055	2.50	682.90	70	61	50
1	90.0	0.810	0.9000	2.50	688.10	70	59	49
End	96.0				693.544			
Average			0.9549	2.84	90.884	72.6		54.1

O_2 % dry 19.2

CO_2 % dry 0.8

Particulate Emissions - Source Test Data

Source Name:	Kennecott Rawhide
Permit no.	AP 1041-1116.02
System tested:	System no. 01. Emission unit S 2.001
Description:	Carbon Kiln
Pollutants sampled:	Mercury
Test Date:	12/04/08
Testing Firm:	Horizon Air Measurement Services

Run no. 3

Traverse Point	Time (sampling interval)	Stack velocity (pitot head)		Dry Gas Meter - Orifice pressure	Dry Gas Meter Reading	Stack Temp.	Dry Gas Meter	Dry Gas Meter
		Δp in. H_2O	sqrt Δp $(in. H_2O)^{1/2}$	ΔH in. H_2O	(Vol.) ft^3	T_s °F	T_{in} °F	T_{out} °F
				initial reading:	694.032			
A8	0.0	1.000	1.0000	3.10	694.03	72	54	47
7	6.0	0.960	0.9798	3.00	700.00	73	63	49
6	12.0	0.920	0.9592	2.90	705.80	72	63	51
5	18.0	0.920	0.9592	2.90	711.40	72	64	52
4	24.0	0.900	0.9487	2.80	717.30	72	65	54
3	30.0	0.840	0.9165	2.60	722.90	72	67	55
2	36.0	0.800	0.8944	2.50	728.30	72	68	56
1	42.0	0.800	0.8944	2.50	733.80	73	69	57
B8	48.0	1.100	1.0488	3.40	739.107	73	63	57
7	54.0	0.940	0.9695	2.90	745.30	74	70	58
6	60.0	0.900	0.9487	2.80	751.00	75	71	59
5	66.0	0.860	0.9274	2.70	756.60	76	72	60
4	72.0	0.840	0.9165	2.60	762.20	77	72	60
3	78.0	0.800	0.8944	2.50	767.80	78	73	61
2	84.0	0.800	0.8944	2.50	773.20	79	73	61
1	90.0	0.760	0.8718	2.40	778.60	80	76	62
End	96.0				783.848			
	Average		0.9390	2.76	89.816	74.4		61.9

O_2 % dry 19.3

CO_2 % dry 0.7

Facility: Kennecott - Rawhide
Source: Retort
Job No.: K18-002

EPA Method 29 Mercury Results

RUN NUMBER	******	1	2	3
DATE OF RUN	******	12/02/08	12/02/08	12/02/08
CLOCK TIME: INITIAL	******	943	1135	1325
CLOCK TIME: FINAL	******	1120	1312	1502
AVG. STACK TEMPERATURE	Degrees F	83	61	53
AVG. SQUARE DELTA P	Inches H20	0.1000	0.1000	0.1000
NOZZLE DIAMETER	Inches	0.720	0.720	0.720
BAROMETRIC PRESSURE	Inches HG	25.29	25.29	25.29
SAMPLING TIME	Minutes	96	96	96
SAMPLE VOLUME	Cubic Feet	110.620	110.709	111.002
AVG. METER TEMP.	Degrees F	63	63	57
AVG. DELTA H	Inches H20	3.80	3.90	3.90
DGM CALIB. FACTOR [Y]	******	1.007	1.007	1.007
WATER COLLECTED	Milliliters	22	11	10
CO 2	Percent	0.4	0.3	0.3
O 2	Percent	19.6	20.1	20.1
CO	Percent			
CH4	Percent			
N 2	Percent	80.00	79.60	79.60
STACK AREA	Square Inches	12.6	12.6	12.6
STATIC PRESSURE	Inches WG.	0.005	0.005	0.005
PITOT COEFFICIENT	******	0.99	0.99	0.99
SAMPLE VOLUME DRY	DSCF	96.18	96.19	97.51
WATER AT STD.	SCF	1.0	0.5	0.5
MOISTURE	Percent	1.1	0.5	0.5
MOLE FRACTION DRY GAS	******	0.99	0.99	1.00
MOLECULAR WT.DRY	lb/lb Mole	28.85	28.85	28.85
MOLECULAR WT. WET	lb/lb Mole	28.73	28.79	28.80
STACK GAS PRESSURE	Inches HG	25.29	25.29	25.29
STACK VELOCITY	AFPM	439	430	426
VOLUMETRIC FLOWRATE, DRY ST	DSCFM	31	32	32
VOLUMETRIC FLOWRATE, ACTUAI	ACFM	38	37	37
ISOKINETIC RATIO	Percent	99	97	97

STD TEMP: 68

CALCULATIONS FOR GRAIN LOADING AND EMISSION RATES

TOTAL MERCURY	mg	0.02088	0.00668	0.00627
MERCURY CONCENTRATION	mg/dscf	0.0002171	0.0000695	0.0000643
MERCURY CONCENTRATION	g/dscm	0.00000767	0.00000245	0.00000227
MERCURY EMISSION RATE	lb/hr	0.000000895	0.000000293	0.000000274
TOTAL PARTICULATE	mg	1.1	2.0	2.4
PARTICULATE CONCENTRATION	gr/dscf	0.00018	0.00032	0.00038
PARTICULATE EMISSION RATE	lb/hr	0.000047	0.000088	0.000105

Particulate Emissions - Source Test Data

Source Name:	Kennecott Rawhide
Permit no.	AP 1041-1116.02
System tested:	System no. 01. Emission unit S 2.002
Description:	Retort
Pollutants sampled:	Mercury
Test Date:	12/02/08
Testing Firm:	Horizon Air Measurement Services

Run no. 1

Traverse Point	Time (sampling interval)	Stack velocity (pitot head)		Dry Gas Meter - Orifice pressure	Dry Gas Meter Reading	Stack Temp.	Dry Gas Meter	Dry Gas Meter
		Δp in. H_2O	sqrt Δp (in. $H_2O)^{1/2}$	ΔH in. H_2O	(Vol.) ft^3	T_s °F	T_{In} °F	T_{out} °F
				initial reading:	519.830			
A8	0	0.010	0.1000	3.80	519.86	90		53
7	6	0.010	0.1000	3.80	527.00	89		55
6	12	0.010	0.1000	3.80	533.80	88		57
5	18	0.010	0.1000	3.80	541.10	87		58
4	24	0.010	0.1000	3.80	547.40	86		59
3	30	0.010	0.1000	3.80	554.90	84		60
2	36	0.010	0.1000	3.80	562.00	85		62
1	42	0.010	0.1000	3.80	568.10	81		61
B8	48	0.010	0.1000	3.80	574.931	80		60
7	54	0.010	0.1000	3.80	581.80	80		64
6	60	0.010	0.1000	3.80	589.60	79		66
5	66	0.010	0.1000	3.80	595.80	79		67
4	72	0.010	0.1000	3.80	602.10	80		69
3	78	0.010	0.1000	3.80	610.40	80		69
2	84	0.010	0.1000	3.80	616.50	80		70
1	90	0.010	0.1000	3.80	622.90	79		71
END	96				630.450			
	Average		0.1000	3.80	110.620	82.9		62.6

O_2 % dry	**19.6**
CO_2 % dry	**0.4**

EPA M29_HG KennecottRetort

Particulate Emissions - Source Test Data

Source Name:	Kennecott Rawhide
Permit no.	AP 1041-1116.02
System tested:	System no. 01. Emission unit S 2.002
Description:	Retort
Pollutants sampled:	Mercury
Test Date:	12/02/08
Testing Firm:	Horizon Air Measurement Services

Run no. 2

Traverse Point	Time (sampling interval)	Stack velocity (pitot head)		Dry Gas Meter - Orifice pressure	Dry Gas Meter Reading	Stack Temp.	Dry Gas Meter	Dry Gas Meter
		Δp in. H_2O	sqrt Δp $(\text{in. } H_2O)^{1/2}$	ΔH in. H_2O	(Vol.) ft^3	T_s °F	T_{in} °F	T_{out} °F
				initial reading:	631.509			
A8	0	0.010	0.1000	3.90	631.51	65		67
7	6	0.010	0.1000	3.90	638.30	62		67
6	12	0.010	0.1000	3.90	645.30	65		67
5	18	0.010	0.1000	3.90	652.20	66		66
4	24	0.010	0.1000	3.90	659.10	67		65
3	30	0.010	0.1000	3.90	666.20	68		65
2	36	0.010	0.1000	3.90	672.90	68		64
1	42	0.010	0.1000	3.90	679.80	64		63
B8	48	0.010	0.1000	3.90	686.739	62		61
7	54	0.010	0.1000	3.90	693.70	59		62
6	60	0.010	0.1000	3.90	700.80	56		61
5	66	0.010	0.1000	3.90	707.30	56		61
4	72	0.010	0.1000	3.90	714.100	56		61
3	78	0.010	0.1000	3.90	7213.00	56		60
2	84	0.010	0.1000	3.90	728.30	55		60
1	90	0.010	0.1000	3.90	735.20	55		60
END	96				742.218			
	Average		0.1000	3.90	110.709	61.3		63.1

O_2 % dry 20.1

CO_2 % dry 0.3

Particulate Emissions - Source Test Data

Source Name:	Kennecott Rawhide
Permit no.	AP 1041-1116.02
System tested:	System no. 01. Emission unit S 2.002
Description:	Retort
Pollutants sampled:	Mercury
Test Date:	12/02/08
Testing Firm:	Horizon Air Measurement Services

Run no. 3

Traverse Point	Time (sampling interval)	Stack velocity (pitot head)		Dry Gas Meter - Orifice pressure	Dry Gas Meter Reading	Stack Temp.	Dry Gas Meter	Dry Gas Meter
		Δp in. H_2O	sqrt Δp (in. $H_2O)^{1/2}$	ΔH in. H_2O	(Vol.) ft^3	T_s °F	T_{in} °F	T_{out} °F
				initial reading:	742.850			
A8	0	0.010	0.1000	3.90	742.85	55		56
7	6	0.010	0.1000	3.90	749.70	54		56
6	12	0.010	0.1000	3.90	756.60	53		56
5	18	0.010	0.1000	3.90	763.40	53		57
4	24	0.010	0.1000	3.90	770.40	53		57
3	30	0.010	0.1000	3.90	777.30	53		57
2	36	0.010	0.1000	3.90	784.20	53		57
1	42	0.010	0.1000	3.90	791.20	53		57
B8	48	0.010	0.1000	3.90	798.10	53		57
7	54	0.010	0.1000	3.90	805.056	53		58
6	60	0.010	0.1000	3.90	812.00	54		58
5	66	0.010	0.1000	3.90	819.90	54		58
4	72	0.010	0.1000	3.90	826.00	54		58
3	78	0.010	0.1000	3.90	832.89	53		58
2	84	0.010	0.1000	3.90	839.80	53		59
1	90	0.010	0.1000	3.90	846.80	53		59
END	96				853.852			
	Average		0.1000	3.90	111.002	53.4		57.4

O_2 % dry 20.1

CO_2 % dry 0.3

Facility: Kennecott - Rawhide
Source: Electrowinning
Job No.: K18-002

EPA Method 29 Mercury Results

RUN NUMBER	******	1	2	3
DATE OF RUN	******	12/04/08	12/04/08	12/04/08
CLOCK TIME: INITIAL	******	758	958	1146
CLOCK TIME: FINAL	******	939	1140	1326
AVG. STACK TEMPERATURE	Degrees F	68	73	75
AVG. SQUARE DELTA P	Inches H20	0.4137	0.4251	0.4413
NOZZLE DIAMETER	Inches	0.345	0.345	0.345
BAROMETRIC PRESSURE	Inches HG	25.26	25.26	25.26
SAMPLING TIME	Minutes	96	96	96
SAMPLE VOLUME	Cubic Feet	85.006	88.289	95.320
AVG. METER TEMP.	Degrees F	45	54	68
AVG. DELTA H	Inches H20	2.57	2.70	2.89
DGM CALIB. FACTOR [Y]	******	1.007	1.007	1.007
WATER COLLECTED	Milliliters	30	34	27
CO 2	Percent	0.0	0.1	0.0
O 2	Percent	20.9	20.8	20.9
CO	Percent			
CH4	Percent			
N 2	Percent	79.10	79.10	79.10
STACK AREA	Square Inches	64.0	64.0	64.0
STATIC PRESSURE	Inches WG.	0.150	0.150	0.150
PITOT COEFFICIENT	******	0.84	0.84	0.84
SAMPLE VOLUME DRY	DSCF	76.11	77.66	81.80
WATER AT STD.	SCF	1.4	1.6	1.3
MOISTURE	Percent	1.8	2.0	1.5
MOLE FRACTION DRY GAS	******	0.98	0.98	0.98
MOLECULAR WT.DRY	lb/lb Mole	28.84	28.85	28.84
MOLECULAR WT. WET	lb/lb Mole	28.64	28.63	28.67
STACK GAS PRESSURE	Inches HG	25.27	25.27	25.27
STACK VELOCITY	AFPM	1522	1572	1635
VOLUMETRIC FLOWRATE, DRY ST	DSCFM	561	573	596
VOLUMETRIC FLOWRATE, ACTUAI	ACFM	676	699	726
ISOKINETIC RATIO	Percent	97	97	98

STD TEMP: 68

CALCULATIONS FOR GRAIN LOADING AND EMISSION RATES

TOTAL MERCURY	mg	0.02323	0.00435	0.00547
MERCURY CONCENTRATION	mg/dscf	0.0003052	0.0000560	0.0000669
MERCURY CONCENTRATION	g/dscm	0.00001078	0.00000198	0.00000236
MERCURY EMISSION RATE	lb/hr	0.00002267	0.00000424	0.00000527
TOTAL PARTICULATE	mg	7.2	7.9	12.6
PARTICULATE CONCENTRATION	gr/dscf	0.0015	0.0016	0.0024
PARTICULATE EMISSION RATE	lb/hr	0.0070	0.0077	0.0121

Particulate Emissions - Source Test Data

Source Name:	Kennecott Rawhide
Permit no.	AP 1041-1116.02
System tested:	NA
Description:	Electrowinning
Pollutants sampled:	Mercury
Test Date:	12/04/08
Testing Firm:	Horizon Air Measurement Services

Run no. 1

Traverse Point	Time (sampling interval)	Stack velocity (pitot head)		Dry Gas Meter - Orifice pressure	Dry Gas Meter Reading	Stack Temp.	Dry Gas Meter	Dry Gas Meter
		Δp in. H_2O	sqrt Δp (in. $H_2O)^{1/2}$	ΔH in. H_2O	(Vol.) ft^3	T_s °F	T_{in} °F	T_{out} °F
				initial reading:	161.429			
A8	0	0.340	0.5831	4.80	161.43	64		34
7	4	0.300	0.5477	4.20	166.40	64		35
6	8	0.260	0.5099	3.60	170.70	64		37
5	12	0.200	0.4472	2.80	175.10	65		38
4	16	0.120	0.3464	1.70	178.80	65		40
3	20	0.080	0.2828	1.10	181.80	66		41
2	24	0.060	0.2449	0.80	184.30	66		42
1	28	0.060	0.2449	0.80	186.40	67		42
B8	32	0.380	0.6164	5.30	188.762	67		41
7	36	0.280	0.5292	3.90	194.50	67		44
6	40	0.200	0.4472	2.80	198.10	67		46
5	44	0.180	0.4243	2.50	201.90	67		47
4	48	0.140	0.3742	2.00	205.50	68		47
3	52	0.100	0.3162	1.40	208.80	68		47
2	56	0.080	0.2828	1.10	211.70	68		48
1	60	0.050	0.2236	0.70	214.50	69		48
C8	64	0.320	0.5657	4.50	216.638	69		48
7	68	0.280	0.5292	3.90	220.40	69		49
6	72	0.220	0.4690	3.10	224.70	70		51
5	76	0.180	0.4243	2.50	229.10	70		51
4	80	0.160	0.4000	2.20	233.60	70		51
3	84	0.140	0.3742	2.00	236.40	71		52
2	88	0.160	0.4000	2.20	239.80	70		52
1	92	0.120	0.3464	1.70	243.30	71		52
END	96				246.435			
	Average		0.4137	2.57	85.006	67.6		45.1

O_2 % dry 20.9

CO_2 % dry 0.0

Particulate Emissions - Source Test Data

Source Name:	Kennecott Rawhide
Permit no.	AP 1041-1116.02
System tested:	NA
Description:	Electrowinning
Pollutants sampled:	Mercury
Test Date:	12/04/08
Testing Firm:	Horizon Air Measurement Services

Run no. 2

Traverse Point	Time (sampling interval)	Stack velocity (pitot head)		Dry Gas Meter - Orifice pressure	Dry Gas Meter Reading	Stack Temp.	Dry Gas Meter	Dry Gas Meter
		Δp in. H_2O	sqrt Δp $(in. H_2O)^{1/2}$	ΔH in. H_2O	(Vol.) ft^3	T_S °F	T_{In} °F	T_{out} °F
				initial reading:	246.894			
A8	0	0.320	0.5657	4.50	246.89	71		49
7	4	0.300	0.5477	4.20	250.70	71		49
6	8	0.280	0.5292	3.90	255.00	71		50
5	12	0.220	0.4690	3.10	259.60	72		51
4	16	0.140	0.3742	2.00	263.70	72		52
3	20	0.100	0.3162	1.40	267.30	72		53
2	24	0.080	0.2828	1.10	269.90	72		53
1	28	0.060	0.2449	0.80	272.40	72		53
B8	32	0.380	0.6164	5.30	274.654	72		53
7	36	0.300	0.5477	4.20	279.90	73		53
6	40	0.220	0.4690	3.10	284.50	73		54
5	44	0.160	0.4000	2.20	288.80	73		55
4	48	0.120	0.3464	1.70	292.80	73		55
3	52	0.100	0.3162	1.40	295.40	74		55
2	56	0.080	0.2828	1.10	298.70	74		56
1	60	0.060	0.2449	0.80	300.80	74		56
C8	64	0.320	0.5657	4.50	303.047	74		56
7	68	0.280	0.5292	3.90	308.20	74		57
6	72	0.240	0.4899	3.40	312.40	74		57
5	76	0.220	0.4690	3.10	316.90	73		57
4	80	0.200	0.4472	2.80	321.10	74		57
3	84	0.160	0.4000	2.20	325.30	74		57
2	88	0.140	0.3742	2.00	328.60	74		57
1	92	0.140	0.3742	2.00	331.90	74		57
END	96				335.183			
	Average		0.4251	2.70	88.289	72.9		54.3

O_2 % dry 20.8

CO_2 % dry 0.1

Particulate Emissions - Source Test Data

Source Name:	Kennecott Rawhide
Permit no.	AP 1041-1116.02
System tested:	NA
Description:	Electrowinning
Pollutants sampled:	Mercury
Test Date:	12/04/08
Testing Firm:	Horizon Air Measurement Services

Run no. 3

Traverse Point	Time (sampling interval)	Stack velocity (pitot head)		Dry Gas Meter - Orifice pressure	Dry Gas Meter Reading	Stack Temp.	Dry Gas Meter	Dry Gas Meter
		Δp in. H_2O	sqrt Δp $(in. H_2O)^{1/2}$	ΔH in. H_2O	(Vol.) ft^3	T_S °F	T_{In} °F	T_{out} °F
				initial reading:	335.601			
A8	0	0.340	0.5831	4.80	335.60	75		55
7	4	0.300	0.5477	4.20	343.00	75		57
6	8	0.280	0.5292	3.90	350.20	75		59
5	12	0.240	0.4899	3.40	354.60	75		61
4	16	0.160	0.4000	2.20	357.10	75		62
3	20	0.120	0.3464	1.70	359.50	76		63
2	24	0.100	0.3162	1.40	362.70	76		64
1	28	0.060	0.2449	0.80	365.50	75		65
B8	32	0.380	0.6164	5.30	367.809	75		64
7	36	0.340	0.5831	4.80	376.60	75		66
6	40	0.280	0.5292	3.90	378.10	75		69
5	44	0.200	0.4472	2.80	382.80	75		69
4	48	0.160	0.4000	2.20	386.90	75		70
3	52	0.120	0.3464	1.70	390.50	75		71
2	56	0.080	0.2828	1.10	393.80	75		71
1	60	0.060	0.2449	0.80	396.20	75		71
C8	64	0.320	0.5657	4.50	398.463	75		71
7	68	0.300	0.5477	4.20	403.00	75		71
6	72	0.260	0.5099	3.60	407.90	75		71
5	76	0.220	0.4690	3.10	413.10	76		72
4	80	0.200	0.4472	2.80	417.00	76		73
3	84	0.180	0.4243	2.50	420.80	76		74
2	88	0.140	0.3742	2.00	424.40	76		75
1	92	0.120	0.3464	1.70	427.70	76		75
END	96				430.921			
	Average		0.4413	2.89	95.320	75.3		67.5

O_2 % dry 20.9

CO_2 % dry 0.0

Facility: Kennecott - Rawhide
Source: Refinery Furnace
Job No.: K18-002

EPA Method 29 Mercury Results

RUN NUMBER	******	1	2	3
DATE OF RUN	******	12/03/08	12/03/08	12/03/08
CLOCK TIME: INITIAL	******	745	938	1129
CLOCK TIME: FINAL	******	927	1117	1308
AVG. STACK TEMPERATURE	Degrees F	62	70	76
AVG. SQUARE DELTA P	Inches H20	1.1640	1.1449	1.1503
NOZZLE DIAMETER	Inches	0.220	0.220	0.220
BAROMETRIC PRESSURE	Inches HG	25.26	25.26	25.26
SAMPLING TIME	Minutes	96	96	96
SAMPLE VOLUME	Cubic Feet	102.324	101.506	102.293
AVG. METER TEMP.	Degrees F	55	61	63
AVG. DELTA H	Inches H20	3.27	3.15	3.19
DGM CALIB. FACTOR [Y]	******	1.007	1.007	1.007
WATER COLLECTED	Milliliters	24	33	14
CO 2	Percent	0.3	0.2	0.6
O 2	Percent	19.7	19.8	19.3
CO	Percent			
CH4	Percent			
N 2	Percent	80.00	80.00	80.10
STACK AREA	Square Inches	572.6	572.6	572.6
STATIC PRESSURE	Inches WG.	0.40	0.40	0.40
PITOT COEFFICIENT	******	0.84	0.84	0.84
SAMPLE VOLUME DRY	DSCF	90.11	88.19	88.60
WATER AT STD.	SCF	1.1	1.6	0.7
MOISTURE	Percent	1.2	1.7	0.7
MOLE FRACTION DRY GAS	******	0.99	0.98	0.99
MOLECULAR WT.DRY	lb/lb Mole	28.84	28.82	28.87
MOLECULAR WT. WET	lb/lb Mole	28.70	28.64	28.79
STACK GAS PRESSURE	Inches HG	25.29	25.29	25.29
STACK VELOCITY	AFPM	4255	4222	4254
VOLUMETRIC FLOWRATE, DRY ST	DSCFM	14275	13880	13972
VOLUMETRIC FLOWRATE, ACTUAI	ACFM	16919	16788	16916
ISOKINETIC RATIO	Percent	99	100	99

STD TEMP: 68

CALCULATIONS FOR GRAIN LOADING AND EMISSION RATES

TOTAL MERCURY	mg	4.75	9.93	7.95
MERCURY CONCENTRATION	mg/dscf	0.0527	0.1126	0.0898
MERCURY CONCENTRATION	g/dscm	0.00186	0.00398	0.00317
MERCURY EMISSION RATE	lb/hr	0.0995	0.2068	0.1659
TOTAL PARTICULATE	mg	4.5	5.4	2.6
PARTICULATE CONCENTRATION	gr/dscf	0.00077	0.00094	0.00045
PARTICULATE EMISSION RATE	lb/hr	0.094	0.112	0.054

Source Name:	Kennecott Rawhide
Permit no.	AP 1041-1116.02
System tested:	System no. 04. Emission unit S 2.004
Description:	Refinery Furnace
Pollutants sampled:	Mercury
Test Date:	12/03/08
Testing Firm:	Horizon Air Measurement Services

Run no. 1

Traverse Point	Time (sampling interval)	Stack velocity (pitot head)		Dry Gas Meter - Orifice pressure	Dry Gas Meter Reading	Stack Temp.	Dry Gas Meter	Dry Gas Meter
		Δp in. H_2O	sqrt Δp (in. $H_2O)^{1/2}$	ΔH in. H_2O	(Vol.) ft^3	T_s °F	T_{in} °F	T_{out} °F
				initial reading:	854.218			
A4	0.0	1.300	1.1402	3.10	854.22	61		41
	6.0	1.400	1.1832	3.40	860.40	59		45
3	12.0	1.400	1.1832	3.40	866.30	58		48
	18.0	1.400	1.1832	3.40	873.00	59		49
2	24.0	1.400	1.1832	3.40	879.50	60		51
	30.0	1.400	1.1832	3.40	886.10	61		52
1	36.0	1.300	1.1402	3.10	892.60	62		53
	42.0	1.300	1.1402	3.10	898.90	63		56
B4	48.0	1.200	1.0954	2.90	905.368	63		57
	54.0	1.200	1.0954	2.90	911.40	63		56
3	60.0	1.300	1.1402	3.10	918.30	64		59
	66.0	1.300	1.1402	3.10	923.70	64		60
2	72.0	1.400	1.1832	3.40	930.10	64		61
	78.0	1.400	1.1832	3.40	936.90	65		61
1	84.0	1.500	1.2247	3.60	943.00	66		62
	90.0	1.500	1.2247	3.60	949.70	67		63
End	96.0				956.542			
	Average		1.1640	3.27	102.324	62.4		54.6

O_2 % dry	19.7
CO_2 % dry	0.3

Source Name:	Kennecott Rawhide
Permit no.	AP 1041-1116.02
System tested:	System no. 04. Emission unit S 2.004
Description:	Refinery Furnace
Pollutants sampled:	Mercury
Test Date:	12/03/08
Testing Firm:	Horizon Air Measurement Services

Run no. 2

Traverse Point	Time (sampling interval)	Stack velocity (pitot head)		Dry Gas Meter - Orifice pressure	Dry Gas Meter Reading	Stack Temp.	Dry Gas Meter	Dry Gas Meter
		Δp in. H_2O	sqrt Δp (in. $H_2O)^{1/2}$	ΔH in. H_2O	(Vol.) ft^3	T_s °F	T_{in} °F	T_{out} °F
				initial reading:	956.851			
A4	0.0	1.200	1.0954	2.90	956.85	70		57
	6.0	1.200	1.0954	2.90	963.60	69		60
3	12.0	1.300	1.1402	3.10	969.70	69		61
	18.0	1.300	1.1402	3.10	976.00	69		61
2	24.0	1.300	1.1402	3.10	982.30	69		62
	30.0	1.300	1.1402	3.10	988.70	68		62
1	36.0	1.400	1.1832	3.40	995.00	67		62
	42.0	1.400	1.1832	3.40	1001.30	66		62
B4	48.0	1.200	1.0954	2.90	1007.616	66		61
	54.0	1.200	1.0954	2.90	1013.80	69		63
3	60.0	1.300	1.1402	3.10	1020.50	70		62
	66.0	1.300	1.1402	3.10	1026.10	72		62
2	72.0	1.300	1.1402	3.10	1031.70	75		62
	78.0	1.300	1.1402	3.10	1038.60	76		62
1	84.0	1.500	1.2247	3.60	1045.10	76		62
	90.0	1.500	1.2247	3.60	1051.60	76		62
End	96.0				1058.357			
	Average		1.1449	3.15	101.506	70.4		61.4

O_2 % dry 19.8

CO_2 % dry 0.2

Source Name:	Kennecott Rawhide
Permit no.	AP 1041-1116.02
System tested:	System no. 04. Emission unit S 2.004
Description:	Refinery Furnace
Pollutants sampled:	Mercury
Test Date:	12/03/08
Testing Firm:	Horizon Air Measurement Services

Run no. 3

Traverse Point	Time (sampling interval)	Stack velocity (pitot head)		Dry Gas Meter - Orifice pressure	Dry Gas Meter Reading	Stack Temp.	Dry Gas Meter	Dry Gas Meter
		Δp in. H_2O	sqrt Δp (in. $H_2O)^{1/2}$	ΔH in. H_2O	(Vol.) ft^3	T_S °F	T_{In} °F	T_{out} °F
				initial reading:	58.772			
A4	0.0	1.200	1.0954	2.90	58.77	77		59
	6.0	1.200	1.0954	2.90	65.10	77		61
3	12.0	1.300	1.1402	3.10	70.90	76		63
	18.0	1.300	1.1402	3.10	77.20	76		64
2	24.0	1.400	1.1832	3.40	83.70	77		65
	30.0	1.400	1.1832	3.40	90.00	77		66
1	36.0	1.400	1.1832	3.40	96.90	76		65
	42.0	1.400	1.1832	3.40	103.30	76		65
B4	48.0	1.200	1.0954	2.90	109.982	76		65
	54.0	1.200	1.0954	2.90	116.20	76		64
3	60.0	1.300	1.1402	3.10	122.30	76		63
	66.0	1.300	1.1402	3.10	128.80	76		63
2	72.0	1.300	1.1402	3.10	135.20	76		62
	78.0	1.300	1.1402	3.10	141.40	76		62
1	84.0	1.500	1.2247	3.60	147.30	75		62
	90.0	1.500	1.2247	3.60	154.20	78		61
End	96.0				161.065			
Average			1.1503	3.19	102.293	76.3		63.1

O_2 % dry 19.3

CO_2 % dry 0.6

Tstd = 68 °F
Pstd = 29.92 in./Hg

STACK VOLUME FLOW RATE CALCULATION SUMMARY

FACILITY: Kennecott Rawhide
SOURCE: Carbon Kiln
RUN #: 1

JOB NO.: K18.002
TEST DATE: 12/2/08 - 12/4/08

Dry molecular weight of stack gas

$$Mwd = 0.44\ (\%CO_2) + 0.32\ (\%O_2) + 0.28\ (\%N_2 + \%CO)$$

.011 + .179 (.81 + 0) x.00

= 28.89 lb/lb-mole

Molecular weight of stack gas, wet basis .961 .961

$$M_w = (M_{wd} \times M_d) + 18\ (1 - M_d)$$

+ (.702)

$$Where,\ M_d = \frac{100 - Moisture}{100}$$ 39 % = .961

= 28.47 lb/lb-mole

Pitot tube coeficient

C_p *(calibration curve)*

Standard = 0.99 S-Type = 0.84

= .99

Average velocity head of stack gas, inches H_2O

$(\sqrt{\Delta P})$ *avg.*

= 0.9675

Average absolute stack gas temperature

(T_s) *avg.* = 86 °F + 460

= 546 °R

Absolute stack gas pressure 25.29 + .78

$$P_s = P_B + (Pstat/13.6)$$

$(Pstat =$ *inches* $H_2O)$

Where P_B = *barometric pressure*

= 25.31 in. Hg

Stack gas velocity $\sqrt{546}$ $\left(\frac{1}{25.31 \cdot 28.47}\right)^{1/2}$

$$(V_s)\ avg. = (5130)\ C_p \times \sqrt{\Delta P}\ Avg \times \sqrt{T_s}\ avg. \times \left(\frac{1}{P_s \times M_w}\right)^{1/2}$$

.99 (.9675) (5078) (.9675) (23.300) (0.0377)

= 4279 ft/min.

Stack gas volume flow rate

$$Q_a = V_s\ A_s \qquad (A_s = \qquad ft^2)$$

(4279) ( )

= 327 acfm

Stack gas volume flow rate, dry basis 68 327 .961

$$Q_s = \frac{(460 + T_{std}) \times Q_a \times M_d \times P_s}{(P_{std})\ (T_s)}$$

(29.92) (546)

= 257 dscfm

H:\WPDOCS\FORMS\Calculation Sheets\Stack Volume Flow Rate

Tstd = 68 °F
Pstd = 29.92 in./Hg

STACK GAS MOISTURE CALCULATION

FACILITY: Kennecott Rawhide
SOURCE: Carbon Kiln
RUN #: 1

JOB NO.: 1618-000
TEST DATE: 12/3/08 - 12/4/08

Volume of sample at standard conditions, dry basis

1.009 (94.173) (65.26) 291

$$Vmstd = \frac{(460 + 68\ Tsd)\ (Y)\ (Vm)\ (Pb + \frac{Pm}{13.6})}{29.92\ (Tm + 460)}$$

75 (535)

= 79.90 dscf

Where, Vm = dry gas meter volume, ft^3
Y = DGM calibration factor
Pm = average ΔH, in H_2O
Pb = barometric pressure, in Hg
Tm = temperature of meter, °F

Volume of water vapor in sample at standard conditions

$$Vwstd = 0.04715\ x\ Vw$$

68

Where, Vw - water volume, ml

= 3.2 scf

Fractional moisture content of stack gas

$$B_{WS} = (\frac{V_{WSTD}}{V_{MSTD} + V_{WSTD}})\ x\ 100$$

$$\frac{3.2}{7990 + 3.2} \times 100$$

= 3.9 %

CALCULATION DATA SHEET

Mercury Emission Rate

$= 31.67\ ug$

$= 31.67\ ug \left| \frac{1\ mg}{1000\ ug} \right. = 0.032\ mg$

$= \frac{0.032\ mg}{80.99\ dscf} = 0.0004\ mg/dscf$

$= 0.0004\ mg/dscf \times \frac{1\ lb}{453590\ mg} \times \frac{60\ min}{hr} \times \frac{257\ dscf}{min}$

$= 1.33\ e^{-5}\ lb/hr$

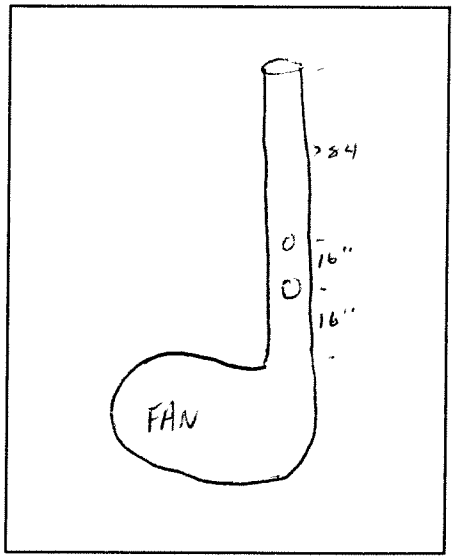
APPENDIX G-2 - Raw Field Data

VELOCITY DATA SHEET - METHOD 2

Facility:	Kennecott Rawhide	**Baro. Press:**	25.26	**D_1 upstream:**	16 (4) 84"
Source:	Kiln	**Static Press:**	+ .12	**D_1 downstream:**	16 (4) 16(4)
Job #:	KIS 002	**Pitot Tube #:**	2'	**Stack Diameter:**	3.75
Date:	12/3/08	**Pitot Tube Type:**	STD	**Leak Check**	
Operator:	JB	**Magnahelic:**	4	**Initial:**	**Final:**
Run #:	Prel. n			✓✓	✓✓

Point #	Position in.	Velocity Head in. H_2O	Stack Temp °F	Cyclonic Flow Angle
A 8	~~78~~.5	.78	83	6
7	.5	.78	83	4
6	.72	.50	83	2
5	1.21	.84	83	2
4	2.54	.92	84	0
3	3.02	.96	84	0
2	.5	1.1	84	0
1	.5	1.1	84	0
B 8		.50	84	3
7		.80	84	3
6		.86	84	1
5		.86	84	0
4		.94	84	1
3		.98	84	1
2		1.1	84	1
1		1.2	84	2
Average		**$\sqrt{\Delta P}$=**	**T_s=**	**∠=** 1.6

Side View



Top View

PARTICULATE FIELD DATA

PLANT Fernecott Rawhide
DATE 12/03/08
LOCATION Fallon NV
OPERATOR SB (m RS)
SOURCE Kiln
RUN NO. 1
SAMPLE BOX NO. C-12

TIME START 13:51

METER BOX NO. 5
METER ΔH @ 1.953
Y= 1.009
PROBE I.D. NO. A-1
NOZZLE DIAMETER, in. .212
STACK DIAMETER, in. 3.75
PROBE HEATER SETTING ~ 250
HEATER BOX SETTING ~ 250
Δ Cp FACTOR .99
FILTER NO. Q 8275

ASSUMED MOISTURE, % 2
AMBIENT TEMPERATURE 50
BARO. PRESS. 25.36
STATIC PRESS. +.28
NOMAGRAPH INDEX 3.1

PRE TEST LEAK CHECKS
METER 0.005 @ 16 in. Hg
PITOTS // @ 36/32 in. Hg
ORSAT

P#	TIME	T_s °F	Δ P in H_2O	√Δ P	Δ H in H_2O	Vm ft^3	$T_{m\,IN}$ °F	T_m OUT °F	OVEN °F	IMP. OUT °F	VAC. (in Hg)
AS	0	86	1.1		3.4	506.873	59	59	237	51	5
7	6	85	1.0		3.1	513.1	80	63	249	50	5
6	12	85	1.0		3.1	519.1	81	65	253	51	5
5	18	86	0.96		3.0	525.8	83	68	254	51	5
4	24	85	0.98		3.0	531.3	83	69	252	52	5
3	30	86	0.88		2.7	537.1	85	70	251	52	5
2	36	87	0.86		2.7	543.6	84	72	253	52	5
1	42	87	0.86		2.7	548.5	84	72	252	53	5
BS	48	87	1.2		3.7	554.352	83	72	250	53	5
7	54	87	1.0		3.1	560.8	84	74	251	54	5
6	60	86	0.96		3.0	567.9	81	74	249	54	5
5	66	86	0.88		2.7	574.5	80	73	247	54	5
4	72	86	0.88		2.7	579.1	79	73	250	54	5
3	78	85	0.84		2.6	584.5	78	71	252	55	5
2	84	85	0.80		2.5	590.1	76	70	253	55	5
1	90	84	0.82		2.5	595.9	74	68	251	55	5
END	96	—	—	—	—	601.046	—	—	—	—	—
Avg.		85.8		0.9675	2.91	94.173		74.6			

TIME END = 15:29

KILN Temp 1304 1298

Volume of Liquid Water Collected	Impinger Volume				Silica Gel Wght.
	1	2	3	4	5
Final					
Initial					
Liquid Collected					
Total Vol. Collected					

POST TEST LEAK CHECKS
Meter 0.005 @ 16 in. Hg
Pitots // @ 36/31 in. Hg
Orsat

Orsat Meas.	Time	CO_2	O_2	CO	N_2
1					
2					
3					

Nozzle Cal	D_1	D_2	D_3	Average

HORIZON AIR MEASUREMENT SERVICES, INC

METHOD 4

MOISTURE DETERMINATION

Client: KENNECOTT

Site: RAWHIDE

Source: CARBON KILN

Job #: K18-002

Box #: C12

Method #: 29

Run #: 1

Date: 12-3-08

Recovered by: BS

FILTER	INITIAL WEIGHT	FINAL WEIGHT	NET WEIGHT
Q 8275			
IMPINGERS	**INITIAL WT/VM**	**FINAL WT/NM**	**NET WT/Vm**
1	666	690	24
2	554	567	13
3	526	532	6
4	627	631	4
5	669	671	2
6	—		
7	—		
8 (Silica Gel)	250	269	19
TOTAL			68

BS

H:WPDOCS\FORMS\DataSheets\FieldDataSheets\Method 4 Moisture Determination

PARTICULATE FIELD DATA

PLANT KENNECOTT RAWHIDE
DATE 12-4-08
LOCATION FALLON, NV
OPERATOR CM, JB, BJ
SOURCE CARBON KILN
RUN NO. 2
SAMPLE BOX NO. C-13
TIME START 7:25

METER BOX NO. 5
METER ΔH @ 1.953
Y= 1.009
PROBE I.D. NO. A-1
NOZZLE DIAMETER, in. .212
STACK DIAMETER, in. 3.75
PROBE HEATER SETTING 250
HEATER BOX SETTING 250
Δ Cp FACTOR .99
FILTER NO. Q 8277

ASSUMED MOISTURE, % 2
AMBIENT TEMPERATURE 30
BARO. PRESS. 25.26
STATIC PRESS. ~~+0.28~~ + 0.28
NOMAGRAPH INDEX 3.1

PRE TEST LEAK CHECKS
METER 0.010 @ 15 in. Hg
PITOTS ✓ @ 41/36 in. Hg
ORSAT

P#	TIME	T_s °F	Δ P in H_2O	√Δ P	Δ H in H_2O	Vm ft^3	$T_{m\,IN}$ °F	T_m OUT °F	OVEN °F	IMP. OUT °F	VAC. (in Hg)
A 8	0	72	0.96		3.0	602.660	40	40	231	48	5
7	6	74	1.0		3.1	608.5	53	42	234	46	5
6	12	74	0.98		3.0	614.4	59	44	248	46	5
5	18	74	0.92		2.9	620.2	61	46	248	46	5
4	24	74	0.86		2.7	625.9	62	47	251	45	5
3	30	73	0.84		2.6	631.4	63	49	251	45	5
2	36	73	0.82		2.5	636.9	63	50	252	44	5
1	42	74	0.80		2.5	642.3	63	51	248	44	5
B 8	48	75	1.1		3.4	647.704	60	51	252	44	6
7	54	75	1.0		3.1	653.9	64	53	253	45	5
6	60	73	.99		3.1	659.9	62	53	250	45	5
5	66	73	.96		3.0	665.9	61	53	255	46	5
4	72	72	.90		2.8	672.5	60	51	255	46	5
3	78	66	.86		2.7	677.4	60	57	252	45	5
2	84	70	.82		2.5	682.9	61	50	252	45	5
1	90	70	.81		2.5	688.1	59	49	254	45	5
END	96	—	—	—	—	693.544	—	—	—	—	—
Avg.		72.6		0.9549	2.94	90.884		54.1			

TIME END = 9:03

Kiln Temp 1301° 1301°

Volume of Liquid Water Collected	Impinger Volume				Silica Gel Wght.
	1	2	3	4	5
Final					
Initial					
Liquid Collected					
Total Vol. Collected					

POST TEST LEAK CHECKS
Meter 0.005 @ 15 in. Hg
Pitots ✓ @ 4.6/3.2 in. Hg
Orsat

Orsat Meas.	Time	CO_2	O_2	CO	N_2
1					
2					
3					

Nozzle Cal	D_1	D_2	D_3	Average

HORIZON AIR MEASUREMENT SERVICES, INC

METHOD 4

MOISTURE DETERMINATION

Client: KENNECOTT

Site: RAWHIDE

Source: CARBON KILN

Job #: K18-002

Box #: C13

Method #: 29

Run #: 2

Date: 12-4-08

Recovered by: BJ

FILTER	INITIAL WEIGHT	FINAL WEIGHT	NET WEIGHT
Q8277			
IMPINGERS	**INITIAL WT/VM**	**FINAL WT/NM**	**NET WT/Vm**
1	640	657	17
2	674	683	9
3	526	528	2
4	632	639	7
5	636	641	5
6	—		
7	—		
8 (Silica Gel)	250	264	14
TOTAL			54

BJ

H:WPDOCS\FORMS\DataSheets\FieldDataSheets\Method 4 Moisture Determination

PARTICULATE FIELD DATA

PLANT KENNECOTT RAWHIDE
DATE 12-4-08
LOCATION FALLON, NV
OPERATOR CSM, JD, BJ
SOURCE CARBON KILN
RUN NO. 3
SAMPLE BOX NO. C12

TIME START 0921

METER BOX NO. 5
METER ΔH @ 1.953
Y= 1.009
PROBE I.D. NO. A-1
NOZZLE DIAMETER, in. .212
STACK DIAMETER, in. 3.75
PROBE HEATER SETTING 250
HEATER BOX SETTING 250
Δ Cp FACTOR .99
FILTER NO. Q 8278

ASSUMED MOISTURE, % 2
AMBIENT TEMPERATURE 40
BARO. PRESS. 25.26
STATIC PRESS. +.28
NOMAGRAPH INDEX 3.1

PRE TEST LEAK CHECKS
METER 0.000 @ 15 in. Hg
PITOTS ✓ @ 4.9/4.7 in. Hg
ORSAT

P#	TIME	T_s °F	Δ P in H_2O	√Δ P	Δ H in H_2O	Vm ft³	$T_{m\,IN}$ °F	T_m OUT °F	OVEN °F	IMP. OUT °F	VAC. (in Hg)
A 8	0	72	1.0		3.1	694.032	54	47	241	44	5
7	6	73	.96		3.0	700.0	63	49	247	45	5
6	12	72	.92		2.9	705.8	63	51	253	45	5
5	18	72	.92		2.9	711.4	64	52	256	46	5
4	24	72	.90		2.8	717.3	65	54	257	45	5
3	30	72	.84		2.6	722.9	67	55	258	45	5
2	36	72	.80		2.5	728.3	68	56	250	45	5
1	42	73	.80		2.5	733.8	69	57	250	46	5
B 8	48	73	1.1		3.4	739.107	69	57	256	45	5
7	54	74	.94		2.9	745.3	70	58	251	45	5
6	60	75	.90		2.8	751.0	71	59	254	46	5
5	66	76	.86		2.7	756.6	72	60	256	47	5
4	72	77	.84		2.6	762.2	72	60	257	47	5
3	78	78	.80		2.5	767.8	73	61	259	47	5
2	84	79	.80		2.5	773.2	73	61	257	47	5
1	90	80	.76		2.4	778.6	76	62	256		
End	96	—	—	—	—	783.848	—	—	—	—	—
Avg.		74.4		0.9390	2.76	89.816		61.9			

TIME END = 1103

Kiln Temp 1302 1294

Volume of Liquid Water Collected	Impinger Volume				Silica Gel Wght.
	1	2	3	4	5
Final					
Initial					
Liquid Collected					
Total Vol. Collected					

POST TEST LEAK CHECKS
Meter 0.005 @ 16 in. Hg
Pitots ✓ @ 5.1/4.3 in. Hg
Orsat

Orsat Meas.	Time	CO_2	O_2	CO	N_2
1					
2					
3					

Nozzle Cal	D_1	D_2	D_3	Average

HORIZON AIR MEASUREMENT SERVICES, INC.

METHOD 4

MOISTURE DETERMINATION

Client: KENNECOTT

Site: RAWHIDE

Source: CARBON KILN

Job #: K18-002

Box #: C12

Method #: 29

Run #: 3

Date: 12-4-08

Recovered by: BJ

FILTER	INITIAL WEIGHT	FINAL WEIGHT	NET WEIGHT
Q8278			
IMPINGERS	**INITIAL WT/VM**	**FINAL WT/NM**	**NET WT/Vm**
1	659	685	26
2	551	566	15
3	525	528	3
4	618	626	8
5	662	668	6
6	—		
7	—		
8 (Silica Gel)	250	267	17
TOTAL			75

5B

H:WPDOCS\FORMS\DataSheets\FieldDataSheets\Method 4 Moisture Determination

METHOD 4

MOISTURE DETERMINATION

Client: KENNECOTT

Site: RAWHIDE

Source: CARBON KILN

Job #: K18-002

Box #: NA

Method #: 29

Run #: BLANK TRAIN

Date: 12-3-08

Recovered by: BS

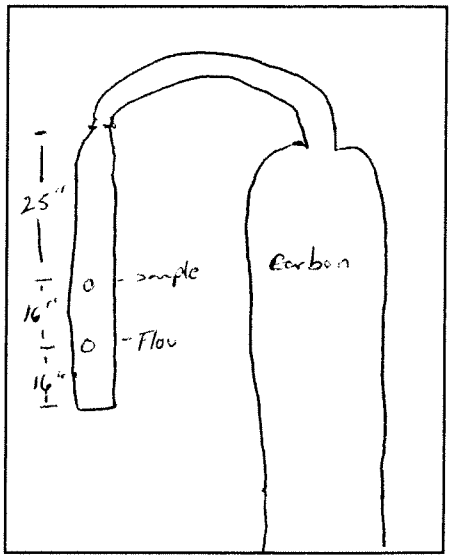
FILTER	INITIAL WEIGHT	FINAL WEIGHT	NET WEIGHT
Q8279			
IMPINGERS	**INITIAL WT/VM**	**FINAL WT/NM**	**NET WT/Vm**
1			
2			
3			
4			
5			
6	—		
7	—		
8 (Silica Gel)			
TOTAL			

VELOCITY DATA SHEET - METHOD 2

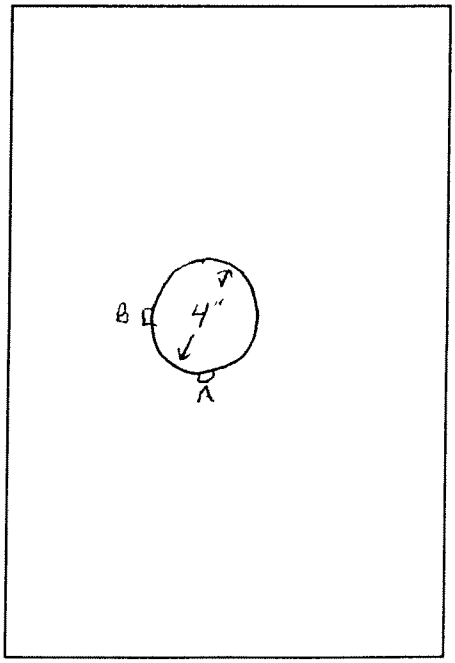
						Flow	Sample
Facility:	Kennecott - Bingham	**Baro. Press:**	25.29		**D_1 upstream:**	16"(4)	16(4)
Source:	Retort	**Static Press:**	-0.005		**D_1 downstream:**	16(4)	25(6.25)
Job #:	K18-002	**Pitot Tube #:**	S7D		**Stack Diameter:**	4"	
Date:	12/2/08	**Pitot Tube Type:**	2'		**Leak Check**		
Operator:	JB Cam	**Magnahelic:**	4		**Initial:**		**Final:**
Run #:	Preliminary					✓✓	✓✓

Point #	Position in.	Velocity Head in. H_2O	Stack Temp °F	Cyclonic Flow Angle
A8	0.5	.01	88	0
7	0.5	.01	88	0
6	0.78	.01	87	0
5	1.30	.01	87	0
4	2.74	.01	87	0
3	3.22	.01	88	0
2	3.5	.01	89	0
1	3.5	.01	89	0
B8		.01	89	0
7		.01	88	0
6		.01	88	0
5		.01	88	0
4		.01	88	0
3		.01	88	0
2		.01	88	0
1		.01	87	0
Average		**√ΔP=**	**T_s=**	**∠=** 0

Side View



Top View



PARTICULATE FIELD DATA

PLANT Kennecott Rankide
DATE 12-2-08
LOCATION Fallon NV
OPERATOR CSM, JB, BJ
SOURCE Rotary
RUN NO. 1
SAMPLE BOX NO. C-12

TIME START 9:43

METER BOX NO. 1
METER ΔH @ 1.807
Y= 1.007
PROBE I.D. NO. A-1
NOZZLE DIAMETER, in. .320
STACK DIAMETER, in. 4"
PROBE HEATER SETTING 250
HEATER BOX SETTING 250
Δ Cp FACTOR .99
FILTER NO. 08225

ASSUMED MOISTURE, % 2
AMBIENT TEMPERATURE 52
BARO. PRESS. 25.29
STATIC PRESS. <0.005
NOMAGRAPH INDEX ~~399~~/375

PRE TEST LEAK CHECKS
METER 0.005 @ 16 in. Hg
PITOTS ✓ @ 5.1/4.1 in. Hg
ORSAT

Ramp 900-1150 (~30min)

P#	TIME	T_s °F	Δ P in H_2O	√Δ P	Δ H in H_2O	Vm ft³	T_m IN °F	T_m OUT °F	OVEN °F	IMP. OUT °F	VAC. (in Hg)
A8	0	90	0.01		3.8	579.830		53	268	49	5
7	6	89	0.01		3.8	527.0		55	269	49	5
6	12	88	0.01		3.8	533.8		57	267	50	6
5	18	87	0.01		3.8	541.1		58	266	50	6
4	24	86	0.01		3.8	547.4		59	268	50	6
3	30	84	0.01		3.8	554.9		60	265	50	6
2	36	85	0.01		3.8	562.0		62	267	51	6
1	42	81	0.01		3.8	568.1		61	268	50	6
B8	48	80	0.01		3.8	574.931		60	269	51	6
7	54	80	0.01		3.8	581.8		64	271	51	6
6	60	79	0.01		3.8	589.6		66	270	51	6
5	66	79	0.01		3.8	595.8		67	271	52	6
4	72	80	0.01		3.8	602.1		69	268	52	6
3	78	80	0.01		3.8	610.4		69	269	52	6
2	84	80	0.01		3.8	616.5		70	267	52	6
1	90	79	0.01		3.8	622.9		71	269	52	6
End	96	—	—	—	—	630.450	—	—	—	—	—
Avg.		82.9		0.1000	3.8	110.620		62.6			

TIME END = 11:20

Volume of Liquid Water Collected	Impinger Volume				Silica Gel Wght.
	1	2	3	4	5
Final					
Initial					
Liquid Collected					
Total Vol. Collected					

POST TEST LEAK CHECKS
Meter 0.005 @ 15 in. Hg
Pitots ✓ @ 4.6/3.2 in. Hg
Orsat

Orsat Meas.	Time	CO_2	O_2	CO	N_2
1					
2					
3					

Nozzle Cal	D_1	D_2	D_3	Average

HORIZON AIR MEASUREMENT SERVICES, INC

METHOD 4

MOISTURE DETERMINATION

Client: KENNECOTT

Site: PANHIDE

Source: Reboot

Job #: K18-002

Box #: C 12

Method #: 29

Run #: 1

Date: 12-2-08

Recovered by: BJ

FILTER	INITIAL WEIGHT	FINAL WEIGHT	NET WEIGHT
Q8225			
IMPINGERS	**INITIAL WT/VM**	**FINAL WT/NM**	**NET WT/Vm**
1	661	653	-8
2	553	555	2
3	523	525	2
4	621	623	2
5	665	667	2
6	—		
7	—		
8 (Silica Gel)	250	272	22
TOTAL			22

JB

H:WPDOCS\FORMS\DataSheets\FieldDataSheets\Method 4 Moisture Determination

PARTICULATE FIELD DATA

PLANT KENNECOTT PAWNTIDE
DATE 12-2-08
LOCATION FALLON, NV
OPERATOR CSM, SD, BS
SOURCE RETORT
RUN NO. 2
SAMPLE BOX NO. C-13
TIME START 11:35

METER BOX NO. 1
METER ΔH @ 1.504
Y= 1.007
PROBE I.D. NO. A-1
NOZZLE DIAMETER, in. .720
STACK DIAMETER, in. 4"
PROBE HEATER SETTING 250
HEATER BOX SETTING 250
Δ Cp FACTOR .99
FILTER NO. 28220

ASSUMED MOISTURE, % 2
AMBIENT TEMPERATURE 55
BARO. PRESS. 25.29
STATIC PRESS. <0.05
NOMAGRAPH INDEX ~~399~~/~~25~~ 392

PRE TEST LEAK CHECKS
METER 0.010 @ 17 in. Hg
PITOTS ~~4~~ @ 6.9/4.1 in. Hg
ORSAT

High Temp (1150°)

P#	TIME	T_s °F	Δ P in H_2O	√Δ P	Δ H in H_2O	Vm ft^3	$T_{m\,IN}$ °F	T_m OUT °F	OVEN °F	IMP. OUT °F	VAC. (in Hg)
A 8	0	65	0.01		3.9	631.509		67	233	50	6
7	6	62	0.01		3.9	638.3		67	237	50	6
6	12	65	0.01		3.9	645.3		67	247	50	6
5	18	66	0.01		3.9	652.2		66	256	49	6
4	24	67	0.01		3.9	659.1		65	264	50	6
3	30	68	0.01		3.9	666.2		65	268	50	6
2	36	68	0.01		3.9	672.9		64	267	50	6
1	42	64	0.01		3.9	679.8		63	258	51	6
B 8	48	62	0.01		3.9	686.739		61	258	50	6
7	54	59	0.01		3.9	693.7		62	255	49	6
6	60	56	0.01		3.9	700.8		61	254	50	6
5	66	56	0.01		3.9	707.3		61	253	50	6
4	72	56	0.01		3.9	714.1		61	256	50	6
3	78	56	0.01		3.9	721.3		60	253	51	6
2	84	55	0.01		3.9	728.3		60	253	51	6
1	90	55	0.01		3.9	735.2		60	255	50	6
END	96	—	—	—	—	742.218	—	—	—	—	—
Avg.		61.3		0.1000	3.9	110.709		63.1			

TIME END = 13:12

Volume of Liquid Water Collected	Impinger Volume 1	2	3	4	Silica Gel Wght. 5
Final					
Initial					
Liquid Collected					
Total Vol. Collected					

POST TEST LEAK CHECKS
Meter 0.005 @ 17 in. Hg
Pitots ~~4~~/1 @ 7.1/6.4 in. Hg
Orsat

Orsat Meas.	Time	CO_2	O_2	CO	N_2
1					
2					
3					

Nozzle Cal	D_1	D_2	D_3	Average

HORIZON AIR MEASUREMENT SERVICES, INC

METHOD 4

MOISTURE DETERMINATION

Client: KENNECOTT

Site: RAWHIDE

Source: Retort

Job #: K18-002

Box #: C13

Method #: 29

Run #: 2

Date: 12-2-08

Recovered by: BJ

FILTER	INITIAL WEIGHT	FINAL WEIGHT	NET WEIGHT
Q8226			
IMPINGERS	**INITIAL WT/VM**	**FINAL WT/NM**	**NET WT/Vm**
1	634	622	-12
2	672	673	1
3	523	524	1
4	647	645	-2
5	639	640	1
6	—		
7	—		
8 (Silica Gel)	250	272	22
TOTAL			11

JD

H:WPDOCS\FORMS\DataSheets\FieldDataSheets\Method 4 Moisture Determination

PARTICULATE FIELD DATA

PLANT: Sweecott Fallon
DATE: 12-2-08
LOCATION: Fallon, NV
OPERATOR: CSN, JB, BJ
SOURCE: Rotary
RUN NO.: 3
SAMPLE BOX NO.: C-12
TIME START: 13:25

METER BOX NO.: 1
METER ΔH @: 1.804
Y=: 1.007
PROBE I.D. NO.: A-1
NOZZLE DIAMETER, in.: .720
STACK DIAMETER, in.: 4"
PROBE HEATER SETTING: 250
HEATER BOX SETTING: 250
Δ Cp FACTOR: .99
FILTER NO.: 28227

ASSUMED MOISTURE, %: 2
AMBIENT TEMPERATURE: 54
BARO. PRESS.: 25.29
STATIC PRESS.: <0.005
NOMAGRAPH INDEX: ~~399~~ 392

PRE TEST LEAK CHECKS
METER 0.00 @ 15 in. Hg
PITOTS ✓ @ 7.7/4 in. Hg
ORSAT

High Temp (1150°)

P#	TIME	T_s °F	Δ P in H_2O	√Δ P	Δ H in H_2O	Vm ft^3	$T_{m\,IN}$ °F	$T_{m\,OUT}$ °F	OVEN °F	IMP. OUT °F	VAC. (in Hg)
A 8	0	55	0.01		3.9	742.850		56	240	49	6
7	6	54	0.01		3.9	749.7		56	244	48	6
6	12	53	0.01		3.9	756.6		56	249	49	6
5	18	53	0.01		3.9	763.4		57	251	49	6
4	24	53	0.01		3.9	770.4		57	252	50	6
3	30	53	0.01		3.9	777.3		57	253	50	6
2	36	53	0.01		3.9	784.2		57	257	50	6
1	42	53	0.01		3.9	791.2		57	256	50	6
B 8	48	53	0.01		3.9	798.1		57	254	50	6
7	54	53	0.01		3.9	805.056		57	255	57	6
6	60	54	0.01		3.9	812.0		58	256	50	6
5	66	54	0.01		3.9	819.9		58	253	50	6
4	72	54	0.01		3.9	826.0		58	252	50	6
3	78	53	0.01		3.9	832.9		58	254	50	6
2	84	53	0.01		3.9	839.8		59	256	50	6
1	90	53	0.01		3.9	846.8		59	255	50	6
(~)	96	—	—	—	—	853.852	—	—	—	—	—
Avg.		53.4		0.1000	3.9	111.002		57.4			

TIME END = 15:02

Volume of Liquid Water Collected	Impinger Volume 1	2	3	4	Silica Gel Wght. 5
Final					
Initial					
Liquid Collected					
Total Vol. Collected					

POST TEST LEAK CHECKS
Meter 0.005 ✓ @ 15 in. Hg
Pitots ✓ @ 4.7/36 in. Hg
Orsat

Orsat Meas.	Time	CO_2	O_2	CO	N_2
1					
2					
3					

Nozzle Cal	D_1	D_2	D_3	Average

METHOD 4

MOISTURE DETERMINATION

Client: KENNECOTT

Site: RAWHIDE

Source: RETORT

Job #: K18-002

Box #: C12

Method #: 29

Run #: 3

Date: 12-2-08

Recovered by: TJS

FILTER	INITIAL WEIGHT	FINAL WEIGHT	NET WEIGHT
Q8227			
IMPINGERS	**INITIAL WT/VM**	**FINAL WT/NM**	**NET WT/Vm**
1	663	652	-11
2	555	556	1
3	524	524	0
4	624	624	0
5	667	667	0
6	—		
7	—		
8 (Silica Gel)	250	270	20
TOTAL			10

JB

H:WPDOCS\FORMS\DataSheets\FieldDataSheets\Method 4 Moisture Determination

METHOD 4

MOISTURE DETERMINATION

Client: KENNECOTT

Site: RAWHIDE

Source: RETORT

Job #: K18-002

Box #: NA

Method #: 29

Run #: BLANK TRAIN

Date: 12-2-08

Recovered by: BS

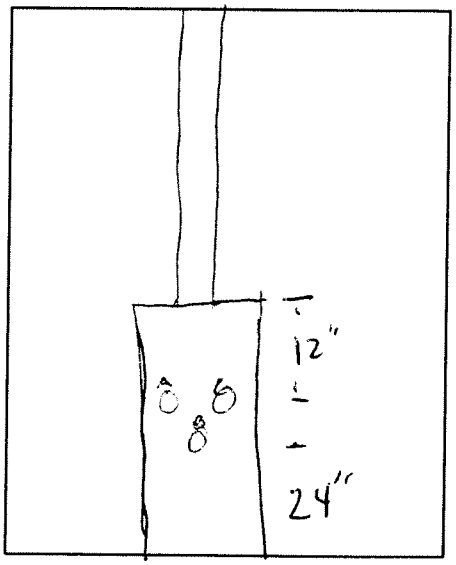
FILTER	INITIAL WEIGHT	FINAL WEIGHT	NET WEIGHT
Q8228			
IMPINGERS	**INITIAL WT/VM**	**FINAL WT/NM**	**NET WT/Vm**
1			
2			
3			
4			
5			
6			
7			
8 (Silica Gel)			
TOTAL			

VELOCITY DATA SHEET - METHOD 2

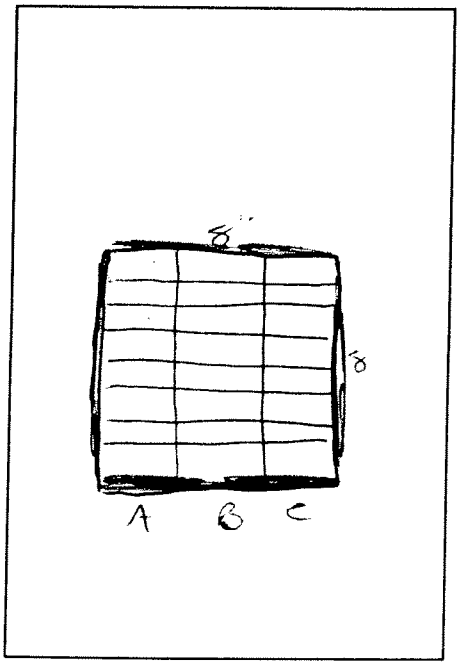
Facility:	Kennecott Rawhide	**Baro. Press:**	25.26	**D_1 upstream:**	12" (1.5)
Source:	Electrowinning	**Static Press:**	+0.15	**D_1 downstream:**	24" (3)
Job #:	1418-002	**Pitot Tube #:**	417-3	**Stack Diameter:**	8 X 8
Date:	12/4/08	**Pitot Tube Type:**	"S"	**Leak Check**	
Operator:	JB	**Magnahelic:**	4	**Initial:**	**Final:**
Run #:	Preliminary			✓✓	✓✓

Point #	Position in.	Velocity Head in. H_2O	Stack Temp °F	Cyclonic Flow Angle
A 8	0.5	0.32	68	8
7	1.5	0.30	69	10
6	2.5	0.24	68	8
5	3.5	0.18	68	6
4	4.5	0.10	68	5
3	5.5	0.08	68	5
2	6.5	0.06	69	3
1	7.5	0.05	69	3
B 8		0.32	67	12
7		0.30	67	8
6		0.28	68	6
5		0.22	68	4
4		0.26	68	3
3		0.22	68	4
2		0.22	68	5
1		0.16	68	3
C 8		0.40	68	8
7		0.26	68	6
6		0.17	67	5
5		0.13	68	5
4		0.10	68	3
3		0.09	68	4
2		0.07	68	3
1		0.06	68	5
Average		**$\sqrt{\Delta P}$=**	**T_s=**	**∠= 5.42**

Side View



Top View



PARTICULATE FIELD DATA

PLANT Kennecott Rawhide
DATE 12/4/05
LOCATION Fallon NV
OPERATOR SB Com
SOURCE E.W.C.
RUN NO. 1
SAMPLE BOX NO. C-14

TIME START 7:58

METER BOX NO. 1
METER ΔH @ 1.8040
Y= 1.007
PROBE I.D. NO. 4-5
NOZZLE DIAMETER, in. .345
STACK DIAMETER, in. 8x8
PROBE HEATER SETTING ~250
HEATER BOX SETTING ~250
Δ Cp FACTOR .84
FILTER NO. Q 8280

ASSUMED MOISTURE, % 3
AMBIENT TEMPERATURE 34
BARO. PRESS. 25.26
STATIC PRESS. + 0.15
NOMAGRAPH INDEX 140

PRE TEST LEAK CHECKS
METER 0.005 @ 15 in. Hg
PITOTS ✓ ✓ @ 3/3 in. Hg
ORSAT

P#	TIME	T_s °F	Δ P in H_2O	√Δ P	Δ H in H_2O	Vm ft^3	$T_{m\,IN}$ °F	T_m OUT °F	OVEN °F	IMP. OUT °F	VAC. (in Hg)
A8	0	64	0.34		4.8	161.429		34	243	46	6
7	4	64	0.30		4.2	166.4		35	247	48	6
6	8	64	0.26		3.6	170.7		37	250	49	5
5	12	65	0.20		2.8	175.1		38	251	50	5
4	16	65	0.12		1.7	178.8		40	252	49	3
3	20	66	0.08		1.1	181.8		41	250	50	3
2	24	66	0.06		0.8	184.3		42	251	50	2
1	28	67	0.06		0.8	186.4		42	250	50	2
B8	32	67	0.38		5.3	188.762		41	248	49	7
7	36	67	0.28		3.9	194.5		44	251	50	6
6	40	67	0.20		2.8	198.1		46	253	50	5
5	44	67	0.18		2.5	201.9		47	252	50	5
4	48	68	0.14		2.0	205.5		47	252	51	4
3	52	68	0.10		1.4	208.8		47	250	57	3
2	56	68	0.08		1.1	211.7		48	249	51	3
1	60	69	0.05		0.7	214.5		48	251	51	2
C8	64	69	0.32		4.5	216.638		48	250	50	6
7	68	69	0.28		3.9	220.4		49	253	51	6
6	72	70	0.22		3.1	224.7		51	254	51	5
5	76	70	0.18		2.5	229.1		51	252	52	5
4	80	70	0.16		2.2	233.6		51	253	51	5
3	84	71	0.14		2.0	236.4		52	253	52	4
2	88	70	0.16		2.2	239.8		52	249	52	5
1	92	71	0.12		1.7	243.3		52	248	52	3
END	96	—	—	—	—	246.435	—	—	—	—	—
Avg		67.6		0.4137	2.57	85.006		45.1			

TIME END = 9:39

Volume of Liquid Water Collected	Impinger Volume 1	2	3	4	Silica Gel Wght. 5
Final					
Initial					
Liquid Collected					
Total Vol. Collected					

POST TEST LEAK CHECKS
Meter 0.005 @ 15 in. Hg
Pitots ✓ ✓ @ 3/3 in. Hg
Orsat

Orsat Meas.	Time	CO_2	O_2	CO	N_2
1					
2					
3					

Nozzle Cal	D_1	D_2	D_3	Average

METHOD 4

MOISTURE DETERMINATION

Client: KENNECOTT

Site: RAWHIDE

Source: ELECTROWINNING

Job #: K18-002

Box #: C14

Method #: 29

Run #: 1

Date: 12-4-08

Recovered by: BJ

FILTER	INITIAL WEIGHT	FINAL WEIGHT	NET WEIGHT
Q8280			
IMPINGERS	**INITIAL WT/VM**	**FINAL WT/NM**	**NET WT/Vm**
1	630	633	3
2	629	632	3
3	561	561	0
4	640	646	6
5	667	672	5
6	—		
7	—		
8 (Silica Gel)	250	263	13
TOTAL			30

SB

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PARTICULATE FIELD DATA

PLANT Kennecott Rawhide
DATE 12-4-08
LOCATION Fallon NV
OPERATOR CSM
SOURCE Electro Win
RUN NO. 2
SAMPLE BOX NO. C-15

TIME START 9:58

METER BOX NO. 1
METER ΔH @ 1.804
Y= 1.007
PROBE I.D. NO. 4-5
NOZZLE DIAMETER, in. .345
STACK DIAMETER, in. 5x8
PROBE HEATER SETTING 250
HEATER BOX SETTING 250
Δ Cp FACTOR .84
FILTER NO. Q 8281

ASSUMED MOISTURE, % 3
AMBIENT TEMPERATURE 45
BARO. PRESS. 25.26
STATIC PRESS. +0.15
NOMAGRAPH INDEX 14.0

PRE TEST LEAK CHECKS
METER 0.010 @ 16 in. Hg
PITOTS ✓✓ @ 3/3 in. Hg
ORSAT

P#	TIME	T_s °F	Δ P in H_2O	√Δ P	Δ H in H_2O	Vm ft^3	$T_{m\,IN}$ °F	$T_{m\,OUT}$ °F	OVEN °F	IMP. OUT °F	VAC. (in Hg)
A 8	0	71	0.32		4.5	246.894		49	256	49	6
7	4	71	0.30		4.2	250.7		49	258	49	6
6	8	71	0.28		3.9	255.0		50	259	49	5
5	12	72	0.22		3.1	259.6		57	257	50	5
4	16	72	0.14		2.0	263.7		52	255	50	4
3	20	72	0.10		1.4	267.3		53	256	50	3
2	24	72	0.08		1.1	269.9		53	253	50	3
1	28	72	0.06		0.8	272.4		53	255	50	2
B 8	32	72	0.38		5.3	274.654		53	256	51	7
7	36	73	0.30		4.2	279.9		54	254	50	6
6	40	73	0.22		3.1	284.5		55	255	51	5
5	44	73	0.16		2.2	288.8		55	257	51	4
4	48	73	0.12		1.7	292.8		55	258	51	3
3	52	73	0.10		1.4	295.4		55	256	51	3
2	56	74	0.08		1.1	298.7		56	257	52	3
1	60	74	0.06		0.8	300.8		56	258	52	2
C 8	64	74	0.32		4.5	303.047		56	259	51	6
7	68	74	0.28		3.9	308.2		57	256	51	6
6	72	74	0.24		3.4	312.4		57	255	52	6
5	76	74	0.22		3.1	316.9		57	257	52	5
4	80	73	0.20		2.8	321.1		57	258	53	5
3	84	74	0.16		2.2	325.3		57	256	53	4
2	88	74	0.14		2.0	328.6		57	255	53	4
1	92	74	0.14		2.0	331.9		57	258	54	4
END	96	—	—	—	—	335.183	—	—	—	—	—
Avg.		72.9		0.4251	2.70	88.259		54.3			

TIME END = 11:40

Volume of Liquid Water Collected	Impinger Volume 1	2	3	4	Silica Gel Wght. 5
Final					
Initial					
Liquid Collected					
Total Vol. Collected					

POST TEST LEAK CHECKS
Meter 0.005 @ 16 in. Hg
Pitots ✓✓ @ 3/3 in. Hg
Orsat

Orsat Meas.	Time	CO_2	O_2	CO	N_2
1					
2					
3					

Nozzle Cal	D_1	D_2	D_3	Average

HORIZON AIR MEASUREMENT SERVICES, INC

METHOD 4

MOISTURE DETERMINATION

Client: KENNECOTT

Site: RAWHIDE

Source: ELECTROWINNING

Job #: R18-002

Box #: C15

Method #: 29

Run #: 2

Date: 12-4-08

Recovered by: BJ

FILTER	INITIAL WEIGHT	FINAL WEIGHT	NET WEIGHT
Q 8281			
IMPINGERS	**INITIAL WT/VM**	**FINAL WT/NM**	**NET WT/Vm**
1	663	663	0
2	620	624	4
3	547	548	1
4	687	694	7
5	668	674	~~5~~ 58 6
6	—		
7	—		
8 (Silica Gel)	250	266	16
TOTAL			~~33~~ 34

58

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PARTICULATE FIELD DATA

PLANT KENNECOTT RAWHIDE
DATE 12-4-08
LOCATION FALLON, NV
OPERATOR CSM, JB, BS
SOURCE ELECTRO WIN
RUN NO. 3
SAMPLE BOX NO. C-14

TIME START 11:46

METER BOX NO. 1
METER ΔH @ 1.504
Y= 1.007
PROBE I.D. NO. 4-5
NOZZLE DIAMETER, in. .345
STACK DIAMETER, in. 8 X 8
PROBE HEATER SETTING 250
HEATER BOX SETTING 250
Δ Cp FACTOR .84
FILTER NO. Q 8282

ASSUMED MOISTURE, % 3
AMBIENT TEMPERATURE 50
BARO. PRESS. 25.26
STATIC PRESS. + 0.15
NOMAGRAPH INDEX 14.0

PRE TEST LEAK CHECKS
METER 0.010 @ 16 in. Hg
PITOTS ✓✓ @ 3/3 in. Hg
ORSAT

P#	TIME	T_s °F	ΔP in H_2O	√ΔP	ΔH in H_2O	Vm ft^3	$T_{m\,IN}$ °F	T_m OUT °F	OVEN °F	IMP. OUT °F	VAC. (in Hg)
A 8	0	75	0.34		4.8	335.601		55	239	49	6
7	4	75	0.30		4.2	343.0		57	247	50	6
6	8	75	0.28		3.9	350.2		59	255	50	5
5	12	75	0.24		3.4	354.6		61	258	50	5
4	16	75	0.16		2.2	357.1		62	259	50	4
3	20	76	0.12		1.7	359.5		63	261	51	3
2	24	76	0.10		1.4	362.7		64	260	51	3
1	28	75	0.06		0.8	365.5		65	258	51	2
B 8	32	75	0.38		5.3	367.809		64	259	51	7
7	36	75	0.34		4.8	373.6		66	260	52	6
6	40	75	0.28		3.9	378.1		69	259	52	5
5	44	75	0.20		2.8	382.8		69	256	52	4
4	48	75	0.16		2.2	386.9		70	255	52	4
3	52	75	0.12		1.7	390.5		71	257	53	3
2	56	75	0.08		1.1	393.8		71	258	53	3
1	60	75	0.06		0.8	396.2		71	256	53	2
C 8	64	75	0.32		4.5	398.463		71	257	53	6
7	68	75	0.30		4.2	403.0		71	259	54	6
6	72	75	0.26		3.6	407.9		71	260	53	5
5	76	76	0.22		3.1	413.1		72	261	54	5
4	80	76	0.20		2.8	417.0		73	258	54	4
3	84	76	0.18		2.5	420.8		74	257	54	4
2	88	76	0.14		2.0	424.4		75	255	55	4
1	92	76	0.12		1.7	427.7		75	258	55	3
END	96	—	—	—	—	430.921	—	—	—	—	—
Avg.		75.3		~~0.6600~~ 0.4413	2.89	95.320		67.5			

TIME END = 13:26

Volume of Liquid Water Collected	Impinger Volume 1	2	3	4	Silica Gel Wght. 5
Final					
Initial					
Liquid Collected					
Total Vol. Collected					

POST TEST LEAK CHECKS
Meter 0.005 @ 16 in. Hg
Pitots ✓✓ @ 3/3 in. Hg
Orsat

Orsat Meas.	Time	CO_2	O_2	CO	N_2
1					
2					
3					

Nozzle Cal	D_1	D_2	D_3	Average

HORIZON AIR MEASUREMENT SERVICES, INC

METHOD 4

MOISTURE DETERMINATION

Client: KENNECOTT

Site: RAWHIDE

Source: ELECTROWINNING

Job #: K18-002

Box #: C14

Method #: 29

Run #: 3

Date: 12-4-08

Recovered by: BS

FILTER	INITIAL WEIGHT	FINAL WEIGHT	NET WEIGHT
Q8282			
IMPINGERS	**INITIAL WT/VM**	**FINAL WT/NM**	**NET WT/Vm**
1	631	628	-3
2	627	632	5
3	560	562	2
4	646	648	2
5	670	672	2
6	—		
7	—		
8 (Silica Gel)	250	269	19
TOTAL			27

SB

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METHOD 4

MOISTURE DETERMINATION

Client: KENNECOTT

Site: RAWHIDE

Source: ELECTROWINNING

Job #: K18-002

Box #: NA

Method #: 29

Run #: BLANK TRAIN

Date: 12-4-08

Recovered by: BJ

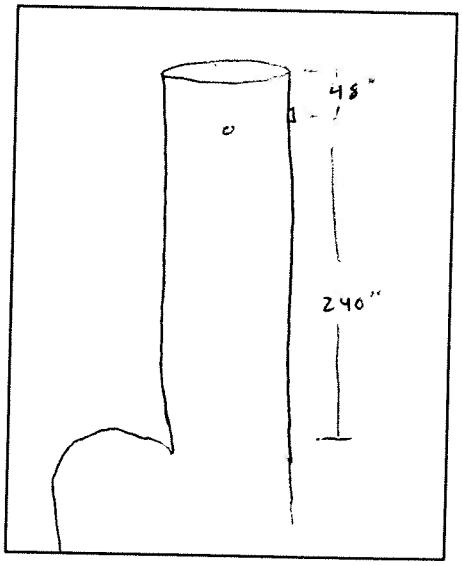
FILTER	INITIAL WEIGHT	FINAL WEIGHT	NET WEIGHT
Q8283			
IMPINGERS	**INITIAL WT/VM**	**FINAL WT/NM**	**NET WT/Vm**
1			
2			
3			
4			
5			
6			
7			
8 (Silica Gel)			
TOTAL			

VELOCITY DATA SHEET - METHOD 2

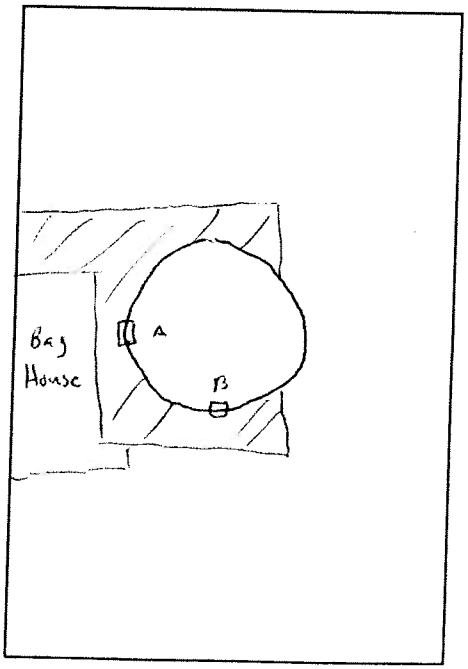
Facility:	Kennecott Rawhide	**Baro. Press:**	25.29	**D_1 upstream:**	1.8
Source:	Furnace	**Static Press:**	-.40	**D_1 downstream:**	8.9
Job #:	K18-002	**Pitot Tube #:**	4.5	**Stack Diameter:**	27" ~~(8.9)~~
Date:	12/3/08	**Pitot Tube Type:**	"S"	**Leak Check**	
Operator:	JB	**Magnahelic:**	4	**Initial:**	**Final:**
Run #:	free			✓✓	✓✓

Point #	Position in.	Velocity Head in. H_2O	Stack Temp °F	Cyclonic Flow Angle
A4	1.8	1.2	57	3
3	6.8	1.3	57	1
2	20.3	1.3	57	2
1	25.2	1.4	57	0
B4		1.2	57	4
3		1.3	57	6
2		1.3	57	1
1		1.5	57	1
Average		$\sqrt{\Delta P}$=	T_s=	∠= 2.25

Side View



Top View



PARTICULATE FIELD DATA

PLANT Kennecott Rawhide
DATE 12/3/08
LOCATION Fallon NV
OPERATOR CSM JB BJ
SOURCE Furnace
RUN NO. 1
SAMPLE BOX NO. C-13

TIME START 7:45

METER BOX NO. 1
METER ΔH @ 1.804
Y= 1.097
PROBE I.D. NO. ~~4~~ 4-5
NOZZLE DIAMETER, in. .220 .23
STACK DIAMETER, in. ~~29"~~ 27"
PROBE HEATER SETTING ~250
HEATER BOX SETTING ~250
Δ Cp FACTOR .84
FILTER NO. 08229

ASSUMED MOISTURE, % 4
AMBIENT TEMPERATURE 32
BARO. PRESS. 25.26
STATIC PRESS. ~~+~~ 0.40
NOMAGRAPH INDEX 2.4

PRE TEST LEAK CHECKS
METER 0.0.0 @ 15 in. Hg
PITOTS ✓ ✓ @ 3/3 in. Hg
ORSAT

START CHARGE 7:47

P#	TIME	T_s °F	ΔP in H_2O	√ΔP	ΔH in H_2O	Vm ft^3	$T_{m\,IN}$ °F	T_m OUT °F	OVEN °F	IMP. OUT °F	VAC. (in Hg)
A4	0	61	1.3		3.1	854.218		41	240	48	5
	6	59	1.4		3.4	860.4		45	242	48	6
3	12	58	1.4		3.4	866.3		48	248	49	6
	18	59	1.4		3.4	873.0		49	250	49	6
2	24	60	1.4		3.4	879.5		51	251	50	6
	30	61	1.4		3.4	886.1		52	251	50	6
1	36	62	1.3		3.1	892.6		53	252	50	6
	42	63	1.3		3.1	898.4		56	250	51	6
B4	48	63	1.2		2.9	905.368		57	251	51	6
	54	63	1.2		2.9	911.4		56	250	51	5
3	60	64	1.3		3.1	918.3		59	249	50	6
	66	64	1.3		3.1	923.7		60	249	51	6
2	72	64	1.4		3.4	930.1		61	251	51	6
	78	65	1.4		3.4	936.9		61	252	51	6
1	84	66	1.5		3.6	943.0		62	252	51	6
	90	67	1.5		3.6	949.7		63	250	52	6
END	96	—	—	—	—	956.542	—	—	—	—	—
Avg.		62.4		1.1640	~~3.25~~ 3.27	102.324		54.6			

TIME END = 9:27

Baghouse Pressure Drop > 2.0 in/Hg

Volume of Liquid Water Collected	Impinger Volume				Silica Gel Wght.
	1	2	3	4	5
Final					
Initial					
Liquid Collected					
Total Vol. Collected					

POST TEST LEAK CHECKS
Meter 0.0.0 @ 15 in. Hg
Pitots ✓ ✓ @ 3/3 in. Hg
Orsat

Orsat Meas.	Time	CO_2	O_2	CO	N_2
1					
2					
3					

Nozzle Cal	D_1	D_2	D_3	Average

HORIZON AIR MEASUREMENT SERVICES, INC.

METHOD 4

MOISTURE DETERMINATION

Client: KENNECOTT

Site: RAWHIDE

Source: FURNACE

Job #: K18-002

Box #: C13

Method #: 29

Run #: 1

Date: 12-3-08

Recovered by: BJ

FILTER	INITIAL WEIGHT	FINAL WEIGHT	NET WEIGHT
Q8229			
IMPINGERS	**INITIAL WT/VM**	**FINAL WT/NM**	**NET WT/Vm**
1	638	634	-4
2	674	676	2
3	525	525	0
4	631	636	5
5	635	640	5
6	—		
7	—		
8 (Silica Gel)	250	266	16
TOTAL			24

SB

H:WPDOCS\FORMS\DataSheets\FieldDataSheets\Method 4 Moisture Determination

PARTICULATE FIELD DATA

PLANT Kennecott Rawhide
DATE 12-3-08
LOCATION Fallon NV
OPERATOR CSM JB BT
SOURCE Furnace
RUN NO. 2
SAMPLE BOX NO. C-12

TIME START 9:38

METER BOX NO. 1
METER ΔH @ 1.84
Y= 1.007
PROBE I.D. NO. 4-5
NOZZLE DIAMETER, in. .220
STACK DIAMETER, in. 27"
PROBE HEATER SETTING 250
HEATER BOX SETTING 250
Δ Cp FACTOR .84
FILTER NO. Q 8230

ASSUMED MOISTURE, % 4
AMBIENT TEMPERATURE 48
BARO. PRESS. 25.26
STATIC PRESS. -0.40
NOMAGRAPH INDEX 2.4

PRE TEST LEAK CHECKS
METER 0.010 @ 17 in. Hg
PITOTS ✓ ✓ @ 3/3 in. Hg
ORSAT

P#	TIME	T_s °F	Δ P in H_2O	√Δ P	Δ H in H_2O	Vm ft^3	$T_{m\ IN}$ °F	T_m OUT °F	OVEN °F	IMP. OUT °F	VAC. (in Hg)
A 4	0	70	1.2		2.9	956.851		57	237	49	7
	6	69	1.2		2.9	963.6		60	248	50	7
3	12	69	1.3		3.1	969.7		61	253	50	6
	18	69	1.3		3.1	976.0		61	255	51	6
2	24	69	1.3		3.1	982.3		62	254	51	6
	30	68	1.3		3.1	988.7		62	252	51	6
1	36	67	1.4		3.4	995.0		62	253	51	6
	42	66	1.4		3.4	1001.3		62	255	51	6
B 4	48	66	1.2		2.9	1007.616		61	256	50	5
	54	69	1.2		2.9	1013.8		63	254	51	5
3	60	70	1.3		3.1	1020.5		62	255	51	5
	66	72	1.3		3.1	1026.1		62	258	52	5
2	72	75	1.3		3.1	1031.7		62	257	52	5
	78	76	1.3		3.1	1038.6		62	259	52	5
1	84	76	1.5		3.6	1045.1		62	257	52	6
	90	76	1.5		3.6	1051.6		62	256	52	6
END	96	—	—	—	—	1058.357	—	—	—	—	—
Avg.		70.4		1.1449	3.15	101.506		61.4			

TIME END = 11:17

Baghouse Pressure Drop >2 in. Hg

Volume of Liquid Water Collected	Impinger Volume				Silica Gel Wght.
	1	2	3	4	5
Final					
Initial					
Liquid Collected					
Total Vol. Collected					

POST TEST LEAK CHECKS
Meter 0.005 @ 17 in. Hg
Pitots ✓ ✓ @ 3/3 in. Hg
Orsat

Orsat Meas.	Time	CO_2	O_2	CO	N_2
1					
2					
3					

Nozzle Cal	D_1	D_2	D_3	Average

HORIZON AIR MEASUREMENT SERVICES, INC

METHOD 4

MOISTURE DETERMINATION

Client: KENNECOTT

Site: RAWHIDE

Source: FURNACE

Job #: K18-002

Box #: C12

Method #: 29

Run #: 2

Date: 12·3·08

Recovered by: BJ

FILTER	INITIAL WEIGHT	FINAL WEIGHT	NET WEIGHT
Q8230			
IMPINGERS	**INITIAL WT/VM**	**FINAL WT/NM**	**NET WT/Vm**
1	660	656	-4
2	555	561	6
3	521	525	4
4	619	624	5
5	663	667	4
6	—		
7	—		
8 (Silica Gel)	250	268	18
TOTAL			33

SB

H:WPDOCS\FORMS\DataSheets\FieldDataSheets\Method 4 Moisture Determination

PARTICULATE FIELD DATA

PLANT KENNECOTT RAWHIDE
DATE 12-3-08
LOCATION FALLON, NV
OPERATOR CSM JD BJ
SOURCE FURNACE
RUN NO. R-3
SAMPLE BOX NO. C-13

TIME START 11:29

METER BOX NO. 1
METER ΔH @ 1.804
Y= 1.007
PROBE I.D. NO. 4-5
NOZZLE DIAMETER, in. .220
STACK DIAMETER, in. 27"
PROBE HEATER SETTING 250
HEATER BOX SETTING 250
Δ Cp FACTOR .84
FILTER NO. Q8231

ASSUMED MOISTURE, % 4
AMBIENT TEMPERATURE 54
BARO. PRESS. 25.26
STATIC PRESS. + 0.40
NOMAGRAPH INDEX 2.4

PRE TEST LEAK CHECKS
METER 0.015 @ 16 in. Hg
PITOTS ✓✓ @ 3/3 in. Hg
ORSAT

P#	TIME	T_s °F	Δ P in H_2O	√Δ P	Δ H in H_2O	Vm ft^3	$T_{m\,IN}$ °F	T_m OUT °F	OVEN °F	IMP. OUT °F	VAC. (in Hg)
A4	0	77	1.2		2.9	058.772		59	239	51	5
	6	77	1.2		2.9	065.1		61	250	50	5
3	12	76	1.3		3.1	070.9		63	254	51	5
	18	76	1.3		3.1	077.2		64	255	51	5
2	24	77	1.4		3.4	083.7		65	253	51	6
	30	77	1.4		3.4	090.0		66	253	52	6
1	36	76	1.4		3.4	096.9		65	256	52	6
	42	76	1.4		3.4	103.3		65	257	52	6
B4	48	76	1.2		2.9	109.982		65	259	52	5
	54	76	1.2		2.9	116.2		64	256	53	5
3	60	76	1.3		3.1	122.3		63	254	53	5
	66	76	1.3		3.1	128.8		63	255	53	5
2	72	76	1.3		3.1	135.2		62	257	54	5
	78	76	1.3		3.1	141.4		62	256	54	5
1	84	75	1.5		3.6	147.3		62	258	54	6
	90	78	1.5		3.6	154.2		61	259	54	6
END	96	—	—	—	—	161.065	—	—	—	—	—
Avg.		76.3		1.1503	3.19	102.293		63.1			

TIME END = 13:08

Pressure drop >2" Hg

Volume of Liquid Water Collected	Impinger Volume 1	2	3	4	Silica Gel Wght. 5
Final					
Initial					
Liquid Collected					
Total Vol. Collected					

POST TEST LEAK CHECKS
Meter 0.005 @ 15 in. Hg
Pitots ✓✓ @ 3/3 in. Hg
Orsat

Orsat Meas.	Time	CO_2	O_2	CO	N_2
1					
2					
3					

Nozzle Cal	D_1	D_2	D_3	Average

HORIZON AIR MEASUREMENT SERVICES, INC

METHOD 4

MOISTURE DETERMINATION

Client: KENNECOTT

Site: RAWHIDE

Source: FURNACE

Job #: K18-002

Box #: C13

Method #: 29

Run #: 3

Date: 12-3-08

Recovered by: BJ

FILTER	INITIAL WEIGHT	FINAL WEIGHT	NET WEIGHT
Q8231			
IMPINGERS	**INITIAL WT/VM**	**FINAL WT/NM**	**NET WT/Vm**
1	637	628	-9
2	671	673	2
3	524	525	1
4	637	637	0
5	643	644	1
6	—		
7	—		
8 (Silica Gel)	250	269	19
TOTAL			14

SB

H:WPDOCS\FORMS\DataSheets\FieldDataSheets\Method 4 Moisture Determination

METHOD 4

MOISTURE DETERMINATION

Client: KENNECOTT

Site: RANDIDE

Source: FURNACE

Job #: K18002

Box #: NA

Method #: 29

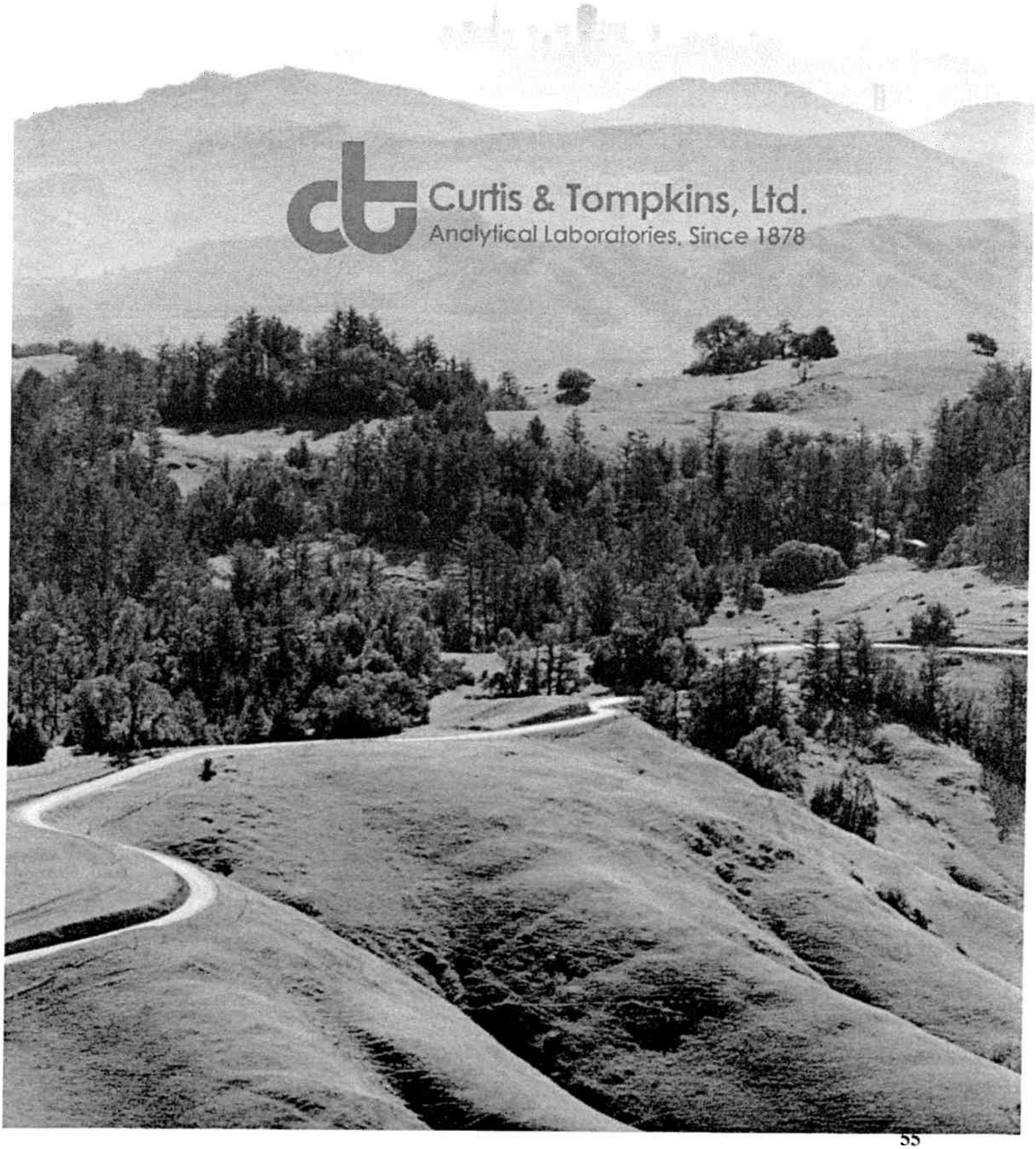
Run #: BLANK TRAIN

Date: 12-3-08

Recovered by: BJ

FILTER	INITIAL WEIGHT	FINAL WEIGHT	NET WEIGHT
Q8274			
IMPINGERS	**INITIAL WT/VM**	**FINAL WT/NM**	**NET WT/Vm**
1			
2			
3			
4			
5			
6			
7			
8 (Silica Gel)			
TOTAL			

APPENDIX G-3 - Laboratory Reports - Method 29


Curtis & Tompkins, Ltd.
Analytical Laboratories, Since 1878

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

Laboratory Job Number 208747
ANALYTICAL REPORT

Horizon Air Measurement Services 996 Lawrence Drive Newbury Park, CA 91320	Project : K18-002 Location : Kennecott / Rawhide Level : II

Sample ID	Lab ID
K18002-M29-RT-R1	208747-001
K18002-M29-RT-R2	208747-002
K18002-M29-RT-R3	208747-003
K18002-M29-RT-BT	208747-004
K18002-M29-FUR-R1	208747-005
K18002-M29-FUR-R2	208747-006
K18002-M29-FUR-R3	208747-007
K18002-M29-FUR-BT	208747-008
K18002-M29-CK-R1	208747-009
K18002-M29-CK-R2	208747-010
K18002-M29-CK-R3	208747-011
K18002-M29-CK-BT	208747-012
K18002-M29-EW-R1	208747-013
K18002-M29-EW-R2	208747-014
K18002-M29-EW-R3	208747-015
K18002-M29-EW-BT	208747-016
K18002-M29-SB	208747-017

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

Signature: _____ Date: 01/19/2009
Senior Program Manager

Signature: Carol Worthan Date: 01/19/2009
Quality Assurance Director

NELAP # 01107CA

Curtis & Tompkins, Ltd.

CASE NARRATIVE

Laboratory number:	**208747**
Client:	**Horizon Air Measurement Services**
Project:	**K18-002**
Location:	**Kennecott / Rawhide**
Request Date:	**12/17/08**
Samples Received:	**12/17/08**

This data package contains sample and QC results for seventeen air samples, requested for the above referenced project on 12/17/08. The samples were received intact. Preparation was done by EPA Method 29 with no exceptions.

Metals (EPA 7470A):

No analytical problems were encountered.

CHAIN OF CUSTODY RECORD

Client/Project Name: KENNECOTT / RAWHIDE	Project Location: FALLON, NV
Project No.: K18-002	Field Logbook No.:
Sampler: (Signature)	Chain of Custody Tape No.:

ANALYSES: EPA METHOD 29 TOTAL Hg; Carbon Filter

Sample No./ Identification	~~Date~~	DATE ~~Time~~	Lab Sample Number	Type of Sample							REMARKS
K18002-M29-RT-R1-C1		12/9/08	205747-1	Filter	X	1					Reject Run #1
K18002-M29-RT-R1-C2				950mL Bottle	X	2					
K18002-M29-RT-R1-C3					X	3					
K18002-M29-RT-R1-C4					X	4					
K18002-M29-RT-R1-C5A					X	5A					
K18002-M29-RT-R1-C5B					X	5B					
K18002-M29-RT-R1-C5C					X	5C					

	Date	Time		Date	Time
Relinquished by: (Signature)	12/17/08	0800	Received by: (Signature)	12/17/08	0800
Relinquished by: (Signature)	12/17/08	1630	Received by: (Signature)	12/17/08	0800
~~Relinquished by:~~ (Signature)			Received for Laboratory: (Signature)		

Sample Disposal Method:

Disposed of by: (Signature) — Date — Time

SAMPLE COLLECTOR

HORIZON AIR MEASUREMENT SERVICES, INC
996 Lawrence Drive, Suite 108
Newbury Park, CA 91320
(805) 498-8781 Fax (805) 498-3173

ANALYTICAL LABORATORY

Curtis + Tompkins
Berkeley, CA.

№ 10372

CHAIN OF CUSTODY RECORD

Client/Project Name: KENNECOTT/RAWHIDE	Project Location: FALLON, NV
Project No.: K18-002	Field Logbook No.:
Sampler: (Signature) [signature]	Chain of Custody Tape No.:

ANALYSES: PA METHOD 29 - TOTAL Hg

Sample No./ Identification	~~Date~~	DATE ~~Time~~	Lab Sample Number	Type of Sample	Container #						REMARKS
K8002-M29-RT-R2-C1		12-2-08	208747-2	Filter	X	1					Retest Run #2
~~K8002-M29-RT-R2-C2~~				~~Blank Bottle~~	X	2					
K8002-M29-RT-R2-C3					X	3					
K8002-M29-RT-R2-C4					X	4					
K8002-M29-RT-R2-C5A					X	5A					
K8002-M29-RT-R2-C5B					X	5B					
K8002-M29-RT-R2-C5C					X	5C					

Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
[signature]	12/17/08	0800	[signature]	12/17/08	0800
[signature]	12/17/08	1630	Pat Hanzalis	12/17/08	0800
Relinquished by: (Signature)	Date	Time	Received for Laboratory: (Signature)	Date	Time
Sample Disposal Method:	Disposed of by: (Signature)			Date	Time

SAMPLE COLLECTOR

HORIZON AIR MEASUREMENT SERVICES, INC
996 Lawrence Drive, Suite 108
Newbury Park, CA 91320
(805) 498-8781 Fax (805) 498-3173

ANALYTICAL LABORATORY

Curtis & Tompkins
Berkeley, CA

№ 10375

CHAIN OF CUSTODY RECORD

Client/Project Name	Project Location
Kennecott/Rawhide	Fallon, NV
Project No. K18-002	Field Logbook No.
Sampler: (Signature) [signature]	Chain of Custody Tape No.

ANALYSES: EPA Method 29, Total Hg

Sample No./ Identification	~~Date~~	~~Time~~ Date	Lab Sample Number	Type of Sample	Container #	REMARKS
K8002-M29-RT-R3-C1		12-2-08	208747-3	Filter	1	Retest Run #3
~~K8002-M29-RT-R3-C2~~				~~35mL Bottle~~	~~2~~	
K8002-M29-RT-R3-C3					3	
K8002-M29-RT-R3-C4					4	
K8002-M29-RT-R3-C5A					5A	
K8002-M29-RT-R3-C5B					5B	
K8002-M29-RT-R3-C5C					5C	
					~~3~~	

Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
[signature]	12/17/08	0800	[signature]	12/17/08	0800
[signature]	12/17/08	1630	Pat Hamilton	12/17/08	0800
Relinquished by: (Signature)	Date	Time	Received for Laboratory: (Signature)	Date	Time

Sample Disposal Method:	Disposed of by: (Signature)	Date	Time

SAMPLE COLLECTOR

HORIZON AIR MEASUREMENT SERVICES, INC
996 Lawrence Drive, Suite 108
Newbury Park, CA 91320
(805) 498-8781 Fax (805) 498-3173

ANALYTICAL LABORATORY

Curtis & Tompkins
Berkeley, CA

№ 10376

CHAIN OF CUSTODY RECORD

Client/Project Name: KENNECOTT / RAWHIDE	Project Location: FALLON, NV
Project No.: K18-002	Field Logbook No.:
Sampler: (Signature)	Chain of Custody Tape No.:

ANALYSES: EPA METHOD 29, TOTAL Hg

Sample No./ Identification	~~Date~~	DATE ~~Time~~	Lab Sample Number	Type of Sample	Container	REMARKS
K8002-M29-RT-BT-C1		12-2-08	2087474	FILTER	X 1	BLANK TRAIN
~~K8002-M29-RT-BT-C2~~				~~95ML BOTTLE~~	~~X 2~~	
K8002-M29-RT-BT-C3					X 3	
K8002-M29-RT-BT-C4					X 4	
K8002-M29-RT-BT-C5A					X 5A	
K8002-M29-RT-BT-C5B					X 5B	
K8002-M29-RT-BT-C5C					X 5C	

	Date	Time		Date	Time
Relinquished by: (Signature)	12/17/08	0800	Received by: (Signature)	12/17/08	0800
Relinquished by: (Signature)	12/17/08	1630	Received by: (Signature) Pat Hanley	12/17/08	0800
Relinquished by: (Signature)			Received for Laboratory: (Signature)		
Sample Disposal Method:			Disposed of by: (Signature)		

SAMPLE COLLECTOR

HORIZON AIR MEASUREMENT SERVICES, INC
996 Lawrence Drive, Suite 108
Newbury Park, CA 91320
(805) 498-8781 Fax (805) 498-3173

ANALYTICAL LABORATORY

Curtis + Tompkins
Berkeley, CA

№ 10374

CHAIN OF CUSTODY RECORD

Client/Project Name	Project Location
KENNECOTT / RAWHIDE	FALLON, NV
Project No. K18-002	Field Logbook No.
Sampler: (Signature)	Chain of Custody Tape No.

ANALYSES: Arsenic by 29 - Method A3 Continuous *

Sample No./ Identification	~~Date~~	DATE ~~Time~~	Lab Sample Number	Type of Sample	Arsenic by 29 - Method A3 Continuous *						REMARKS
K8002-M29-FUR-RI-C1		12:30	208747-5	Filter	X	1					FURNACE RUN #1
~~K8002-M29-FUR-RI-C2~~				~~Filter Blank~~	~~X~~	~~2~~					
K8002-M29-FUR-RI-C3					X	3					
K8002-M29-FUR-RI-C4					X	4					
K8002-M29-FUR-RI-C5A					X	5A					
K8002-M29-FUR-RI-C5B					X	5B					
K8002-M29-FUR-RI-C5C					X	5C					

Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
[signature]	12/17/08	0800	[signature]	12/17/08	0800
[signature]	12/17/08	1630	Pat Hanaily	12/17/08	4:30 PM 0800
~~Relinquished by: (Signature)~~			Received for Laboratory: (Signature)		

Sample Disposal Method:	Disposed of by: (Signature)	Date	Time

SAMPLE COLLECTOR

HORIZON AIR MEASUREMENT SERVICES, INC
996 Lawrence Drive, Suite 108
Newbury Park, CA 91320
(805) 498-8781 Fax (805) 498-3173

ANALYTICAL LABORATORY

CURTIS + TOMPKINS
BERKELEY, CA

№ 10377

CHAIN OF CUSTODY RECORD

Client/Project Name	Project Location
KENNECOTT / RAWHIDE	FALLON, NV
Project No. K18-002	Field Logbook No.
Sampler: (Signature)	Chain of Custody Tape No.

ANALYSES: EPA Method 29 Total Hg; Container #

Sample No./ Identification	~~Date~~	DATE ~~Time~~	Lab Sample Number	Type of Sample	EPA Method 29 Total Hg	Container #					REMARKS
K18002-M29-FUR-R2-C1		12-3-08	208747-6	FILTER	X	1					FURNACE RUN #2
~~K18002-M29-FUR-R2-C2~~				~~PEDAL BOTTLE~~	~~X~~	~~2~~					
K18002-M29-FUR-R2-C3					X	3					
K18002-M29-FUR-R2-C4					X	4					
K18002-M29-FUR-R2-C5A					X	5A					
K18002-M29-FUR-R2-C5B					X	5B					
K18002-M29-FUR-R2-C5C					X	5C					

Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
[signature]	12/17/08	0800	[signature]	12/17/08	0800
Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
[signature]	12/17/08	1630	Pat Hongly	12/17	4:30
Relinquished by: (Signature)	Date	Time	Received for Laboratory: (Signature)	Date	Time
Sample Disposal Method:	Disposed of by: (Signature)			Date	Time

SAMPLE COLLECTOR

HORIZON AIR MEASUREMENT SERVICES, INC
996 Lawrence Drive, Suite 108
Newbury Park, CA 91320
(805) 498-8781 Fax (805) 498-3173

ANALYTICAL LABORATORY

Curtis & Tompkins
Berkeley, CA

№ 10378

CHAIN OF CUSTODY RECORD

Client/Project Name	Project Location
KENNECOTT/RAWHIDE	FALLON, NV
Project No. K18-002	Field Logbook No.
Sampler: (Signature)	Chain of Custody Tape No.

ANALYSES: Method 29 Total Hg

Sample No./ Identification	~~Date~~	DATE ~~Time~~	Lab Sample Number	Type of Sample	Container #	REMARKS
KF002-M29-FUR-R3-C1		12-3-08	208777-7	Filter	1	FURNACE RUN #3
~~KF002-M29-FUR-R3-C2~~				~~Blank Bottle~~	~~2~~	
KF002-M29-FUR-R3-C3					3	
KF002-M29-FUR-R3-C4					4	
KF002-M29-FUR-R3-C5A					5A	
KF002-M29-FUR-R3-C5B					5B	
KF002-M29-FUR-R3-C5C					5C	

Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
	12/17/08	1800		12/17/08	0800
Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
	12/17/08	1630	Pat Hanaly	12/17/08	4:30 pm
Relinquished by: (Signature)	Date	Time	Received for Laboratory: (Signature)	Date	Time

Sample Disposal Method:	Disposed of by: (Signature)	Date	Time

SAMPLE COLLECTOR

HORIZON AIR MEASUREMENT SERVICES, INC
996 Lawrence Drive, Suite 108
Newbury Park, CA 91320
(805) 498-8781 Fax (805) 498-3173

ANALYTICAL LABORATORY

Curtis & Tompkins
Berkeley, CA

№ 10379

CHAIN OF CUSTODY RECORD

Client/Project Name: KENNECOTT/RAWHIDE	Project Location: FALLON, NV
Project No.: K8-002	Field Logbook No.:
Sampler: (Signature)	Chain of Custody Tape No.:

ANALYSES: All Method 29 Total Hg; Container #; FURNACE

Sample No./ Identification	~~Date~~	DATE ~~Time~~	Lab Sample Number	Type of Sample							REMARKS
K8002-M29-FUR-BF-C1		12-3-08	208747-B	FILTER	X	1					BLANK TRAIN
~~K8002-M29-FUR-BF-C2~~				~~BLANK TRAIN~~	X	2					
K8002-M29-FUR-BF-C3					X	3					
K8002-M29-FUR-BF-C4					X	4					
K8002-M29-FUR-BF-C5A					X	5A					
K8002-M29-FUR-BF-C5B					X	5B					
K8002-M29-FUR-BF-C5C					X	5C					

	Date	Time		Date	Time
Relinquished by: (Signature)	12/17/08	0800	Received by: (Signature)	12/17/08	0800
Relinquished by: (Signature)	12/17/08	1630	Received by: (Signature) Pat Hanly	12/17/08	4:30 pm
Relinquished by: (Signature)			Received for Laboratory: (Signature)		
Sample Disposal Method:			Disposed of by: (Signature)		

SAMPLE COLLECTOR

HORIZON AIR MEASUREMENT SERVICES, INC
996 Lawrence Drive, Suite 108
Newbury Park, CA 91320
(805) 498-8781 Fax (805) 498-3173

ANALYTICAL LABORATORY

Curtis & Tompkins
Berkeley, CA

Nº 10380

CHAIN OF CUSTODY RECORD

Client/Project Name: KENNECOTT/RAWHIDE	Project Location: FALLON, NV
Project No.: R18-002	Field Logbook No.:
Sampler: (Signature) [signature]	Chain of Custody Tape No.:

ANALYSES

Sample No./ Identification	~~Date~~	DATE ~~Time~~	Lab Sample Number	Type of Sample	EPA METHOD 29 TOTAL Hg	Container #					REMARKS
KR002-M29-CK-R1-C1		123-08	205747-9	Filter	X	1					CARBON KILN RUN # 1
~~KR002-M29-CK-R1-C2~~				~~250ml Bottle~~	X	2					
KR002-M29-CK-R1-C3					X	3					
KR002-M29-CK-R1-C4					X	4					
KR002-M29-CK-R1-C5A					X	5A					
KR002-M29-CK-R1-C5B					X	5B					
KR002-M29-CK-R1-C5C					X	5C					

	Date	Time		Date	Time
Relinquished by: (Signature) [signature]	12/17/08	0800	Received by: (Signature) [signature]	12/17/08	0800
Relinquished by: (Signature) [signature]	12/17/08	1630	Received by: (Signature) [signature]	12/17/08	4:30 pm
Relinquished by: (Signature)			Received for Laboratory: (Signature)		
Sample Disposal Method:			Disposed of by: (Signature)		

SAMPLE COLLECTOR

HORIZON AIR MEASUREMENT SERVICES, INC
996 Lawrence Drive, Suite 108
Newbury Park, CA 91320
(805) 498-8781 Fax (805) 498-3173

ANALYTICAL LABORATORY

Curtis + Tompkins
Berkeley, CA

№ 10381

CHAIN OF CUSTODY RECORD

Client/Project Name	Project Location
KENNECOTT/RAWHIDE	FALLON, NV
Project No. R18-002	Field Logbook No.
Sampler: (Signature)	Chain of Custody Tape No.

ANALYSES: EPA METHOD 29 TOTAL Hg; Contained #; Carbon Kiln

Sample No./ Identification	~~Date~~	DATE ~~Time~~	Lab Sample Number	Type of Sample							REMARKS
K8002-M29-CK-R2-C1		12-4-08	208747-10	FILTER	X	1					RUN #2
~~K8002-M29-CK-R2-C2~~				~~250mL Bottle~~	~~X~~	~~2~~					
K8002-M29-CK-R2-C3					X	3					
K8002-M29-CK-R2-C4					X	4					
K8002-M29-CK-R2-C5A					X	5A					
K8002-M29-CK-R2-C5B					X	5B					
K8002-M29-CK-R2-C5C					X	5C					

Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
[signature]	12/7/08	1800	[signature]	12/17/08	0800
Relinquished by: (Signature) [signature]	12/17/08	1630	Received by: (Signature) Pat Langley	12/17/08	4:30 pm
Relinquished by: (Signature)			Received for Laboratory: (Signature)		

Sample Disposal Method:	Disposed of by: (Signature)	Date	Time

SAMPLE COLLECTOR

HORIZON AIR MEASUREMENT SERVICES, INC
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ANALYTICAL LABORATORY

Curtis + Tompkins
Berkeley, CA.

№ 10382

CHAIN OF CUSTODY RECORD

Client/Project Name: KENNECOTT/RAWHIDE	Project Location: FALLON, NV
Project No.: K18-002	Field Logbook No.:
Sampler: (Signature) [signature]	Chain of Custody Tape No.:

ANALYSES: All methods 29 - total Hg

Sample No./ Identification	~~Date~~	DATE ~~Time~~	Lab Sample Number	Type of Sample	All methods 29 - total Hg	Container #					REMARKS
K18002-M29-CK-R3-C1		12-4-08	208777-11	FILTER	X	1					RUN #3
~~K18002-M29-CK-R3-C2~~		↓		~~BOTTLE~~	~~X~~	~~2~~					↓
K18002-M29-CK-R3-C3				↓	X	3					
K18002-M29-CK-R3-C4					X	4					
K18002-M29-CK-R3-C5A					X	5A					
K18002-M29-CK-R3-C5B					X	5B					
K18002-M29-CK-R3-C5C					X	5C					

Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
[signature]	12/17/08	0800	[signature]	12/17/08	0800
[signature]	12/17/08	1630	Pat Hanaby	12/17/08	4:30
			Received for Laboratory: (Signature)		

Sample Disposal Method:	Disposed of by: (Signature)

SAMPLE COLLECTOR

HORIZON AIR MEASUREMENT SERVICES, INC
996 Lawrence Drive, Suite 108
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(805) 498-8781 Fax (805) 498-3173

ANALYTICAL LABORATORY

Curtis + Tompkins
Berkeley, CA

Nº 10383

CHAIN OF CUSTODY RECORD

Client/Project Name: KENNECOTT/RAWHIDE	Project Location: FALLON, NV
Project No.: R18-002	Field Logbook No.
Sampler: (Signature)	Chain of Custody Tape No.

ANALYSES

Sample No./ Identification	~~Date~~	DATE ~~Time~~	Lab Sample Number	Type of Sample	EPA METHOD 29 TOTAL Hg Containers #						REMARKS
K8002-M29-CK-BF C1		12-3-08	208747-12	Filter	X	1					BLANK TRAIN
~~K8002-M29-CK-BF C2~~				~~250ml Bottle~~	X	2					
K8002-M29-CK-BF-C3					X	3					
K8002-M29-CK-BF-C4					X	4					
K8002-M29-CK-BF-C5A					X	5A					
K8002-M29-CK-BF-C5B					X	5B					
K8002-M29-CK-BF C5C					X	5C					

	Date	Time		Date	Time
Relinquished by: (Signature)	12/17/08	0800	Received by: (Signature)	12/17/08	0800
Relinquished by: (Signature)	12/17/08	1630	Received by: (Signature) Pat Hanly	12/17/08	4:30 pm
Relinquished by: (Signature)			Received for Laboratory: (Signature)		

Sample Disposal Method:

Disposed of by: (Signature) — Date — Time

SAMPLE COLLECTOR

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ANALYTICAL LABORATORY

Curtis + Tompkins
Berkeley, CA

№ 10385

CHAIN OF CUSTODY RECORD

Client/Project Name	Project Location
Kennecott/Rawhide	Fallon, NV
Project No. K18-002	Field Logbook No.
Sampler: (Signature)	Chain of Custody Tape No.

ANALYSES

Sample No./ Identification	~~Date~~	DATE ~~Time~~	Lab Sample Number	Type of Sample	Hg method 29 total Hg	Container #					REMARKS
K18002-M29-EW-R1-C1		12-4-08	208747-13	Filter	X	1					Run #1
~~K18002-M29-EW-R1-C2~~				~~250ml Bottle~~	~~X~~	~~2~~					
K18002-M29-EW-R1-C3					X	3					
K18002-M29-EW-R1-C4					X	4					
K18002-M29-EW-R1-C5A					X	5A					
K18002-M29-EW-R1-C5B					X	5B					
K18002-M29-EW-R1-C5C					X	5C					

Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
[signature]	12/17/08	0800	[signature]	12/17/08	0600
Relinquished by: (Signature) [signature]	12/17/08	1630	Received by: (Signature) [signature]	12/17/08	4:30 pm
Relinquished by: (Signature)	Date	Time	Received for Laboratory: (Signature)	Date	Time
Sample Disposal Method:	Disposed of by: (Signature)			Date	Time

SAMPLE COLLECTOR

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ANALYTICAL LABORATORY

Curtis + Tompkins
Berkeley, CA

№ 10388

CHAIN OF CUSTODY RECORD

Client/Project Name: KENNECOTT/RAWHIDE	Project Location: FALLON, NV
Project No.: K18-002	Field Logbook No.:
Sampler: (Signature)	Chain of Custody Tape No.:

ANALYSES: EPA METHOD 29-TOTAL Hg

Sample No./ Identification	~~Date~~	Date ~~Time~~	Lab Sample Number	Type of Sample	EPA METHOD 29-TOTAL Hg	Containers #					ELECTROWINNING REMARKS
K18002-M29-EW-R2-C1		12-4-08	208747-14	FILTER	X	1					RUN #2
~~K18002-M29-EW-R2-C2~~				~~250ML BOTTLE~~	X	2					
K18002-M29-EW-R2-C3					X	3					
K18002-M29-EW-R2-C4					X	4					
K18002-M29-EW-R2-C5A					X	5A					
K18002-M29-EW-R2-C5B					X	5B					
K18002-M29-EW-R2-C5C					X	5C					

	Date	Time		Date	Time
Relinquished by: (Signature)	12/7/08	0800	Received by: (Signature)	12/17/08	0800
Relinquished by: (Signature)	12/7/08	1630	Received by: (Signature) Pat Humphrey	12/18/08	4:30
Relinquished by: (Signature)			Received for Laboratory: (Signature)		
Sample Disposal Method:			Disposed of by: (Signature)		

SAMPLE COLLECTOR

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ANALYTICAL LABORATORY

Curtis & Tompkins
Berkeley, CA

№ 10389

CHAIN OF CUSTODY RECORD

Client/Project Name	Project Location
KENNECOTT/RAWHIDE	FALLON, NV
Project No. K18-002	Field Logbook No.
Sampler: (Signature)	Chain of Custody Tape No.

ANALYSES: EPA Method 29 Total Hg; Container #; Electrowinning

Sample No./ Identification	~~Date~~	~~Time~~	Lab Sample Number	Type of Sample							REMARKS
K18002-M29-EW-R3-E1	12-4-08		20874715	Filter	X	1					Run #3
~~K18002-M29-EW-R3-C2~~				~~250ml Bottle~~	~~X~~	~~2~~					
K18002-M29-EW-R3-C3					X	3					
K18002-M29-EW-R3-C4					X	4					
K18002-M29-EW-R3-C5A					X	5A					
K18002-M29-EW-R3-C5B					X	5B					
K18002-M29-EW-R3-C5C					X	5C					

Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
[signature]	12/17/08	0800	[signature]	12/17/08	0800
Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
[signature]	12/17/08	1630	Pat Langhar	12/17/08	4:30 pm
Relinquished by: (Signature)	Date	Time	Received for Laboratory: (Signature)	Date	Time
Sample Disposal Method:	Disposed of by: (Signature)			Date	Time

SAMPLE COLLECTOR

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ANALYTICAL LABORATORY

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Berkeley, CA

№ 10390

CHAIN OF CUSTODY RECORD

Client/Project Name: KENNECOTT/RAWHIDE	Project Location: FALLON, NV
Project No.: K18-002	Field Logbook No.:
Sampler: (Signature) [signature]	Chain of Custody Tape No.:

ANALYSES: EPA METHOD 29, Total Hg; Container #; ELECTROWINNING

Sample No./ Identification	~~Date~~	~~Time~~	Lab Sample Number	Type of Sample	EPA METHOD 29, Total Hg	Container #					REMARKS
KB002-M29-EW-BT-C1		12-4-08	2087-17-16	FILTER	X	1					BLANK TRAIN
~~KB002-M29-EW-BT-C2~~				~~ASBESTOS BOTTLE~~	~~X~~	~~2~~					
KB002-M29-EW-BT-C3					X	3					
KB002-M29-EW-BT-C4					X	4					
KB002-M29-EW-BT-C5A					X	5A					
KB002-M29-EW-BT-C5B					X	5B					
KB002-M29-EW-BT-C5C					X	5C					

	Date	Time		Date	Time
Relinquished by: (Signature) [signature]	12/17/08	0800	Received by: (Signature) [signature]	12/17/08	0800
Relinquished by: (Signature) [signature]	12/17/08	1630	Received by: (Signature) Pat Hanahan	12/17/08	4:30 pm
Relinquished by: (Signature)			Received for Laboratory: (Signature)		

Sample Disposal Method:	Disposed of by: (Signature)	Date	Time

SAMPLE COLLECTOR

HORIZON AIR MEASUREMENT SERVICES, INC
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ANALYTICAL LABORATORY

Curtis + Tompkins
Berkeley, CA

№ 10391

CHAIN OF CUSTODY RECORD

Client/Project Name	Project Location
KENNECOTT / RAWHIDE	FALLON, NV
Project No. K18-002	Field Logbook No.
Sampler: (Signature)	Chain of Custody Tape No.

ANALYSES: 8A 8B 9 10 11 12 (Total # of Containers)

Sample No./ Identification	~~Date~~	DATE ~~Time~~	Lab Sample Number	Type of Sample	8A	8B	9	10	11	12	REMARKS
K1802-M29-SB-C8A		12-4-08	208747-17	0.1 N HNO3	X	8A					Solution Blank
~~K1802-M29-SB-C8B~~				~~DI WATER~~	X	~~8B~~					
K1802-M29-SB-C9				5% HNO3/10% H2O2	X	9					
K1802-M29-SB-C10				KMnO4	X	10					
K1802-M29-SB-C11				8N HCl	X	11					
K1802-M29-SB-C12				FILTERS (3EA.)	X	12					

Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
	12/17/08	0800		12/17/08	0800
Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
	12/17/08	1630	Pat Mangahas	12/17/08	4:30 pm
Relinquished by: (Signature)	Date	Time	Received for Laboratory: (Signature)	Date	Time
Sample Disposal Method:	Disposed of by: (Signature)			Date	Time

SAMPLE COLLECTOR

HORIZON AIR MEASUREMENT SERVICES, INC
996 Lawrence Drive, Suite 108
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(805) 498-8781 Fax (805) 498-3173

ANALYTICAL LABORATORY

Curtis & Tompkins
Berkeley, CA

№ 10400

Curtis & Tompkins, Ltd.

Metals Analytical Report

Lab #:	208747	Location:	Kennecott / Rawhide
Client:	Horizon Air Measurement Services	Prep:	EPA 29
Project#:	K18-002	Analysis:	EPA 7470A
Matrix:	Air	Received:	12/17/08
Units:	ug/s		

Field ID: K18002-M29-RT-R1 Lab ID: 208747-001
Type: SAMPLE Sampled: 12/02/08

Analyte	Result	RL	Diln Fac	Batch#	Prepared	Analyzed
Mercury (Front)	0.68	0.50	10.00	146613	01/02/09	01/02/09
Mercury (Back)	ND	3.6	5.000	146405	12/23/08	12/23/08
Mercury (Empty)	0.033	0.027	1.000	146240	12/18/08	12/19/08
Mercury (KMnO4)	0.17	0.089	1.000	146442	12/24/08	12/24/08
Mercury (HCl)	20	1.1	20.00	146539	12/30/08	12/30/08

Field ID: K18002-M29-RT-R2 Lab ID: 208747-002
Type: SAMPLE Sampled: 12/02/08

Analyte	Result	RL	Diln Fac	Batch#	Prepared	Analyzed
Mercury (Front)	0.71	0.50	10.00	146613	01/02/09	01/02/09
Mercury (Back)	ND	3.6	5.000	146405	12/23/08	12/23/08
Mercury (Empty)	0.031	0.025	1.000	146240	12/18/08	12/19/08
Mercury (KMnO4)	0.14	0.088	1.000	146442	12/24/08	12/24/08
Mercury (HCl)	5.8	0.27	5.000	146539	12/30/08	12/30/08

Field ID: K18002-M29-RT-R3 Lab ID: 208747-003
Type: SAMPLE Sampled: 12/02/08

Analyte	Result	RL	Diln Fac	Batch#	Prepared	Analyzed
Mercury (Front)	0.59	0.50	10.00	146613	01/02/09	01/02/09
Mercury (Back)	ND	3.6	5.000	146405	12/23/08	12/23/08
Mercury (Empty)	0.10	0.026	1.000	146240	12/18/08	12/19/08
Mercury (KMnO4)	0.68	0.088	1.000	146442	12/24/08	12/24/08
Mercury (HCl)	4.9	0.22	4.000	146539	12/30/08	12/30/08

Field ID: K18002-M29-RT-BT Lab ID: 208747-004
Type: SAMPLE Sampled: 12/02/08

Analyte	Result	RL	Diln Fac	Batch#	Prepared	Analyzed
Mercury (Front)	ND	0.50	10.00	146613	01/02/09	01/02/09
Mercury (Back)	ND	3.1	5.000	146405	12/23/08	12/23/08
Mercury (Empty)	ND	0.021	1.000	146240	12/18/08	12/19/08
Mercury (KMnO4)	ND	0.078	1.000	146442	12/24/08	12/24/08
Mercury (HCl)	ND	0.051	1.000	146539	12/30/08	12/30/08

ND= Not Detected
RL= Reporting Limit
HCl= HCl Rinse
Back= Back Half
Empty= Empty Impinger (EPA 29)
Front= Front Half
KMnO4= KMnO4

Curtis & Tompkins, Ltd.

Metals Analytical Report

Lab #:	208747	Location:	Kennecott / Rawhide
Client:	Horizon Air Measurement Services	Prep:	EPA 29
Project#:	K18-002	Analysis:	EPA 7470A
Matrix:	Air	Received:	12/17/08
Units:	ug/s		

Field ID: K18002-M29-FUR-R1 Lab ID: 208747-005
Type: SAMPLE Sampled: 12/03/08

Analyte	Result	RL	Diln Fac	Batch#	Prepared	Analyzed
Mercury (Front)	33	2.0	40.00	146613	01/02/09	01/02/09
Mercury (Back)	35	3.8	5.000	146405	12/23/08	12/23/08
Mercury (Empty)	23	1.3	50.00	146240	12/18/08	12/19/08
Mercury (KMnO4)	57	3.6	40.00	146442	12/24/08	12/24/08
Mercury (HCl)	4,600	270	5,000	146539	12/30/08	12/30/08

Field ID: K18002-M29-FUR-R2 Lab ID: 208747-006
Type: SAMPLE Sampled: 12/03/08

Analyte	Result	RL	Diln Fac	Batch#	Prepared	Analyzed
Mercury (Front)	42	2.5	50.00	146613	01/02/09	01/02/09
Mercury (Back)	250	7.7	10.00	146405	12/23/08	12/23/08
Mercury (Empty)	240	10	400.0	146240	12/18/08	12/19/08
Mercury (KMnO4)	1,800	110	1,200	146442	12/24/08	12/24/08
Mercury (HCl)	7,600	270	5,000	146539	12/30/08	12/30/08

Field ID: K18002-M29-FUR-R3 Lab ID: 208747-007
Type: SAMPLE Sampled: 12/03/08

Analyte	Result	RL	Diln Fac	Batch#	Prepared	Analyzed
Mercury (Front)	5.7	0.50	10.00	146613	01/02/09	01/02/09
Mercury (Back)	29	3.6	5.000	146405	12/23/08	12/23/08
Mercury (Empty)	18	1.0	40.00	146240	12/18/08	12/19/08
Mercury (KMnO4)	6,800	440	5,000	146442	12/24/08	12/24/08
Mercury (HCl)	1,100	54	1,000	146539	12/30/08	12/30/08

Field ID: K18002-M29-FUR-BT Lab ID: 208747-008
Type: SAMPLE Sampled: 12/03/08

Analyte	Result	RL	Diln Fac	Batch#	Prepared	Analyzed
Mercury (Front)	ND	0.50	10.00	146613	01/02/09	01/02/09
Mercury (Back)	ND	3.1	5.000	146405	12/23/08	12/23/08
Mercury (Empty)	ND	0.021	1.000	146240	12/18/08	12/19/08
Mercury (KMnO4)	ND	0.078	1.000	146442	12/24/08	12/24/08
Mercury (HCl)	0.057	0.052	1.000	146539	12/30/08	12/30/08

ND= Not Detected
RL= Reporting Limit
HCl= HCl Rinse
Back= Back Half
Empty= Empty Impinger (EPA 29)
Front= Front Half
KMnO4= KMnO4

Curtis & Tompkins, Ltd.

Metals Analytical Report

Lab #:	208747	Location:	Kennecott / Rawhide
Client:	Horizon Air Measurement Services	Prep:	EPA 29
Project#:	K18-002	Analysis:	EPA 7470A
Matrix:	Air	Received:	12/17/08
Units:	ug/s		

Field ID: K18002-M29-CK-R1
Type: SAMPLE
Lab ID: 208747-009
Sampled: 12/03/08

Analyte	Result	RL	Diln Fac	Batch#	Prepared	Analyzed
Mercury (Front)	ND	0.50	10.00	146613	01/02/09	01/02/09
Mercury (Back)	16	4.2	5.000	146405	12/23/08	12/23/08
Mercury (Empty)	0.55	0.028	1.000	146240	12/18/08	12/19/08
Mercury (KMnO4)	0.12	0.090	1.000	146442	12/24/08	12/24/08
Mercury (HCl)	15	0.55	10.00	146539	12/30/08	12/30/08

Field ID: K18002-M29-CK-R2
Type: SAMPLE
Lab ID: 208747-010
Sampled: 12/04/08

Analyte	Result	RL	Diln Fac	Batch#	Prepared	Analyzed
Mercury (Front)	ND	0.50	10.00	146613	01/02/09	01/02/09
Mercury (Back)	4.8	3.8	5.000	146405	12/23/08	12/23/08
Mercury (Empty)	0.43	0.026	1.000	146240	12/18/08	12/19/08
Mercury (KMnO4)	0.56	0.088	1.000	146442	12/24/08	12/24/08
Mercury (HCl)	12	0.53	10.00	146539	12/30/08	12/30/08

Field ID: K18002-M29-CK-R3
Type: SAMPLE
Lab ID: 208747-011
Sampled: 12/04/08

Analyte	Result	RL	Diln Fac	Batch#	Prepared	Analyzed
Mercury (Front)	ND	0.50	10.00	146613	01/02/09	01/02/09
Mercury (Back)	ND	4.2	5.000	146405	12/23/08	12/23/08
Mercury (Empty)	0.20	0.027	1.000	146240	12/18/08	12/19/08
Mercury (KMnO4)	1.6	0.090	1.000	146442	12/24/08	12/24/08
Mercury (HCl)	3.9	0.21	4.000	146539	12/30/08	12/30/08

Field ID: K18002-M29-CK-BT
Type: SAMPLE
Lab ID: 208747-012
Sampled: 12/03/08

Analyte	Result	RL	Diln Fac	Batch#	Prepared	Analyzed
Mercury (Front)	ND	0.50	10.00	146613	01/02/09	01/02/09
Mercury (Back)	ND	3.1	5.000	146405	12/23/08	12/23/08
Mercury (Empty)	ND	0.021	1.000	146240	12/18/08	12/19/08
Mercury (KMnO4)	ND	0.078	1.000	146442	12/24/08	12/24/08
Mercury (HCl)	ND	0.051	1.000	146539	12/30/08	12/30/08

ND= Not Detected
RL= Reporting Limit
HCl= HCl Rinse
Back= Back Half
Empty= Empty Impinger (EPA 29)
Front= Front Half
KMnO4= KMnO4

Curtis & Tompkins, Ltd.

Metals Analytical Report

Lab #:	208747	Location:	Kennecott / Rawhide
Client:	Horizon Air Measurement Services	Prep:	EPA 29
Project#:	K18-002	Analysis:	EPA 7470A
Matrix:	Air	Received:	12/17/08
Units:	ug/s		

Field ID: K18002-M29-EW-R1 Lab ID: 208747-013
Type: SAMPLE Sampled: 12/04/08

Analyte	Result	RL	Diln Fac	Batch#	Prepared	Analyzed
Mercury (Front)	1.6	0.50	10.00	146613	01/02/09	01/02/09
Mercury (Back)	6.1	3.8	5.000	146405	12/23/08	12/23/08
Mercury (Empty)	0.051	0.026	1.000	146240	12/18/08	12/19/08
Mercury (KMnO4)	15	0.88	10.00	146442	12/24/08	12/24/08
Mercury (HCl)	0.48	0.053	1.000	146539	12/30/08	12/30/08

Field ID: K18002-M29-EW-R2 Lab ID: 208747-014
Type: SAMPLE Sampled: 12/04/08

Analyte	Result	RL	Diln Fac	Batch#	Prepared	Analyzed
Mercury (Front)	ND	0.50	10.00	146613	01/02/09	01/02/09
Mercury (Back)	ND	3.6	5.000	146405	12/23/08	12/23/08
Mercury (Empty)	0.052	0.025	1.000	146240	12/18/08	12/19/08
Mercury (KMnO4)	4.0	0.27	3.000	146442	12/24/08	12/24/08
Mercury (HCl)	0.30	0.052	1.000	146539	12/30/08	12/30/08

Field ID: K18002-M29-EW-R3 Lab ID: 208747-015
Type: SAMPLE Sampled: 12/04/08

Analyte	Result	RL	Diln Fac	Batch#	Prepared	Analyzed
Mercury (Front)	ND	0.50	10.00	146613	01/02/09	01/02/09
Mercury (Back)	ND	3.8	5.000	146405	12/23/08	12/23/08
Mercury (Empty)	ND	0.027	1.000	146240	12/18/08	12/19/08
Mercury (KMnO4)	5.3	0.27	3.000	146442	12/24/08	12/24/08
Mercury (HCl)	0.17	0.054	1.000	146539	12/30/08	12/30/08

Field ID: K18002-M29-EW-BT Lab ID: 208747-016
Type: SAMPLE Sampled: 12/04/08

Analyte	Result	RL	Diln Fac	Batch#	Prepared	Analyzed
Mercury (Front)	ND	0.50	10.00	146613	01/02/09	01/02/09
Mercury (Back)	ND	3.1	5.000	146405	12/23/08	12/23/08
Mercury (Empty)	ND	0.021	1.000	146240	12/18/08	12/19/08
Mercury (KMnO4)	ND	0.078	1.000	146442	12/24/08	12/24/08
Mercury (HCl)	ND	0.051	1.000	146539	12/30/08	12/30/08

ND= Not Detected
RL= Reporting Limit
HCl= HCl Rinse
Back= Back Half
Empty= Empty Impinger (EPA 29)
Front= Front Half
KMnO4= KMnO4

Curtis & Tompkins, Ltd.

Metals Analytical Report

Lab #:	208747	Location:	Kennecott / Rawhide
Client:	Horizon Air Measurement Services	Prep:	EPA 29
Project#:	K18-002	Analysis:	EPA 7470A
Matrix:	Air	Received:	12/17/08
Units:	ug/s		

Field ID:	K18002-M29-SB	Lab ID:	208747-017
Type:	SAMPLE	Sampled:	12/04/08

Analyte	Result	RL	Diln Fac	Batch#	Prepared	Analyzed
Mercury (Front)	ND	0.50	10.00	146613	01/02/09	01/02/09
Mercury (Back)	ND	3.1	5.000	146405	12/23/08	12/23/08
Mercury (Empty)	ND	0.020	1.000	146240	12/18/08	12/19/08
Mercury (KMnO4)	ND	0.080	1.000	146442	12/24/08	12/24/08
Mercury (HCl)	ND	0.045	1.000	146539	12/30/08	12/30/08

Type:	BLANK	Batch#:	146240
Lab ID:	QC476456	Prepared:	12/18/08
Diln Fac:	1.000	Analyzed:	12/18/08

Analyte	Result	RL
Mercury (Empty)	ND	0.020

Type:	BLANK	Batch#:	146405
Lab ID:	QC477095	Prepared:	12/23/08
Diln Fac:	1.000	Analyzed:	12/23/08

Analyte	Result	RL
Mercury (Back)	ND	0.020

Type:	BLANK	Batch#:	146442
Lab ID:	QC477256	Prepared:	12/24/08
Diln Fac:	1.000	Analyzed:	12/24/08

Analyte	Result	RL
Mercury (KMnO4)	ND	0.020

Type:	BLANK	Batch#:	146539
Lab ID:	QC477649	Prepared:	12/30/08
Diln Fac:	1.000	Analyzed:	12/30/08

Analyte	Result	RL
Mercury (HCl)	ND	0.020

ND= Not Detected
RL= Reporting Limit
HCl= HCl Rinse
Back= Back Half
Empty= Empty Impinger (EPA 29)
Front= Front Half
KMnO4= KMnO4

Curtis & Tompkins, Ltd.

Metals Analytical Report

Lab #:	208747	Location:	Kennecott / Rawhide
Client:	Horizon Air Measurement Services	Prep:	EPA 29
Project#:	K18-002	Analysis:	EPA 7470A
Matrix:	Air	Received:	12/17/08
Units:	ug/s		

Type:	BLANK	Batch#:	146613
Lab ID:	QC477964	Prepared:	01/02/09
Diln Fac:	1.000	Analyzed:	01/02/09

Analyte	Result	RL
Mercury (Front)	ND	0.020

ND= Not Detected
RL= Reporting Limit
HCl= HCl Rinse
Back= Back Half
Empty= Empty Impinger (EPA 29)
Front= Front Half
KMnO4= KMnO4

Curtis & Tompkins, Ltd.

Batch QC Report

Metals Analytical Report

Lab #:	208747	Location:	Kennecott / Rawhide
Client:	Horizon Air Measurement Services	Prep:	EPA 29
Project#:	K18-002	Analysis:	EPA 7470A
Matrix:	Air	Received:	12/17/08
Units:	ug/s		

Type:	BS	Batch#:	146240
Lab ID:	QC476457	Prepared:	12/18/08
Diln Fac:	1.000	Analyzed:	12/18/08

Analyte	Spiked	Result	%REC	Limits
Mercury (Empty)	0.005000	0.005190	104	80-120

Type:	BSD	Batch#:	146240
Lab ID:	QC476458	Prepared:	12/18/08
Diln Fac:	1.000	Analyzed:	12/18/08

Analyte	Spiked	Result	%REC	Limits	RPD	Lim
Mercury (Empty)	0.005000	0.005200	104	80-120	0	20

Field ID:	K18002-M29-RT-R1	Batch#:	146240
Type:	SSPIKE	Sampled:	12/02/08
MSS Lab ID:	208747-001	Prepared:	12/18/08
Lab ID:	QC476459	Analyzed:	12/19/08
Diln Fac:	1.000		

Analyte	MSS Result	Spiked	Result	%REC	Limits
Mercury (Empty)	0.03324	0.6757	0.6946	98	71-124

Field ID:	K18002-M29-RT-R1	Batch#:	146240
Type:	SDUP	Sampled:	12/02/08
MSS Lab ID:	208747-001	Prepared:	12/18/08
Lab ID:	QC476460	Analyzed:	12/19/08
Diln Fac:	1.000		

Analyte	MSS Result	Result	RL	RPD	Lim
Mercury (Empty)	0.03324	0.03419	0.02703	3	20

NC= Not Calculated
ND= Not Detected
NM= Not Meaningful: Sample concentration > 4X spike concentration
RL= Reporting Limit
HCl= HCl Rinse
RPD= Relative Percent Difference
Back= Back Half
Empty= Empty Impinger (EPA 29)
Front= Front Half
KMnO4= KMnO4

Curtis & Tompkins, Ltd.

Batch QC Report

Metals Analytical Report

Lab #:	208747	Location:	Kennecott / Rawhide
Client:	Horizon Air Measurement Services	Prep:	EPA 29
Project#:	K18-002	Analysis:	EPA 7470A
Matrix:	Air	Received:	12/17/08
Units:	ug/s		

Field ID:	K18002-M29-RT-R2	Batch#:	146240
Type:	SDUP	Sampled:	12/02/08
MSS Lab ID:	208747-002	Prepared:	12/18/08
Lab ID:	QC476461	Analyzed:	12/19/08
Diln Fac:	1.000		

Analyte	MSS Result	Result	RL	RPD	Lim
Mercury (Empty)	0.03050	ND	0.02500	NC	20

Field ID:	K18002-M29-RT-R3	Batch#:	146240
Type:	SDUP	Sampled:	12/02/08
MSS Lab ID:	208747-003	Prepared:	12/18/08
Lab ID:	QC476462	Analyzed:	12/19/08
Diln Fac:	1.000		

Analyte	MSS Result	Result	RL	RPD	Lim
Mercury (Empty)	0.1009	0.1023	0.02604	1	20

Field ID:	K18002-M29-RT-BT	Batch#:	146240
Type:	SDUP	Sampled:	12/02/08
MSS Lab ID:	208747-004	Prepared:	12/18/08
Lab ID:	QC476463	Analyzed:	12/19/08
Diln Fac:	1.000		

Analyte	MSS Result	Result	RL	RPD	Lim
Mercury (Empty)	<0.02053	ND	0.02053	NC	20

Field ID:	K18002-M29-FUR-R1	Batch#:	146240
Type:	SDUP	Sampled:	12/03/08
MSS Lab ID:	208747-005	Prepared:	12/18/08
Lab ID:	QC476464	Analyzed:	12/19/08
Diln Fac:	50.00		

Analyte	MSS Result	Result	RL	RPD	Lim
Mercury (Empty)	22.77	24.62	1.276	8	20

NC= Not Calculated
ND= Not Detected
NM= Not Meaningful: Sample concentration > 4X spike concentration
RL= Reporting Limit
HCl= HCl Rinse
RPD= Relative Percent Difference
Back= Back Half
Empty= Empty Impinger (EPA 29)
Front= Front Half
KMnO4= KMnO4

Curtis & Tompkins, Ltd.

Batch QC Report

Metals Analytical Report

Lab #:	208747	Location:	Kennecott / Rawhide
Client:	Horizon Air Measurement Services	Prep:	EPA 29
Project#:	K18-002	Analysis:	EPA 7470A
Matrix:	Air	Received:	12/17/08
Units:	ug/s		

Field ID:	K18002-M29-FUR-R2	Batch#:	146240
Type:	SDUP	Sampled:	12/03/08
MSS Lab ID:	208747-006	Prepared:	12/18/08
Lab ID:	QC476465	Analyzed:	12/19/08
Diln Fac:	400.0		

Analyte	MSS Result	Result	RL	RPD	Lim
Mercury (Empty)	240.5	244.0	10.00	1	20

Field ID:	K18002-M29-FUR-R3	Batch#:	146240
Type:	SDUP	Sampled:	12/03/08
MSS Lab ID:	208747-007	Prepared:	12/18/08
Lab ID:	QC476466	Analyzed:	12/19/08
Diln Fac:	40.00		

Analyte	MSS Result	Result	RL	RPD	Lim
Mercury (Empty)	17.85	17.80	1.000	0	20

Field ID:	K18002-M29-FUR-BT	Batch#:	146240
Type:	SDUP	Sampled:	12/03/08
MSS Lab ID:	208747-008	Prepared:	12/18/08
Lab ID:	QC476467	Analyzed:	12/19/08
Diln Fac:	1.000		

Analyte	MSS Result	Result	RL	RPD	Lim
Mercury (Empty)	<0.02053	ND	0.02053	NC	20

Field ID:	K18002-M29-CK-R1	Batch#:	146240
Type:	SDUP	Sampled:	12/03/08
MSS Lab ID:	208747-009	Prepared:	12/18/08
Lab ID:	QC476468	Analyzed:	12/19/08
Diln Fac:	1.000		

Analyte	MSS Result	Result	RL	RPD	Lim
Mercury (Empty)	0.5537	0.5634	0.02755	2	20

NC= Not Calculated
ND= Not Detected
NM= Not Meaningful: Sample concentration > 4X spike concentration
RL= Reporting Limit
HCl= HCl Rinse
RPD= Relative Percent Difference
Back= Back Half
Empty= Empty Impinger (EPA 29)
Front= Front Half
KMnO4= KMnO4

Curtis & Tompkins, Ltd.

Batch QC Report

Metals Analytical Report

Lab #:	208747	Location:	Kennecott / Rawhide
Client:	Horizon Air Measurement Services	Prep:	EPA 29
Project#:	K18-002	Analysis:	EPA 7470A
Matrix:	Air	Received:	12/17/08
Units:	ug/s		

Field ID:	K18002-M29-CK-R2	Batch#:	146240
Type:	SDUP	Sampled:	12/04/08
MSS Lab ID:	208747-010	Prepared:	12/18/08
Lab ID:	QC476469	Analyzed:	12/19/08
Diln Fac:	1.000		

Analyte	MSS Result	Result	RL	RPD	Lim
Mercury (Empty)	0.4273	0.4235	0.02551	1	20

Field ID:	K18002-M29-CK-R3	Batch#:	146240
Type:	SDUP	Sampled:	12/04/08
MSS Lab ID:	208747-011	Prepared:	12/18/08
Lab ID:	QC476470	Analyzed:	12/19/08
Diln Fac:	1.000		

Analyte	MSS Result	Result	RL	RPD	Lim
Mercury (Empty)	0.2042	0.2042	0.02653	0	20

Field ID:	K18002-M29-CK-BT	Batch#:	146240
Type:	SDUP	Sampled:	12/03/08
MSS Lab ID:	208747-012	Prepared:	12/18/08
Lab ID:	QC476471	Analyzed:	12/19/08
Diln Fac:	1.000		

Analyte	MSS Result	Result	RL	RPD	Lim
Mercury (Empty)	<0.02101	ND	0.02101	NC	20

Field ID:	K18002-M29-EW-R1	Batch#:	146240
Type:	SDUP	Sampled:	12/04/08
MSS Lab ID:	208747-013	Prepared:	12/18/08
Lab ID:	QC476472	Analyzed:	12/19/08
Diln Fac:	1.000		

Analyte	MSS Result	Result	RL	RPD	Lim
Mercury (Empty)	0.05115	0.05217	0.02551	2	20

NC= Not Calculated
ND= Not Detected
NM= Not Meaningful: Sample concentration > 4X spike concentration
RL= Reporting Limit
HCl= HCl Rinse
RPD= Relative Percent Difference
Back= Back Half
Empty= Empty Impinger (EPA 29)
Front= Front Half
KMnO4= KMnO4

Curtis & Tompkins, Ltd.

Batch QC Report

Metals Analytical Report

Lab #:	208747	Location:	Kennecott / Rawhide
Client:	Horizon Air Measurement Services	Prep:	EPA 29
Project#:	K18-002	Analysis:	EPA 7470A
Matrix:	Air	Received:	12/17/08
Units:	ug/s		

Field ID:	K18002-M29-EW-R2	Batch#:	146240
Type:	SDUP	Sampled:	12/04/08
MSS Lab ID:	208747-014	Prepared:	12/18/08
Lab ID:	QC476473	Analyzed:	12/19/08
Diln Fac:	1.000		

Analyte	MSS Result	Result	RL	RPD	Lim
Mercury (Empty)	0.05233	0.05172	0.02451	1	20

Field ID:	K18002-M29-EW-R3	Batch#:	146240
Type:	SDUP	Sampled:	12/04/08
MSS Lab ID:	208747-015	Prepared:	12/18/08
Lab ID:	QC476474	Analyzed:	12/19/08
Diln Fac:	1.000		

Analyte	MSS Result	Result	RL	RPD	Lim
Mercury (Empty)	<0.02653	ND	0.02653	NC	20

Field ID:	K18002-M29-EW-BT	Batch#:	146240
Type:	SDUP	Sampled:	12/04/08
MSS Lab ID:	208747-016	Prepared:	12/18/08
Lab ID:	QC476475	Analyzed:	12/19/08
Diln Fac:	1.000		

Analyte	MSS Result	Result	RL	RPD	Lim
Mercury (Empty)	<0.02053	ND	0.02053	NC	20

Field ID:	K18002-M29-SB	Batch#:	146240
Type:	SDUP	Sampled:	12/04/08
MSS Lab ID:	208747-017	Prepared:	12/18/08
Lab ID:	QC476476	Analyzed:	12/19/08
Diln Fac:	1.000		

Analyte	MSS Result	Result	RL	RPD	Lim
Mercury (Empty)	<0.02000	ND	0.02000	NC	20

NC= Not Calculated
ND= Not Detected
NM= Not Meaningful: Sample concentration > 4X spike concentration
RL= Reporting Limit
HCl= HCl Rinse
RPD= Relative Percent Difference
Back= Back Half
Empty= Empty Impinger (EPA 29)
Front= Front Half
KMnO4= KMnO4

Curtis & Tompkins, Ltd.

Batch QC Report

Metals Analytical Report

Lab #:	208747	Location:	Kennecott / Rawhide
Client:	Horizon Air Measurement Services	Prep:	EPA 29
Project#:	K18-002	Analysis:	EPA 7470A
Matrix:	Air	Received:	12/17/08
Units:	ug/s		

Type:	BS	Batch#:	146405
Lab ID:	QC477096	Prepared:	12/23/08
Diln Fac:	1.000	Analyzed:	12/23/08

Analyte	Spiked	Result	%REC	Limits
Mercury (Back)	0.005000	0.005310	106	80-120

Type:	BSD	Batch#:	146405
Lab ID:	QC477097	Prepared:	12/23/08
Diln Fac:	1.000	Analyzed:	12/23/08

Analyte	Spiked	Result	%REC	Limits	RPD	Lim
Mercury (Back)	0.005000	0.005240	105	80-120	1	20

Field ID:	K18002-M29-RT-R1	Batch#:	146405
Type:	SSPIKE	Sampled:	12/02/08
MSS Lab ID:	208747-001	Prepared:	12/23/08
Lab ID:	QC477098	Analyzed:	12/23/08
Diln Fac:	5.000		

Analyte	MSS Result	Spiked	Result	%REC	Limits
Mercury (Back)	0.1250	17.86	16.86	94	71-124

Field ID:	K18002-M29-RT-R1	Batch#:	146405
Type:	SDUP	Sampled:	12/02/08
MSS Lab ID:	208747-001	Prepared:	12/23/08
Lab ID:	QC477099	Analyzed:	12/23/08
Diln Fac:	5.000		

Analyte	MSS Result	Result	RL	RPD	Lim
Mercury (Back)	<3.571	ND	3.571	NC	20

NC= Not Calculated
ND= Not Detected
NM= Not Meaningful: Sample concentration > 4X spike concentration
RL= Reporting Limit
HCl= HCl Rinse
RPD= Relative Percent Difference
Back= Back Half
Empty= Empty Impinger (EPA 29)
Front= Front Half
KMnO4= KMnO4

Curtis & Tompkins, Ltd.

Batch QC Report

Metals Analytical Report

Lab #:	208747	Location:	Kennecott / Rawhide
Client:	Horizon Air Measurement Services	Prep:	EPA 29
Project#:	K18-002	Analysis:	EPA 7470A
Matrix:	Air	Received:	12/17/08
Units:	ug/s		

Field ID:	K18002-M29-RT-R2	Batch#:	146405
Type:	SDUP	Sampled:	12/02/08
MSS Lab ID:	208747-002	Prepared:	12/23/08
Lab ID:	QC477100	Analyzed:	12/23/08
Diln Fac:	5.000		

Analyte	MSS Result	Result	RL	RPD	Lim
Mercury (Back)	<3.571	ND	3.571	NC	20

Field ID:	K18002-M29-RT-R3	Batch#:	146405
Type:	SDUP	Sampled:	12/02/08
MSS Lab ID:	208747-003	Prepared:	12/23/08
Lab ID:	QC477101	Analyzed:	12/23/08
Diln Fac:	5.000		

Analyte	MSS Result	Result	RL	RPD	Lim
Mercury (Back)	<3.571	ND	3.571	NC	20

Field ID:	K18002-M29-RT-BT	Batch#:	146405
Type:	SDUP	Sampled:	12/02/08
MSS Lab ID:	208747-004	Prepared:	12/23/08
Lab ID:	QC477102	Analyzed:	12/23/08
Diln Fac:	5.000		

Analyte	MSS Result	Result	RL	RPD	Lim
Mercury (Back)	<3.125	ND	3.125	NC	20

Field ID:	K18002-M29-FUR-R1	Batch#:	146405
Type:	SDUP	Sampled:	12/03/08
MSS Lab ID:	208747-005	Prepared:	12/23/08
Lab ID:	QC477103	Analyzed:	12/23/08
Diln Fac:	5.000		

Analyte	MSS Result	Result	RL	RPD	Lim
Mercury (Back)	34.81	35.19	3.846	1	20

NC= Not Calculated
ND= Not Detected
NM= Not Meaningful: Sample concentration > 4X spike concentration
RL= Reporting Limit
HCl= HCl Rinse
RPD= Relative Percent Difference
Back= Back Half
Empty= Empty Impinger (EPA 29)
Front= Front Half
KMnO4= KMnO4

Curtis & Tompkins, Ltd.

Batch QC Report

Metals Analytical Report

Lab #:	208747	Location:	Kennecott / Rawhide
Client:	Horizon Air Measurement Services	Prep:	EPA 29
Project#:	K18-002	Analysis:	EPA 7470A
Matrix:	Air	Received:	12/17/08
Units:	ug/s		

Field ID:	K18002-M29-FUR-R2	Batch#:	146405
Type:	SDUP	Sampled:	12/03/08
MSS Lab ID:	208747-006	Prepared:	12/23/08
Lab ID:	QC477104	Analyzed:	12/23/08
Diln Fac:	10.00		

Analyte	MSS Result	Result	RL	RPD	Lim
Mercury (Back)	251.9	270.0	7.692	7	20

Field ID:	K18002-M29-FUR-R3	Batch#:	146405
Type:	SDUP	Sampled:	12/03/08
MSS Lab ID:	208747-007	Prepared:	12/23/08
Lab ID:	QC477106	Analyzed:	12/23/08
Diln Fac:	5.000		

Analyte	MSS Result	Result	RL	RPD	Lim
Mercury (Back)	28.93	29.46	3.571	2	20

Field ID:	K18002-M29-FUR-BT	Batch#:	146405
Type:	SDUP	Sampled:	12/03/08
MSS Lab ID:	208747-008	Prepared:	12/23/08
Lab ID:	QC477107	Analyzed:	12/23/08
Diln Fac:	5.000		

Analyte	MSS Result	Result	RL	RPD	Lim
Mercury (Back)	<3.125	ND	3.125	NC	20

Field ID:	K18002-M29-CK-R1	Batch#:	146405
Type:	SDUP	Sampled:	12/03/08
MSS Lab ID:	208747-009	Prepared:	12/23/08
Lab ID:	QC477108	Analyzed:	12/23/08
Diln Fac:	5.000		

Analyte	MSS Result	Result	RL	RPD	Lim
Mercury (Back)	15.94	16.90	4.167	6	20

NC= Not Calculated
ND= Not Detected
NM= Not Meaningful: Sample concentration > 4X spike concentration
RL= Reporting Limit
HCl= HCl Rinse
RPD= Relative Percent Difference
Back= Back Half
Empty= Empty Impinger (EPA 29)
Front= Front Half
KMnO4= KMnO4

Curtis & Tompkins, Ltd.

Batch QC Report

Metals Analytical Report

Lab #:	208747	Location:	Kennecott / Rawhide
Client:	Horizon Air Measurement Services	Prep:	EPA 29
Project#:	K18-002	Analysis:	EPA 7470A
Matrix:	Air	Received:	12/17/08
Units:	ug/s		

Field ID:	K18002-M29-CK-R2	Batch#:	146405
Type:	SDUP	Sampled:	12/04/08
MSS Lab ID:	208747-010	Prepared:	12/23/08
Lab ID:	QC477109	Analyzed:	12/23/08
Diln Fac:	5.000		

Analyte	MSS Result	Result	RL	RPD	Lim
Mercury (Back)	4.808	4.192	3.846	14	20

Field ID:	K18002-M29-CK-R3	Batch#:	146405
Type:	SDUP	Sampled:	12/04/08
MSS Lab ID:	208747-011	Prepared:	12/23/08
Lab ID:	QC477110	Analyzed:	12/23/08
Diln Fac:	5.000		

Analyte	MSS Result	Result	RL	RPD	Lim
Mercury (Back)	<4.167	ND	4.167	NC	20

Field ID:	K18002-M29-CK-BT	Batch#:	146405
Type:	SDUP	Sampled:	12/03/08
MSS Lab ID:	208747-012	Prepared:	12/23/08
Lab ID:	QC477111	Analyzed:	12/23/08
Diln Fac:	5.000		

Analyte	MSS Result	Result	RL	RPD	Lim
Mercury (Back)	<3.125	ND	3.125	NC	20

Field ID:	K18002-M29-EW-R1	Batch#:	146405
Type:	SDUP	Sampled:	12/04/08
MSS Lab ID:	208747-013	Prepared:	12/23/08
Lab ID:	QC477112	Analyzed:	12/23/08
Diln Fac:	5.000		

Analyte	MSS Result	Result	RL	RPD	Lim
Mercury (Back)	6.115	6.538	3.846	7	20

NC= Not Calculated
ND= Not Detected
NM= Not Meaningful: Sample concentration > 4X spike concentration
RL= Reporting Limit
HCl= HCl Rinse
RPD= Relative Percent Difference
Back= Back Half
Empty= Empty Impinger (EPA 29)
Front= Front Half
KMnO4= KMnO4

Curtis & Tompkins, Ltd.

Batch QC Report

Metals Analytical Report

Lab #:	208747	Location:	Kennecott / Rawhide
Client:	Horizon Air Measurement Services	Prep:	EPA 29
Project#:	K18-002	Analysis:	EPA 7470A
Matrix:	Air	Received:	12/17/08
Units:	ug/s		

Field ID:	K18002-M29-EW-R2	Batch#:	146405
Type:	SDUP	Sampled:	12/04/08
MSS Lab ID:	208747-014	Prepared:	12/23/08
Lab ID:	QC477113	Analyzed:	12/23/08
Diln Fac:	5.000		

Analyte	MSS Result	Result	RL	RPD	Lim
Mercury (Back)	<3.571	ND	3.571	NC	20

Field ID:	K18002-M29-EW-R3	Batch#:	146405
Type:	SDUP	Sampled:	12/04/08
MSS Lab ID:	208747-015	Prepared:	12/23/08
Lab ID:	QC477114	Analyzed:	12/23/08
Diln Fac:	5.000		

Analyte	MSS Result	Result	RL	RPD	Lim
Mercury (Back)	<3.846	ND	3.846	NC	20

Field ID:	K18002-M29-EW-BT	Batch#:	146405
Type:	SDUP	Sampled:	12/04/08
MSS Lab ID:	208747-016	Prepared:	12/23/08
Lab ID:	QC477115	Analyzed:	12/23/08
Diln Fac:	5.000		

Analyte	MSS Result	Result	RL	RPD	Lim
Mercury (Back)	<3.125	ND	3.125	NC	20

Field ID:	K18002-M29-SB	Batch#:	146405
Type:	SDUP	Sampled:	12/04/08
MSS Lab ID:	208747-017	Prepared:	12/23/08
Lab ID:	QC477116	Analyzed:	12/23/08
Diln Fac:	5.000		

Analyte	MSS Result	Result	RL	RPD	Lim
Mercury (Back)	<3.125	ND	3.125	NC	20

NC= Not Calculated
ND= Not Detected
NM= Not Meaningful: Sample concentration > 4X spike concentration
RL= Reporting Limit
HCl= HCl Rinse
RPD= Relative Percent Difference
Back= Back Half
Empty= Empty Impinger (EPA 29)
Front= Front Half
KMnO4= KMnO4

Curtis & Tompkins, Ltd.

Batch QC Report

Metals Analytical Report

Lab #:	208747	Location:	Kennecott / Rawhide
Client:	Horizon Air Measurement Services	Prep:	EPA 29
Project#:	K18-002	Analysis:	EPA 7470A
Matrix:	Air	Received:	12/17/08
Units:	ug/s		

Type:	BS	Batch#:	146442
Lab ID:	QC477257	Prepared:	12/24/08
Diln Fac:	1.000	Analyzed:	12/24/08

Analyte	Spiked	Result	%REC	Limits
Mercury (KMnO4)	0.005000	0.004930	99	80-120

Type:	BSD	Batch#:	146442
Lab ID:	QC477258	Prepared:	12/24/08
Diln Fac:	1.000	Analyzed:	12/24/08

Analyte	Spiked	Result	%REC	Limits	RPD	Lim
Mercury (KMnO4)	0.005000	0.004760	95	80-120	4	20

Field ID:	K18002-M29-RT-R1	Batch#:	146442
Type:	SSPIKE	Sampled:	12/02/08
MSS Lab ID:	208747-001	Prepared:	12/24/08
Lab ID:	QC477259	Analyzed:	12/24/08
Diln Fac:	1.000		

Analyte	MSS Result	Spiked	Result	%REC	Limits
Mercury (KMnO4)	0.1688	2.232	2.286	95	71-124

Field ID:	K18002-M29-RT-R1	Batch#:	146442
Type:	SDUP	Sampled:	12/02/08
MSS Lab ID:	208747-001	Prepared:	12/24/08
Lab ID:	QC477260	Analyzed:	12/24/08
Diln Fac:	1.000		

Analyte	MSS Result	Result	RL	RPD	Lim
Mercury (KMnO4)	0.1688	0.1777	0.08929	5	20

NC= Not Calculated
ND= Not Detected
NM= Not Meaningful: Sample concentration > 4X spike concentration
RL= Reporting Limit
HCl= HCl Rinse
RPD= Relative Percent Difference
Back= Back Half
Empty= Empty Impinger (EPA 29)
Front= Front Half
KMnO4= KMnO4

Curtis & Tompkins, Ltd.

Batch QC Report

Metals Analytical Report

Lab #:	208747	Location:	Kennecott / Rawhide
Client:	Horizon Air Measurement Services	Prep:	EPA 29
Project#:	K18-002	Analysis:	EPA 7470A
Matrix:	Air	Received:	12/17/08
Units:	ug/s		

Field ID:	K18002-M29-RT-R2	Batch#:	146442
Type:	SDUP	Sampled:	12/02/08
MSS Lab ID:	208747-002	Prepared:	12/24/08
Lab ID:	QC477261	Analyzed:	12/24/08
Diln Fac:	1.000		

Analyte	MSS Result	Result	RL	RPD	Lim
Mercury (KMnO4)	0.1429	0.1628	0.08850	13	20

Field ID:	K18002-M29-RT-R3	Batch#:	146442
Type:	SDUP	Sampled:	12/02/08
MSS Lab ID:	208747-003	Prepared:	12/24/08
Lab ID:	QC477262	Analyzed:	12/24/08
Diln Fac:	1.000		

Analyte	MSS Result	Result	RL	RPD	Lim
Mercury (KMnO4)	0.6754	0.6798	0.08772	1	20

Field ID:	K18002-M29-RT-BT	Batch#:	146442
Type:	SDUP	Sampled:	12/02/08
MSS Lab ID:	208747-004	Prepared:	12/24/08
Lab ID:	QC477263	Analyzed:	12/24/08
Diln Fac:	1.000		

Analyte	MSS Result	Result	RL	RPD	Lim
Mercury (KMnO4)	<0.07813	ND	0.07813	NC	20

Field ID:	K18002-M29-FUR-R1	Batch#:	146442
Type:	SDUP	Sampled:	12/03/08
MSS Lab ID:	208747-005	Prepared:	12/24/08
Lab ID:	QC477264	Analyzed:	12/24/08
Diln Fac:	40.00		

Analyte	MSS Result	Result	RL	RPD	Lim
Mercury (KMnO4)	56.61	61.79	3.571	9	20

NC= Not Calculated
ND= Not Detected
NM= Not Meaningful: Sample concentration > 4X spike concentration
RL= Reporting Limit
HCl= HCl Rinse
RPD= Relative Percent Difference
Back= Back Half
Empty= Empty Impinger (EPA 29)
Front= Front Half
KMnO4= KMnO4

Curtis & Tompkins, Ltd.

Batch QC Report

Metals Analytical Report

Lab #:	208747	Location:	Kennecott / Rawhide
Client:	Horizon Air Measurement Services	Prep:	EPA 29
Project#:	K18-002	Analysis:	EPA 7470A
Matrix:	Air	Received:	12/17/08
Units:	ug/s		

Field ID:	K18002-M29-FUR-R2	Batch#:	146442
Type:	SDUP	Sampled:	12/03/08
MSS Lab ID:	208747-006	Prepared:	12/24/08
Lab ID:	QC477265	Analyzed:	12/24/08
Diln Fac:	1,200		

Analyte	MSS Result	Result	RL	RPD	Lim
Mercury (KMnO4)	1,753	1,874	105.3	7	20

Field ID:	K18002-M29-FUR-R3	Batch#:	146442
Type:	SDUP	Sampled:	12/03/08
MSS Lab ID:	208747-007	Prepared:	12/24/08
Lab ID:	QC477266	Analyzed:	12/24/08
Diln Fac:	5,000		

Analyte	MSS Result	Result	RL	RPD	Lim
Mercury (KMnO4)	6,776	7,390	438.6	9	20

Field ID:	K18002-M29-FUR-BT	Batch#:	146442
Type:	SDUP	Sampled:	12/03/08
MSS Lab ID:	208747-008	Prepared:	12/24/08
Lab ID:	QC477267	Analyzed:	12/24/08
Diln Fac:	1.000		

Analyte	MSS Result	Result	RL	RPD	Lim
Mercury (KMnO4)	<0.07813	ND	0.07813	NC	20

Field ID:	K18002-M29-CK-R1	Batch#:	146442
Type:	SDUP	Sampled:	12/03/08
MSS Lab ID:	208747-009	Prepared:	12/24/08
Lab ID:	QC477268	Analyzed:	12/24/08
Diln Fac:	1.000		

Analyte	MSS Result	Result	RL	RPD	Lim
Mercury (KMnO4)	0.1248	0.1284	0.09009	3	20

NC= Not Calculated
ND= Not Detected
NM= Not Meaningful: Sample concentration > 4X spike concentration
RL= Reporting Limit
HCl= HCl Rinse
RPD= Relative Percent Difference
Back= Back Half
Empty= Empty Impinger (EPA 29)
Front= Front Half
KMnO4= KMnO4

Curtis & Tompkins, Ltd.

Batch QC Report

Metals Analytical Report

Lab #:	208747	Location:	Kennecott / Rawhide
Client:	Horizon Air Measurement Services	Prep:	EPA 29
Project#:	K18-002	Analysis:	EPA 7470A
Matrix:	Air	Received:	12/17/08
Units:	ug/s		

Field ID:	K18002-M29-CK-R2	Batch#:	146442
Type:	SDUP	Sampled:	12/04/08
MSS Lab ID:	208747-010	Prepared:	12/24/08
Lab ID:	QC477269	Analyzed:	12/24/08
Diln Fac:	1.000		

Analyte	MSS Result	Result	RL	RPD	Lim
Mercury (KMnO4)	0.5619	0.5619	0.08850	0	20

Field ID:	K18002-M29-CK-R3	Batch#:	146442
Type:	SDUP	Sampled:	12/04/08
MSS Lab ID:	208747-011	Prepared:	12/24/08
Lab ID:	QC477270	Analyzed:	12/24/08
Diln Fac:	1.000		

Analyte	MSS Result	Result	RL	RPD	Lim
Mercury (KMnO4)	1.631	1.640	0.09009	1	20

Field ID:	K18002-M29-CK-BT	Batch#:	146442
Type:	SDUP	Sampled:	12/03/08
MSS Lab ID:	208747-012	Prepared:	12/24/08
Lab ID:	QC477271	Analyzed:	12/24/08
Diln Fac:	1.000		

Analyte	MSS Result	Result	RL	RPD	Lim
Mercury (KMnO4)	<0.07813	ND	0.07813	NC	20

Field ID:	K18002-M29-EW-R1	Batch#:	146442
Type:	SDUP	Sampled:	12/04/08
MSS Lab ID:	208747-013	Prepared:	12/24/08
Lab ID:	QC477272	Analyzed:	12/24/08
Diln Fac:	10.00		

Analyte	MSS Result	Result	RL	RPD	Lim
Mercury (KMnO4)	14.91	15.58	0.8850	4	20

NC= Not Calculated
ND= Not Detected
NM= Not Meaningful: Sample concentration > 4X spike concentration
RL= Reporting Limit
HCl= HCl Rinse
RPD= Relative Percent Difference
Back= Back Half
Empty= Empty Impinger (EPA 29)
Front= Front Half
KMnO4= KMnO4

Curtis & Tompkins, Ltd.

Batch QC Report

Metals Analytical Report

Lab #:	208747	Location:	Kennecott / Rawhide
Client:	Horizon Air Measurement Services	Prep:	EPA 29
Project#:	K18-002	Analysis:	EPA 7470A
Matrix:	Air	Received:	12/17/08
Units:	ug/s		

Field ID:	K18002-M29-EW-R2	Batch#:	146442
Type:	SDUP	Sampled:	12/04/08
MSS Lab ID:	208747-014	Prepared:	12/24/08
Lab ID:	QC477273	Analyzed:	12/24/08
Diln Fac:	3.000		

Analyte	MSS Result	Result	RL	RPD	Lim
Mercury (KMnO4)	4.022	4.075	0.2655	1	20

Field ID:	K18002-M29-EW-R3	Batch#:	146442
Type:	SDUP	Sampled:	12/04/08
MSS Lab ID:	208747-015	Prepared:	12/24/08
Lab ID:	QC477274	Analyzed:	12/24/08
Diln Fac:	3.000		

Analyte	MSS Result	Result	RL	RPD	Lim
Mercury (KMnO4)	5.344	5.518	0.2679	3	20

Field ID:	K18002-M29-EW-BT	Batch#:	146442
Type:	SDUP	Sampled:	12/04/08
MSS Lab ID:	208747-016	Prepared:	12/24/08
Lab ID:	QC477275	Analyzed:	12/24/08
Diln Fac:	1.000		

Analyte	MSS Result	Result	RL	RPD	Lim
Mercury (KMnO4)	<0.07813	ND	0.07813	NC	20

Field ID:	K18002-M29-SB	Batch#:	146442
Type:	SDUP	Sampled:	12/04/08
MSS Lab ID:	208747-017	Prepared:	12/24/08
Lab ID:	QC477276	Analyzed:	12/24/08
Diln Fac:	1.000		

Analyte	MSS Result	Result	RL	RPD	Lim
Mercury (KMnO4)	<0.08000	ND	0.08000	NC	20

NC= Not Calculated
ND= Not Detected
NM= Not Meaningful: Sample concentration > 4X spike concentration
RL= Reporting Limit
HCl= HCl Rinse
RPD= Relative Percent Difference
Back= Back Half
Empty= Empty Impinger (EPA 29)
Front= Front Half
KMnO4= KMnO4

Curtis & Tompkins, Ltd.

Batch QC Report

Metals Analytical Report

Lab #:	208747	Location:	Kennecott / Rawhide
Client:	Horizon Air Measurement Services	Prep:	EPA 29
Project#:	K18-002	Analysis:	EPA 7470A
Matrix:	Air	Received:	12/17/08
Units:	ug/s		

Type:	BS	Batch#:	146539
Lab ID:	QC477650	Prepared:	12/30/08
Diln Fac:	1.000	Analyzed:	12/30/08

Analyte	Spiked	Result	%REC	Limits
Mercury (HCl)	0.005000	0.005430	109	80-120

Type:	BSD	Batch#:	146539
Lab ID:	QC477651	Prepared:	12/30/08
Diln Fac:	1.000	Analyzed:	12/30/08

Analyte	Spiked	Result	%REC	Limits	RPD	Lim
Mercury (HCl)	0.005000	0.005600	112	80-120	3	20

Field ID:	K18002-M29-RT-R1	Batch#:	146539
Type:	SSPIKE	Sampled:	12/02/08
MSS Lab ID:	208747-001	Prepared:	12/30/08
Lab ID:	QC477652	Analyzed:	12/30/08
Diln Fac:	20.00		

Analyte	MSS Result	Spiked	Result	%REC	Limits
Mercury (HCl)	20.00	1.366	20.66	48 NM	71-124

Field ID:	K18002-M29-RT-R1	Batch#:	146539
Type:	SDUP	Sampled:	12/02/08
MSS Lab ID:	208747-001	Prepared:	12/30/08
Lab ID:	QC477653	Analyzed:	12/30/08
Diln Fac:	20.00		

Analyte	MSS Result	Result	RL	RPD	Lim
Mercury (HCl)	20.00	20.00	1.093	0	20

NC= Not Calculated
ND= Not Detected
NM= Not Meaningful: Sample concentration > 4X spike concentration
RL= Reporting Limit
HCl= HCl Rinse
RPD= Relative Percent Difference
Back= Back Half
Empty= Empty Impinger (EPA 29)
Front= Front Half
KMnO4= KMnO4

Curtis & Tompkins, Ltd.

Batch QC Report

Metals Analytical Report

Lab #:	208747	Location:	Kennecott / Rawhide
Client:	Horizon Air Measurement Services	Prep:	EPA 29
Project#:	K18-002	Analysis:	EPA 7470A
Matrix:	Air	Received:	12/17/08
Units:	ug/s		

Field ID:	K18002-M29-RT-R2	Batch#:	146539
Type:	SDUP	Sampled:	12/02/08
MSS Lab ID:	208747-002	Prepared:	12/30/08
Lab ID:	QC477654	Analyzed:	12/30/08
Diln Fac:	5.000		

Analyte	MSS Result	Result	RL	RPD	Lim
Mercury (HCl)	5.838	5.851	0.2660	0	20

Field ID:	K18002-M29-RT-R3	Batch#:	146539
Type:	SDUP	Sampled:	12/02/08
MSS Lab ID:	208747-003	Prepared:	12/30/08
Lab ID:	QC477655	Analyzed:	12/30/08
Diln Fac:	4.000		

Analyte	MSS Result	Result	RL	RPD	Lim
Mercury (HCl)	4.914	4.957	0.2151	1	20

Field ID:	K18002-M29-RT-BT	Batch#:	146539
Type:	SDUP	Sampled:	12/02/08
MSS Lab ID:	208747-004	Prepared:	12/30/08
Lab ID:	QC477656	Analyzed:	12/30/08
Diln Fac:	1.000		

Analyte	MSS Result	Result	RL	RPD	Lim
Mercury (HCl)	<0.05102	ND	0.05102	NC	20

Field ID:	K18002-M29-FUR-R1	Batch#:	146539
Type:	SDUP	Sampled:	12/03/08
MSS Lab ID:	208747-005	Prepared:	12/30/08
Lab ID:	QC477657	Analyzed:	12/30/08
Diln Fac:	5,000		

Analyte	MSS Result	Result	RL	RPD	Lim
Mercury (HCl)	4,574	4,574	266.0	0	20

NC= Not Calculated
ND= Not Detected
NM= Not Meaningful: Sample concentration > 4X spike concentration
RL= Reporting Limit
HCl= HCl Rinse
RPD= Relative Percent Difference
Back= Back Half
Empty= Empty Impinger (EPA 29)
Front= Front Half
KMnO4= KMnO4

Curtis & Tompkins, Ltd.

Batch QC Report

Metals Analytical Report

Lab #:	208747	Location:	Kennecott / Rawhide
Client:	Horizon Air Measurement Services	Prep:	EPA 29
Project#:	K18-002	Analysis:	EPA 7470A
Matrix:	Air	Received:	12/17/08
Units:	ug/s		

Field ID:	K18002-M29-FUR-R2	Batch#:	146539
Type:	SDUP	Sampled:	12/03/08
MSS Lab ID:	208747-006	Prepared:	12/30/08
Lab ID:	QC477658	Analyzed:	12/30/08
Diln Fac:	5,000		

Analyte	MSS Result	Result	RL	RPD	Lim
Mercury (HCl)	7,606	7,713	266.0	1	20

Field ID:	K18002-M29-FUR-R3	Batch#:	146539
Type:	SDUP	Sampled:	12/03/08
MSS Lab ID:	208747-007	Prepared:	12/30/08
Lab ID:	QC477659	Analyzed:	12/30/08
Diln Fac:	1,000		

Analyte	MSS Result	Result	RL	RPD	Lim
Mercury (HCl)	1,103	1,127	54.05	2	20

Field ID:	K18002-M29-FUR-BT	Batch#:	146539
Type:	SDUP	Sampled:	12/03/08
MSS Lab ID:	208747-008	Prepared:	12/30/08
Lab ID:	QC477660	Analyzed:	12/30/08
Diln Fac:	1.000		

Analyte	MSS Result	Result	RL	RPD	Lim
Mercury (HCl)	0.05747	0.06186	0.05155	7	20

Field ID:	K18002-M29-CK-R1	Batch#:	146539
Type:	SDUP	Sampled:	12/03/08
MSS Lab ID:	208747-009	Prepared:	12/30/08
Lab ID:	QC477661	Analyzed:	12/30/08
Diln Fac:	10.00		

Analyte	MSS Result	Result	RL	RPD	Lim
Mercury (HCl)	15.33	15.22	0.5464	1	20

NC= Not Calculated
ND= Not Detected
NM= Not Meaningful: Sample concentration > 4X spike concentration
RL= Reporting Limit
HCl= HCl Rinse
RPD= Relative Percent Difference
Back= Back Half
Empty= Empty Impinger (EPA 29)
Front= Front Half
KMnO4= KMnO4

Curtis & Tompkins, Ltd.

Batch QC Report

Metals Analytical Report

Lab #:	208747	Location:	Kennecott / Rawhide
Client:	Horizon Air Measurement Services	Prep:	EPA 29
Project#:	K18-002	Analysis:	EPA 7470A
Matrix:	Air	Received:	12/17/08
Units:	ug/s		

Field ID:	K18002-M29-CK-R2	Batch#:	146539
Type:	SDUP	Sampled:	12/04/08
MSS Lab ID:	208747-010	Prepared:	12/30/08
Lab ID:	QC477662	Analyzed:	12/30/08
Diln Fac:	10.00		

Analyte	MSS Result	Result	RL	RPD	Lim
Mercury (HCl)	12.29	12.53	0.5319	2	20

Field ID:	K18002-M29-CK-R3	Batch#:	146539
Type:	SDUP	Sampled:	12/04/08
MSS Lab ID:	208747-011	Prepared:	12/30/08
Lab ID:	QC477663	Analyzed:	12/30/08
Diln Fac:	4.000		

Analyte	MSS Result	Result	RL	RPD	Lim
Mercury (HCl)	3.948	3.896	0.2083	1	20

Field ID:	K18002-M29-CK-BT	Batch#:	146539
Type:	SDUP	Sampled:	12/03/08
MSS Lab ID:	208747-012	Prepared:	12/30/08
Lab ID:	QC477664	Analyzed:	12/30/08
Diln Fac:	1.000		

Analyte	MSS Result	Result	RL	RPD	Lim
Mercury (HCl)	<0.05102	ND	0.05102	NC	20

Field ID:	K18002-M29-EW-R1	Batch#:	146539
Type:	SDUP	Sampled:	12/04/08
MSS Lab ID:	208747-013	Prepared:	12/30/08
Lab ID:	QC477665	Analyzed:	12/30/08
Diln Fac:	1.000		

Analyte	MSS Result	Result	RL	RPD	Lim
Mercury (HCl)	0.4816	0.4553	0.05263	6	20

NC= Not Calculated
ND= Not Detected
NM= Not Meaningful: Sample concentration > 4X spike concentration
RL= Reporting Limit
HCl= HCl Rinse
RPD= Relative Percent Difference
Back= Back Half
Empty= Empty Impinger (EPA 29)
Front= Front Half
KMnO4= KMnO4

Curtis & Tompkins, Ltd.

Batch QC Report

Metals Analytical Report

Lab #:	208747	Location:	Kennecott / Rawhide
Client:	Horizon Air Measurement Services	Prep:	EPA 29
Project#:	K18-002	Analysis:	EPA 7470A
Matrix:	Air	Received:	12/17/08
Units:	ug/s		

Field ID:	K18002-M29-EW-R2	Batch#:	146539
Type:	SDUP	Sampled:	12/04/08
MSS Lab ID:	208747-014	Prepared:	12/30/08
Lab ID:	QC477666	Analyzed:	12/30/08
Diln Fac:	1.000		

Analyte	MSS Result	Result	RL	RPD	Lim
Mercury (HCl)	0.3015	0.2964	0.05155	2	20

Field ID:	K18002-M29-EW-R3	Batch#:	146539
Type:	SDUP	Sampled:	12/04/08
MSS Lab ID:	208747-015	Prepared:	12/30/08
Lab ID:	QC477667	Analyzed:	12/30/08
Diln Fac:	1.000		

Analyte	MSS Result	Result	RL	RPD	Lim
Mercury (HCl)	0.1651	0.1511	0.05405	9	20

Field ID:	K18002-M29-EW-BT	Batch#:	146539
Type:	SDUP	Sampled:	12/04/08
MSS Lab ID:	208747-016	Prepared:	12/30/08
Lab ID:	QC477668	Analyzed:	12/30/08
Diln Fac:	1.000		

Analyte	MSS Result	Result	RL	RPD	Lim
Mercury (HCl)	<0.05051	ND	0.05051	NC	20

Field ID:	K18002-M29-SB	Batch#:	146539
Type:	SDUP	Sampled:	12/04/08
MSS Lab ID:	208747-017	Prepared:	12/30/08
Lab ID:	QC477669	Analyzed:	12/30/08
Diln Fac:	1.000		

Analyte	MSS Result	Result	RL	RPD	Lim
Mercury (HCl)	<0.04505	ND	0.04505	NC	20

NC= Not Calculated
ND= Not Detected
NM= Not Meaningful: Sample concentration > 4X spike concentration
RL= Reporting Limit
HCl= HCl Rinse
RPD= Relative Percent Difference
Back= Back Half
Empty= Empty Impinger (EPA 29)
Front= Front Half
KMnO4= KMnO4

Curtis & Tompkins, Ltd.

Batch QC Report

Metals Analytical Report

Lab #:	208747	Location:	Kennecott / Rawhide
Client:	Horizon Air Measurement Services	Prep:	EPA 29
Project#:	K18-002	Analysis:	EPA 7470A
Matrix:	Air	Received:	12/17/08
Units:	ug/s		

Type: BS
Lab ID: QC477966
Diln Fac: 1.000

Batch#: 146613
Prepared: 01/02/09
Analyzed: 01/02/09

Analyte	Spiked	Result	%REC	Limits
Mercury (Front)	0.005000	0.005450	109	80-120

Type: BSD
Lab ID: QC477967
Diln Fac: 1.000

Batch#: 146613
Prepared: 01/02/09
Analyzed: 01/02/09

Analyte	Spiked	Result	%REC	Limits	RPD	Lim
Mercury (Front)	0.005000	0.005510	110	80-120	1	20

Field ID: K18002-M29-RT-R1
Type: SSPIKE
MSS Lab ID: 208747-001
Lab ID: QC477968
Diln Fac: 10.00

Batch#: 146613
Sampled: 12/02/08
Prepared: 01/02/09
Analyzed: 01/02/09

Analyte	MSS Result	Spiked	Result	%REC	Limits
Mercury (Front)	0.6825	1.250	1.758	86	71-124

Field ID: K18002-M29-RT-R1
Type: SDUP
MSS Lab ID: 208747-001
Lab ID: QC477969
Diln Fac: 10.00

Batch#: 146613
Sampled: 12/02/08
Prepared: 01/02/09
Analyzed: 01/02/09

Analyte	MSS Result	Result	RL	RPD	Lim
Mercury (Front)	0.6825	0.6825	0.5000	0	20

NC= Not Calculated
ND= Not Detected
NM= Not Meaningful: Sample concentration > 4X spike concentration
RL= Reporting Limit
HCl= HCl Rinse
RPD= Relative Percent Difference
Back= Back Half
Empty= Empty Impinger (EPA 29)
Front= Front Half
KMnO4= KMnO4

Curtis & Tompkins, Ltd.

Batch QC Report

Metals Analytical Report

Lab #:	208747	Location:	Kennecott / Rawhide
Client:	Horizon Air Measurement Services	Prep:	EPA 29
Project#:	K18-002	Analysis:	EPA 7470A
Matrix:	Air	Received:	12/17/08
Units:	ug/s		

Field ID:	K18002-M29-RT-R2	Batch#:	146613
Type:	SDUP	Sampled:	12/02/08
MSS Lab ID:	208747-002	Prepared:	01/02/09
Lab ID:	QC477970	Analyzed:	01/02/09
Diln Fac:	10.00		

Analyte	MSS Result	Result	RL	RPD	Lim
Mercury (Front)	0.7100	ND	0.5000	NC	20

Field ID:	K18002-M29-RT-R3	Batch#:	146613
Type:	SDUP	Sampled:	12/02/08
MSS Lab ID:	208747-003	Prepared:	01/02/09
Lab ID:	QC477971	Analyzed:	01/02/09
Diln Fac:	10.00		

Analyte	MSS Result	Result	RL	RPD	Lim
Mercury (Front)	0.5850	0.5250	0.5000	11	20

Field ID:	K18002-M29-RT-BT	Batch#:	146613
Type:	SDUP	Sampled:	12/02/08
MSS Lab ID:	208747-004	Prepared:	01/02/09
Lab ID:	QC477972	Analyzed:	01/02/09
Diln Fac:	10.00		

Analyte	MSS Result	Result	RL	RPD	Lim
Mercury (Front)	<0.5000	ND	0.5000	NC	20

Field ID:	K18002-M29-FUR-R1	Batch#:	146613
Type:	SDUP	Sampled:	12/03/08
MSS Lab ID:	208747-005	Prepared:	01/02/09
Lab ID:	QC477973	Analyzed:	01/02/09
Diln Fac:	40.00		

Analyte	MSS Result	Result	RL	RPD	Lim
Mercury (Front)	32.60	35.60	2.000	9	20

NC= Not Calculated
ND= Not Detected
NM= Not Meaningful: Sample concentration > 4X spike concentration
RL= Reporting Limit
HCl= HCl Rinse
RPD= Relative Percent Difference
Back= Back Half
Empty= Empty Impinger (EPA 29)
Front= Front Half
KMnO4= KMnO4

Curtis & Tompkins, Ltd.

Batch QC Report

Metals Analytical Report

Lab #:	208747	Location:	Kennecott / Rawhide
Client:	Horizon Air Measurement Services	Prep:	EPA 29
Project#:	K18-002	Analysis:	EPA 7470A
Matrix:	Air	Received:	12/17/08
Units:	ug/s		

Field ID:	K18002-M29-FUR-R2	Batch#:	146613
Type:	SDUP	Sampled:	12/03/08
MSS Lab ID:	208747-006	Prepared:	01/02/09
Lab ID:	QC477974	Analyzed:	01/02/09
Diln Fac:	50.00		

Analyte	MSS Result	Result	RL	RPD	Lim
Mercury (Front)	41.50	38.50	2.500	8	20

Field ID:	K18002-M29-FUR-R3	Batch#:	146613
Type:	SDUP	Sampled:	12/03/08
MSS Lab ID:	208747-007	Prepared:	01/02/09
Lab ID:	QC477975	Analyzed:	01/02/09
Diln Fac:	10.00		

Analyte	MSS Result	Result	RL	RPD	Lim
Mercury (Front)	5.675	5.725	0.5000	1	20

Field ID:	K18002-M29-FUR-BT	Batch#:	146613
Type:	SDUP	Sampled:	12/03/08
MSS Lab ID:	208747-008	Prepared:	01/02/09
Lab ID:	QC477976	Analyzed:	01/02/09
Diln Fac:	10.00		

Analyte	MSS Result	Result	RL	RPD	Lim
Mercury (Front)	<0.5000	ND	0.5000	NC	20

Field ID:	K18002-M29-CK-R1	Batch#:	146613
Type:	SDUP	Sampled:	12/03/08
MSS Lab ID:	208747-009	Prepared:	01/02/09
Lab ID:	QC477977	Analyzed:	01/02/09
Diln Fac:	10.00		

Analyte	MSS Result	Result	RL	RPD	Lim
Mercury (Front)	<0.5000	ND	0.5000	NC	20

NC= Not Calculated
ND= Not Detected
NM= Not Meaningful: Sample concentration > 4X spike concentration
RL= Reporting Limit
HCl= HCl Rinse
RPD= Relative Percent Difference
Back= Back Half
Empty= Empty Impinger (EPA 29)
Front= Front Half
KMnO4= KMnO4

Curtis & Tompkins, Ltd.

Batch QC Report

Metals Analytical Report

Lab #:	208747	Location:	Kennecott / Rawhide
Client:	Horizon Air Measurement Services	Prep:	EPA 29
Project#:	K18-002	Analysis:	EPA 7470A
Matrix:	Air	Received:	12/17/08
Units:	ug/s		

Field ID:	K18002-M29-CK-R2	Batch#:	146613
Type:	SDUP	Sampled:	12/04/08
MSS Lab ID:	208747-010	Prepared:	01/02/09
Lab ID:	QC477978	Analyzed:	01/02/09
Diln Fac:	10.00		

Analyte	MSS Result	Result	RL	RPD	Lim
Mercury (Front)	<0.5000	ND	0.5000	NC	20

Field ID:	K18002-M29-CK-R3	Batch#:	146613
Type:	SDUP	Sampled:	12/04/08
MSS Lab ID:	208747-011	Prepared:	01/02/09
Lab ID:	QC477979	Analyzed:	01/02/09
Diln Fac:	10.00		

Analyte	MSS Result	Result	RL	RPD	Lim
Mercury (Front)	<0.5000	ND	0.5000	NC	20

Field ID:	K18002-M29-CK-BT	Batch#:	146613
Type:	SDUP	Sampled:	12/03/08
MSS Lab ID:	208747-012	Prepared:	01/02/09
Lab ID:	QC477980	Analyzed:	01/02/09
Diln Fac:	10.00		

Analyte	MSS Result	Result	RL	RPD	Lim
Mercury (Front)	<0.5000	ND	0.5000	NC	20

Field ID:	K18002-M29-EW-R1	Batch#:	146613
Type:	SDUP	Sampled:	12/04/08
MSS Lab ID:	208747-013	Prepared:	01/02/09
Lab ID:	QC477981	Analyzed:	01/02/09
Diln Fac:	10.00		

Analyte	MSS Result	Result	RL	RPD	Lim
Mercury (Front)	1.595	1.515	0.5000	5	20

NC= Not Calculated
ND= Not Detected
NM= Not Meaningful: Sample concentration > 4X spike concentration
RL= Reporting Limit
HCl= HCl Rinse
RPD= Relative Percent Difference
Back= Back Half
Empty= Empty Impinger (EPA 29)
Front= Front Half
KMnO4= KMnO4

Curtis & Tompkins, Ltd.

Batch QC Report

Metals Analytical Report

Lab #:	208747	Location:	Kennecott / Rawhide
Client:	Horizon Air Measurement Services	Prep:	EPA 29
Project#:	K18-002	Analysis:	EPA 7470A
Matrix:	Air	Received:	12/17/08
Units:	ug/s		

Field ID:	K18002-M29-EW-R2	Batch#:	146613
Type:	SDUP	Sampled:	12/04/08
MSS Lab ID:	208747-014	Prepared:	01/02/09
Lab ID:	QC477982	Analyzed:	01/02/09
Diln Fac:	10.00		

Analyte	MSS Result	Result	RL	RPD	Lim
Mercury (Front)	<0.5000	ND	0.5000	NC	20

Field ID:	K18002-M29-EW-R3	Batch#:	146613
Type:	SDUP	Sampled:	12/04/08
MSS Lab ID:	208747-015	Prepared:	01/02/09
Lab ID:	QC477983	Analyzed:	01/02/09
Diln Fac:	10.00		

Analyte	MSS Result	Result	RL	RPD	Lim
Mercury (Front)	<0.5000	ND	0.5000	NC	20

Field ID:	K18002-M29-EW-BT	Batch#:	146613
Type:	SDUP	Sampled:	12/04/08
MSS Lab ID:	208747-016	Prepared:	01/02/09
Lab ID:	QC477984	Analyzed:	01/02/09
Diln Fac:	10.00		

Analyte	MSS Result	Result	RL	RPD	Lim
Mercury (Front)	<0.5000	ND	0.5000	NC	20

Field ID:	K18002-M29-SB	Batch#:	146613
Type:	SDUP	Sampled:	12/04/08
MSS Lab ID:	208747-017	Prepared:	01/02/09
Lab ID:	QC477985	Analyzed:	01/02/09
Diln Fac:	10.00		

Analyte	MSS Result	Result	RL	RPD	Lim
Mercury (Front)	<0.5000	ND	0.5000	NC	20

NC= Not Calculated
ND= Not Detected
NM= Not Meaningful: Sample concentration > 4X spike concentration
RL= Reporting Limit
HCl= HCl Rinse
RPD= Relative Percent Difference
Back= Back Half
Empty= Empty Impinger (EPA 29)
Front= Front Half
KMnO4= KMnO4

Facility: Kennecott/Rawhide
Source: Carbon Kiln
Job No.: K18-002
Test Date: 12/3/2008

EPA Method 5-29

DATE SHEET FOR PARTICULATE MATTER EPA METHOD 5 - 29

DATE SAMPLED: 12/3/2008
DATE EXTRACTED:

RUN#R1

	SAMPLE ID	BEAKER/ FILTER ID	VOLUME	INITIAL	FINAL	NET WEIGHT(g)
A - FILTER CATCH	K18-002-M29-CK-R1-C1	Q8275	NA	0.6185	0.6192	0.0007
FILTER ACID						0.0000
FILTER SULFATE						0.0000
B - PROBE CATCH	K18-002-M29-CK-R1-C2	476	NA	29.5388	29.5409	0.0021
PROBE ACID						
PROBE SULFATE						

FILTER (PARTICULATE) TEMPERATURE GEATER THAN 200F

TOTAL PARTICULATE	(A+B+C+D)	
BLANK CORRECTED		0.0028
		0.0028
SOLID PARTICULATE	(A+B+C)	
BLANK CORRECTED		0.0028
		0.0028

Facility: Kennecott/Rawhide
Source: Carbon Kiln
Job No.: K18-002
Test Date: 12/4/2008

EPA Method 5-29

DATE SHEET FOR PARTICULATE MATTER EPA METHOD 5 - 29

DATE SAMPLED: 12/4/2008
DATE EXTRACTED:

RUN# R2

	SAMPLE ID	BEAKER/ FILTER ID	VOLUME	INITIAL	FINAL	NET WEIGHT(g)
A - FILTER CATCH	K18-002-M29-CK-R2-C1	Q8277	NA	0.6166	0.6166	0.0000
FILTER ACID						0.0000
FILTER SULFATE						0.0000
B - PROBE CATCH	K18-002-M29-CK-R2-C2	477	NA	29.1688	29.1801	0.0113
PROBE ACID						
PROBE SULFATE						

FILTER (PARTICULATE) TEMPERATURE GEATER THAN 200F

TOTAL PARTICULATE	(A+B+C+D)	0.0113
BLANK CORRECTED		0.0113
SOLID PARTICULATE	(A+B+C)	0.0113
BLANK CORRECTED		0.0113

Facility: Kennecott/Rawhide
Source: Carbon Kiln
Job No.: K18-002
Test Date: 12/4/2008

EPA Method 5-29

DATE SHEET FOR PARTICULATE MATTER EPA METHOD 5 - 29

DATE SAMPLED: 12/4/2008
DATE EXTRACTED:

RUN# R3

	SAMPLE ID	BEAKER/ FILTER ID	VOLUME	INITIAL	FINAL	NET WEIGHT(g)
A - FILTER CATCH	K18-002-M29-CK-R3-C1	Q8278	NA	0.6174	0.6169	0.0000
FILTER ACID						0.0000
FILTER SULFATE						0.0000
B - PROBE CATCH	K18-002-M29-CK-R3-C2	478	NA	29.4394	29.4473	0.0079
PROBE ACID						
PROBE SULFATE						

FILTER (PARTICULATE) TEMPERATURE GEATER THAN 200F

TOTAL PARTICULATE	(A+B+C+D)	0.0079
BLANK CORRECTED		0.0079
SOLID PARTICULATE	(A+B+C)	0.0079
BLANK CORRECTED		0.0079

Facility: Kennecott/Rawhide
Source: Carbon Kiln
Job No.: K18-002
Test Date: 12/4/2008

EPA Method 5-29

DATE SHEET FOR PARTICULATE MATTER EPA METHOD 5 - 29

DATE SAMPLED: 12/4/2008
DATE EXTRACTED:

RUN# BLANK TRAIN

	SAMPLE ID	BEAKER/ FILTER ID	VOLUME	INITIAL	FINAL	NET WEIGHT(g)
A - FILTER CATCH	K18-002-M29-CK-BT-C1	Q8279	NA	0.6226	0.6214	0.0000
FILTER ACID						0.0000
FILTER SULFATE						0.0000
B - PROBE CATCH	K18-002-M29-CK-BT-C2	479	NA	29.0588	29.0598	0.0010
PROBE ACID						
PROBE SULFATE						

FILTER (PARTICULATE) TEMPERATURE GEATER THAN 200F

TOTAL PARTICULATE	(A+B+C+D)	
BLANK CORRECTED		0.0010
		0.0010
SOLID PARTICULATE	(A+B+C)	
BLANK CORRECTED		0.0010
		0.0010

Facility: Kennecott/Rawhide
Source: Retort
Job No.: K18-002
Test Date: 12/2/2008

EPA Method 5-29

DATE SHEET FOR PARTICULATE MATTER EPA METHOD 5 - 29

DATE SAMPLED: 12/2/2008
DATE EXTRACTED:

RUN #RETORT RUN 1

	SAMPLE ID	BEAKER/ FILTER ID	VOLUME	INITIAL	FINAL	NET WEIGHT(g)
A - FILTER CATCH	K18-002-M29-RT-R1-C1	Q8225	NA	0.5927	0.5930	0.0003
FILTER ACID						0.0000
FILTER SULFATE						0.0000
B - PROBE CATCH	K18-002-M29-RT-R1-C2	468	NA	31.1384	31.1392	0.0008
PROBE ACID						
PROBE SULFATE						

FILTER (PARTICULATE) TEMPERATURE GEATER THAN 200F

TOTAL PARTICULATE	(A+B+C+D)	
BLANK CORRECTED		0.0011
		0.0011
SOLID PARTICULATE	(A+B+C)	
BLANK CORRECTED		0.0011
		0.0011

Facility: Kennecott/Rawhide
Source: Retort
Job No.: K18-002
Test Date: 12/2/2008

EPA Method 5-29

DATE SHEET FOR PARTICULATE MATTER EPA METHOD 5 - 29

DATE SAMPLED: 12/2/2008 RUN #RETORT RUN 2
DATE EXTRACTED:

	SAMPLE ID	BEAKER/ FILTER ID	VOLUME	INITIAL	FINAL	NET WEIGHT(g)
A - FILTER CATCH	K18-002-M29-RT-R2-C1	Q8226	NA	0.5911	0.5915	0.0004
FILTER ACID						0.0000
FILTER SULFATE						0.0000
B - PROBE CATCH	K18-002-M29-RT-R2-C2	469	NA	29.3035	29.3051	0.0016
PROBE ACID						
PROBE SULFATE						

FILTER (PARTICULATE) TEMPERATURE GEATER THAN 200F

TOTAL PARTICULATE	(A+B+C+D)	0.0020
BLANK CORRECTED		0.0020
SOLID PARTICULATE	(A+B+C)	0.0020
BLANK CORRECTED		0.0020

Facility: Kennecott/Rawhide
Source: Retort
Job No.: K18-002
Test Date: 12/2/2008

EPA Method 5-29

DATE SHEET FOR PARTICULATE MATTER EPA METHOD 5 - 29

DATE SAMPLED: 12/2/2008 RUN #RETORT RUN 3
DATE EXTRACTED:

	SAMPLE ID	BEAKER/ FILTER ID	VOLUME	INITIAL	FINAL	NET WEIGHT(g)
A - FILTER CATCH	K18-002-M29-RT-R3-C1	Q8227	NA	0.5945	0.5946	0.0001
FILTER ACID						0.0000
FILTER SULFATE						0.0000
B - PROBE CATCH	K18-002-M29-RT-R3-C2	470	NA	27.2169	27.2192	0.0023
PROBE ACID						
PROBE SULFATE						

FILTER (PARTICULATE) TEMPERATURE GEATER THAN 200F

TOTAL PARTICULATE	(A+B+C+D)	0.0024
BLANK CORRECTED		0.0024
SOLID PARTICULATE	(A+B+C)	0.0024
BLANK CORRECTED		0.0024

Facility: Kennecott/Rawhide
Source: Retort
Job No.: K18-002
Test Date: 12/2/2008

EPA Method 5-29

DATE SHEET FOR PARTICULATE MATTER EPA METHOD 5 - 29

DATE SAMPLED: 12/2/2008
DATE EXTRACTED:

RUN #RETOR BLANK TRAIN

	SAMPLE ID	BEAKER/ FILTER ID	VOLUME	INITIAL	FINAL	NET WEIGHT(g)
A - FILTER CATCH	K18-002-M29-RT-BT-C1	Q8228	NA	0.5749	0.5756	0.0007
FILTER ACID						0.0000
FILTER SULFATE						0.0000
B - PROBE CATCH	K18-002-M29-RT-BT-C2	471	NA	29.0465	29.0476	0.0011
PROBE ACID						
PROBE SULFATE						

FILTER (PARTICULATE) TEMPERATURE GEATER THAN 200F

TOTAL PARTICULATE	(A+B+C+D)	0.0018
BLANK CORRECTED		0.0018
SOLID PARTICULATE	(A+B+C)	0.0018
BLANK CORRECTED		0.0018

DATE SHEET FOR PARTICULATE MATTER EPA METHOD 5 - 29

DATE SAMPLED: 12/4/2008 RUN# R1
DATE EXTRACTED:

	SAMPLE ID	BEAKER/ FILTER ID	VOLUME	INITIAL	FINAL	NET WEIGHT(g)
A - FILTER CATCH	K18-002-M29-EW-R1-C1	Q8280	NA	0.6267	0.6253	0.0000
FILTER ACID						0.0000
FILTER SULFATE						0.0000
B - PROBE CATCH	K18-002-M29-EW-R1-C2	480	NA	30.0205	30.0277	0.0072
PROBE ACID						
PROBE SULFATE						

FILTER (PARTICULATE) TEMPERATURE GEATER THAN 200F

TOTAL PARTICULATE	(A+B+C+D)	0.0072
BLANK CORRECTED		0.0072
SOLID PARTICULATE	(A+B+C)	0.0072
BLANK CORRECTED		0.0072

Facility: Kennecott/Rawhide
Source: Electrowinning
Job No.: K18-002
Test Date: 12/4/2008

EPA Method 5-29

DATE SHEET FOR PARTICULATE MATTER EPA METHOD 5 - 29

DATE SAMPLED: 12/4/2008
DATE EXTRACTED:

RUN# R2

	SAMPLE ID	BEAKER/ FILTER ID	VOLUME	INITIAL	FINAL	NET WEIGHT(g)
A - FILTER CATCH	K18-002-M29-EW-R2-C1	Q8281	NA	0.6214	0.6231	0.0017
FILTER ACID						0.0000
FILTER SULFATE						0.0000
B - PROBE CATCH	K18-002-M29-EW-R2-C2	481	NA	29.7320	29.7382	0.0062
PROBE ACID						
PROBE SULFATE						

FILTER (PARTICULATE) TEMPERATURE GEATER THAN 200F

TOTAL PARTICULATE	(A+B+C+D)	0.0079
BLANK CORRECTED		0.0079
SOLID PARTICULATE	(A+B+C)	0.0079
BLANK CORRECTED		0.0079

Facility: Kennecott/Rawhide
Source: Electrowinning
Job No.: K18-002
Test Date: 12/4/2008

EPA Method 5-29

DATE SHEET FOR PARTICULATE MATTER EPA METHOD 5 - 29

DATE SAMPLED: 12/4/2008 RUN# R3
DATE EXTRACTED:

	SAMPLE ID	BEAKER/ FILTER ID	VOLUME	INITIAL	FINAL	NET WEIGHT(g)
A - FILTER CATCH	K18-002-M29-EW-R3-C1	Q8282	NA	0.6291	0.6311	0.0020
FILTER ACID						0.0000
FILTER SULFATE						0.0000
B - PROBE CATCH	K18-002-M29-EW-R3-C2	482	NA	28.6772	28.6878	0.0106
PROBE ACID						
PROBE SULFATE						

FILTER (PARTICULATE) TEMPERATURE GEATER THAN 200F

TOTAL PARTICULATE	(A+B+C+D)	0.0126
BLANK CORRECTED		0.0126
SOLID PARTICULATE	(A+B+C)	0.0126
BLANK CORRECTED		0.0126

Facility: Kennecott/Rawhide
Source: Electrowinning
Job No.: K18-002
Test Date: 12/4/2008

DATE SHEET FOR PARTICULATE MATTER EPA METHOD 5 - 29

DATE SAMPLED: 12/4/2008 RUN# BLANK TRAIN
DATE EXTRACTED:

	SAMPLE ID	BEAKER/ FILTER ID	VOLUME	INITIAL	FINAL	NET WEIGHT(g)
A - FILTER CATCH	K18-002-M29-EW-BT-C1	Q8283	NA	0.6251	0.6248	0.0000
FILTER ACID						0.0000
FILTER SULFATE						0.0000
B - PROBE CATCH	K18-002-M29-EW-BT-C2	483	NA	29.1433	29.1440	0.0007
PROBE ACID						
PROBE SULFATE						

FILTER (PARTICULATE) TEMPERATURE GEATER THAN 200F

TOTAL PARTICULATE	(A+B+C+D)	0.0007
BLANK CORRECTED		0.0007
SOLID PARTICULATE	(A+B+C)	0.0007
BLANK CORRECTED		0.0007

Facility: Kennecott/Rawhide
Source: Furnace
Job No.: K18-002
Test Date: 12/3/2008

EPA Method 5-29

DATE SHEET FOR PARTICULATE MATTER EPA METHOD 5 - 29

DATE SAMPLED: 12/3/2008 RUN# R1
DATE EXTRACTED:

	SAMPLE ID	BEAKER/ FILTER ID	VOLUME	INITIAL	FINAL	NET WEIGHT(g)
A - FILTER CATCH	K18-002-M29-FUR-R1-C1	Q8229	NA	0.5737	0.5756	0.0019
FILTER ACID						0.0000
FILTER SULFATE						0.0000
B - PROBE CATCH	K18-002-M29-FUR-R1-C2	472	NA	29.6375	29.6401	0.0026
PROBE ACID						
PROBE SULFATE						

FILTER (PARTICULATE) TEMPERATURE GEATER THAN 200F

TOTAL PARTICULATE	(A+B+C+D)	0.0045
BLANK CORRECTED		0.0045
SOLID PARTICULATE	(A+B+C)	0.0045
BLANK CORRECTED		0.0045

Facility: Kennecott/Rawhide
Source: Furnace
Job No.: K18-002
Test Date: 12/3/2008

EPA Method 5-29

DATE SHEET FOR PARTICULATE MATTER EPA METHOD 5 - 29

DATE SAMPLED: 12/3/2008 RUN# R2
DATE EXTRACTED:

	SAMPLE ID	BEAKER/ FILTER ID	VOLUME	INITIAL	FINAL	NET WEIGHT(g)
A - FILTER CATCH	K18-002-M29-FUR-R2-C1	Q8230	NA	0.5718	0.5743	0.0025
FILTER ACID						0.0000
FILTER SULFATE						0.0000
B - PROBE CATCH	K18-002-M29-FUR-R2-C2	473	NA	29.6061	29.6090	0.0029
PROBE ACID						
PROBE SULFATE						

FILTER (PARTICULATE) TEMPERATURE GEATER THAN 200F

TOTAL PARTICULATE	(A+B+C+D)	0.0054
BLANK CORRECTED		0.0054
SOLID PARTICULATE	(A+B+C)	0.0054
BLANK CORRECTED		0.0054

Facility: Kennecott/Rawhide
Source: Furnace
Job No.: K18-002
Test Date: 12/3/2008

EPA Method 5-29

DATE SHEET FOR PARTICULATE MATTER EPA METHOD 5 - 29

DATE SAMPLED: 12/3/2008 RUN# R3
DATE EXTRACTED:

	SAMPLE ID	BEAKER/ FILTER ID	VOLUME	INITIAL	FINAL	NET WEIGHT(g)
A - FILTER CATCH	K18-002-M29-FUR-R3-C1	Q8231	NA	0.5742	0.5749	0.0007
FILTER ACID						0.0000
FILTER SULFATE						0.0000
B - PROBE CATCH	K18-002-M29-FUR-R3-C2	474	NA	28.5876	28.5895	0.0019
PROBE ACID						
PROBE SULFATE						

FILTER (PARTICULATE) TEMPERATURE GEATER THAN 200F

TOTAL PARTICULATE	(A+B+C+D)	0.0026
BLANK CORRECTED		0.0026
SOLID PARTICULATE	(A+B+C)	0.0026
BLANK CORRECTED		0.0026

Facility: Kennecott/Rawhide
Source: Furnace
Job No.: K18-002
Test Date: 12/3/2008

EPA Method 5-29

DATE SHEET FOR PARTICULATE MATTER EPA METHOD 5 - 29

DATE SAMPLED: 12/3/2008 RUN# BLANK TRAIN
DATE EXTRACTED:

	SAMPLE ID	BEAKER/ FILTER ID	VOLUME	INITIAL	FINAL	NET WEIGHT(g)
A - FILTER CATCH	K18-002-M29-FUR-BT-C1	Q8274	NA	0.6163	0.6168	0.0005
FILTER ACID						0.0000
FILTER SULFATE						0.0000
B - PROBE CATCH	K18-002-M29-FUR-BT-C2	475	NA	29.7139	29.7149	0.0010
PROBE ACID						
PROBE SULFATE						

FILTER (PARTICULATE) TEMPERATURE GEATER THAN 200F

TOTAL PARTICULATE	(A+B+C+D)	0.0015
BLANK CORRECTED		0.0015
SOLID PARTICULATE	(A+B+C)	0.0015
BLANK CORRECTED		0.0015

ORSAT DATA SHEET
METHOD 3

Client: KENNECOTT
Project #: K18-002
Facility: RAWHIDE
Date: 12-18-08
Source: CARBON KILN
Analyzed by: BOB
Run #: R1

Gas \ Run	1		2		3		Average Net Volume
	Actual Reading	Net	Actual Reading	Net	Actual Reading	Net	
CO_2	1.0		1.2		1.2		1.1
O_2 (Net is Actual O_2 minus Actual CO_2 Reading)	19.0	18.0	19.0	17.8	19.0	17.8	17.9
CO (Net is Actual CO minus Actual O_2 reading)							
N_2 (Net is 100 minus Acutal CO reading)							

ORSAT DATA SHEET
METHOD 3

Client: KENNECOTT **Project #:** K18-002

Facility: RAWHIDE **Date:** 12-18-08

Source: CARBON KILN **Analyzed by:** BOB

Run #: R2

Gas \ Run	1		2		3		Average Net Volume
	Actual Reading	Net	Actual Reading	Net	Actual Reading	Net	
CO_2	0.8		0.8		0.8		0.8
O_2 (Net is Actual O_2 minus Actual CO_2 Reading)	20.0	19.2	20.0	19.2	20.0	19.2	19.2
CO (Net is Actual CO minus Actual O_2 reading)							
N_2 (Net is 100 minus Acutal CO reading)							

ORSAT DATA SHEET
METHOD 3

Client: KENNECOTT **Project #:** K18-002

Facility: RAWHIDE **Date:** 12-18-08

Source: CARBON KILN **Analyzed by:** BOB

Run #: R3

Gas \ Run	1		2		3		Average Net Volume
	Actual Reading	Net	Actual Reading	Net	Actual Reading	Net	
CO_2	0.8		0.8		0.6		0.7
O_2 (Net is Actual O_2 minus Actual CO_2 Reading)	20.0	19.2	20.0	19.2	20.2	19.6	19.3
CO (Net is Actual CO minus Actual O_2 reading)							
N_2 (Net is 100 minus Acutal CO reading)							

ORSAT DATA SHEET
METHOD 3

Client: KENNECOTT **Project #:** K18-002

Facility: RAWHIDE **Date:** 12-18-08

Source: RETORT **Analyzed by:** BOB

Run #: R1

Run / Gas	1		2		3		Average Net Volume
	Actual Reading	Net	Actual Reading	Net	Actual Reading	Net	
CO_2	0.6		0.5		0.4		0.4
O_2 (Net is Actual O_2 minus Actual CO_2 Reading)	20.0	19.4	20.0	19.5	20.2	19.8	19.6
CO (Net is Actual CO minus Actual O_2 reading)							
N_2 (Net is 100 minus Acutal CO reading)							

ORSAT DATA SHEET
METHOD 3

Client: KENNECOTT **Project #:** K18-002

Facility: RAWHIDE **Date:** 12-18-08

Source: RETORT **Analyzed by:** BoB

Run #: R2

Run / Gas	1		2		3		Average Net Volume
	Actual Reading	Net	Actual Reading	Net	Actual Reading	Net	
CO_2	0.2		0.4		0.2		0.3
O_2 (Net is Actual O_2 minus Actual CO_2 Reading)	20.4	20.2	20.4	20.0	20.2	20.0	20.1
CO (Net is Actual CO minus Actual O_2 reading)							
N_2 (Net is 100 minus Acutal CO reading)							

ORSAT DATA SHEET
METHOD 3

Client: KENNECOTT **Project #:** K18-002

Facility: RAWHIDE **Date:** 12-18-08

Source: RETORT **Analyzed by:** BoB

Run #: R3

Run / Gas	1		2		3		Average Net Volume
	Actual Reading	Net	Actual Reading	Net	Actual Reading	Net	
CO_2	0.4		0.2		0.2		0.3
O_2 (Net is Actual O_2 minus Actual CO_2 Reading)	20.4	20.0	20.4	20.2	20.2	20.0	20.1
CO (Net is Actual CO minus Actual O_2 reading)							
N_2 (Net is 100 minus Acutal CO reading)							

Horizon Air Measurement Services, Inc.
H:\WPDOCS\FORMS\ Field Data Sheets\Method 3 Orsat

ORSAT DATA SHEET
METHOD 3

Client: KENNECOTT **Project #:** K18-002

Facility: RAWHIDE **Date:** 12-18-08

Source: ELECTROWINNING **Analyzed by:** BOB

Run #: R1

Gas \ Run	1		2		3		Average Net Volume
	Actual Reading	Net	Actual Reading	Net	Actual Reading	Net	
CO_2	0.0		0.0		0.0		0.0
O_2 (Net is Actual O_2 minus Actual CO_2 Reading)	20.9	20.9	20.9	20.9	20.9	20.9	20.9
CO (Net is Actual CO minus Actual O_2 reading)							
N_2 (Net is 100 minus Acutal CO reading)							

ORSAT DATA SHEET
METHOD 3

Client: KENNECOTT **Project #:** K18-002

Facility: RAWHIDE **Date:** 12-18-08

Source: ELECTROWINNING **Analyzed by:** BOB

Run #: R2

Run / Gas	1		2		3		Average Net Volume
	Actual Reading	Net	Actual Reading	Net	Actual Reading	Net	
CO_2	0.2		0.0		0.2		0.1
O_2 (Net is Actual O_2 minus Actual CO_2 Reading)	20.9	20.7	20.9	20.9	20.9	20.7	20.8
CO (Net is Actual CO minus Actual O_2 reading)							
N_2 (Net is 100 minus Acutal CO reading)							

ORSAT DATA SHEET
METHOD 3

Client: KENNECOTT **Project #:** K18-002

Facility: RAWHIDE **Date:** 12-18-08

Source: ELECTROWINNING **Analyzed by:** BOB

Run #: R3

Run / Gas	1		2		3		Average Net Volume
	Actual Reading	Net	Actual Reading	Net	Actual Reading	Net	
CO_2	0.0		0.0		0.0	~~0~~ CO	0.0
O_2 (Net is Actual O_2 minus Actual CO_2 Reading)	20.9	20.9	20.9	20.9	20.9	20.9	20.9
CO (Net is Actual CO minus Actual O_2 reading)							
N_2 (Net is 100 minus Acutal CO reading)							

ORSAT DATA SHEET
METHOD 3

Client: KENNECOTT **Project #:** K18-002

Facility: RAWHIDE **Date:** 12-18-08

Source: FURNACE **Analyzed by:** BOB

Run #: R1

Run / Gas	1		2		3		Average Net Volume
	Actual Reading	Net	Actual Reading	Net	Actual Reading	Net	
CO_2	0.4		0.2		0.2		0.3
O_2 (Net is Actual O_2 minus Actual CO_2 Reading)	20.0	19.6	20.0	19.8	20.0	19.8	19.7
CO (Net is Actual CO minus Actual O_2 reading)							
N_2 (Net is 100 minus Acutal CO reading)							

ORSAT DATA SHEET
METHOD 3

Client: KENNECOTT **Project #:** K18-002

Facility: RAWHIDE **Date:** 12-18-08

Source: FURNACE **Analyzed by:** BOB

Run #: R2

Run / Gas	1		2		3		Average Net Volume
	Actual Reading	Net	Actual Reading	Net	Actual Reading	Net	
CO_2	0.2		0.2		0.2		0.2
O_2 (Net is Actual O_2 minus Actual CO_2 Reading)	20.0	19.8	20.0	19.8	20.0	19.8	19.8
CO (Net is Actual CO minus Actual O_2 reading)							
N_2 (Net is 100 minus Acutal CO reading)							

ORSAT DATA SHEET
METHOD 3

Client: KENNECOTT **Project #:** K18-002

Facility: RAWHIDE **Date:** 12-18-08

Source: FURNACE **Analyzed by:** BOB

Run #: R3

Run / Gas	1		2		3		Average Net Volume
	Actual Reading	Net	Actual Reading	Net	Actual Reading	Net	
CO_2	0.8		0.6		0.4		0.6
O_2 (Net is Actual O_2 minus Actual CO_2 Reading)	19.8	19.0	20.0	19.4	20.0	19.4	19.3
CO (Net is Actual CO minus Actual O_2 reading)							
N_2 (Net is 100 minus Acutal CO reading)							

CHAIN OF CUSTODY RECORD

Client/Project Name	Project Location
Kennecott Rawhide	Fallon NV
Project No.	**Field Logbook No.**
K18-002	
Sampler: (Signature)	**Chain of Custody Tape No.**
[signature]	

ANALYSES: M3 (O2 (O2) orsat)

Sample No./ Identification	Date	Time	Lab Sample Number	Type of Sample	M3 (O2 (O2) orsat						REMARKS
K18002-M3-RT-R1	12/2/08			5L Tedlar Bag	X						Retort
K18002-M3-RT-R2		↓		↓	X						↓
K18002-M3-RT-R3					X						
K18002-M3-FUR-R1	12/2/08				X						Refinery Furnace
K18002-M3-FUR-R2		↓		↓	X						↓
K18002-M3-FUR-R3					X						

Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
[signature]	12/5/08	0800	[signature]	12/5/08	0800
Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
Relinquished by: (Signature)	Date	Time	Received for Laboratory: (Signature)	Date	Time
Sample Disposal Method:	Disposed of by: (Signature)			Date	Time

SAMPLE COLLECTOR

HORIZON AIR MEASUREMENT SERVICES, INC
996 Lawrence Drive, Suite 108
Newbury Park, CA 91320
(805) 498-8781 Fax (805) 498-3173

ANALYTICAL LABORATORY

HAMS

Nº 10386

CHAIN OF CUSTODY RECORD

Client/Project Name	Project Location
Kennecott Rawhide	Fallon NV.
Project No. K18-002	Field Logbook No.
Sampler: (Signature)	Chain of Custody Tape No.

ANALYSES: M3 (O_2 CO_2) O/S m X

Sample No./ Identification	Date	Time	Lab Sample Number	Type of Sample	M3 (O_2 CO_2)	O/S m X					REMARKS
K18002-M3-CK-R1		12/3/08		5L Tedlar Bag	X						Carbon Kiln
K18002-M3-CK-R2		12/4/08		↓	X						
K18002-M3-CK-R3		12/4/08			X						
K18002-M3-EW-R1		12/4/08		↓	X						Electro Winning Cell
K18002-M3-EW-R2		↓		↓	X						↓
K18002-M3-EW-R3					X						

Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
	12/5/08	0800		12/5/08	0800
Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
Relinquished by: (Signature)	Date	Time	Received for Laboratory: (Signature)	Date	Time
Sample Disposal Method:	Disposed of by: (Signature)			Date	Time

SAMPLE COLLECTOR

HORIZON AIR MEASUREMENT SERVICES, INC
996 Lawrence Drive, Suite 108
Newbury Park, CA 91320
(805) 498-8781 Fax (805) 498-3173

ANALYTICAL LABORATORY

HAMS

№ 10387

APPENDIX G-4 - Production Data

Production Data

Tues 12/2

Retort 1372 (wet lbs) processed

0.0286 tons/hr = 572 % of limit

0.05 tons/hr = Limit

Wed 12/3

Furnace 853 lb of Dry sludge

299 lb of Flux

Kiln	R-1	1298°	1304°

Thurs 12/4

Kiln	R-2	1301°	1301°
	R-3	1304°	1294°

Electrowinning cell

R1	Gpm	22.5	22.5	22.8
	Temp	178°	180°	182°
R2	GPM	21.6	22.6	22.8
	Temp	178°	180°	182°
R3	GPM	22.6	22.8	22.8
	Temp	180°	182°	182°

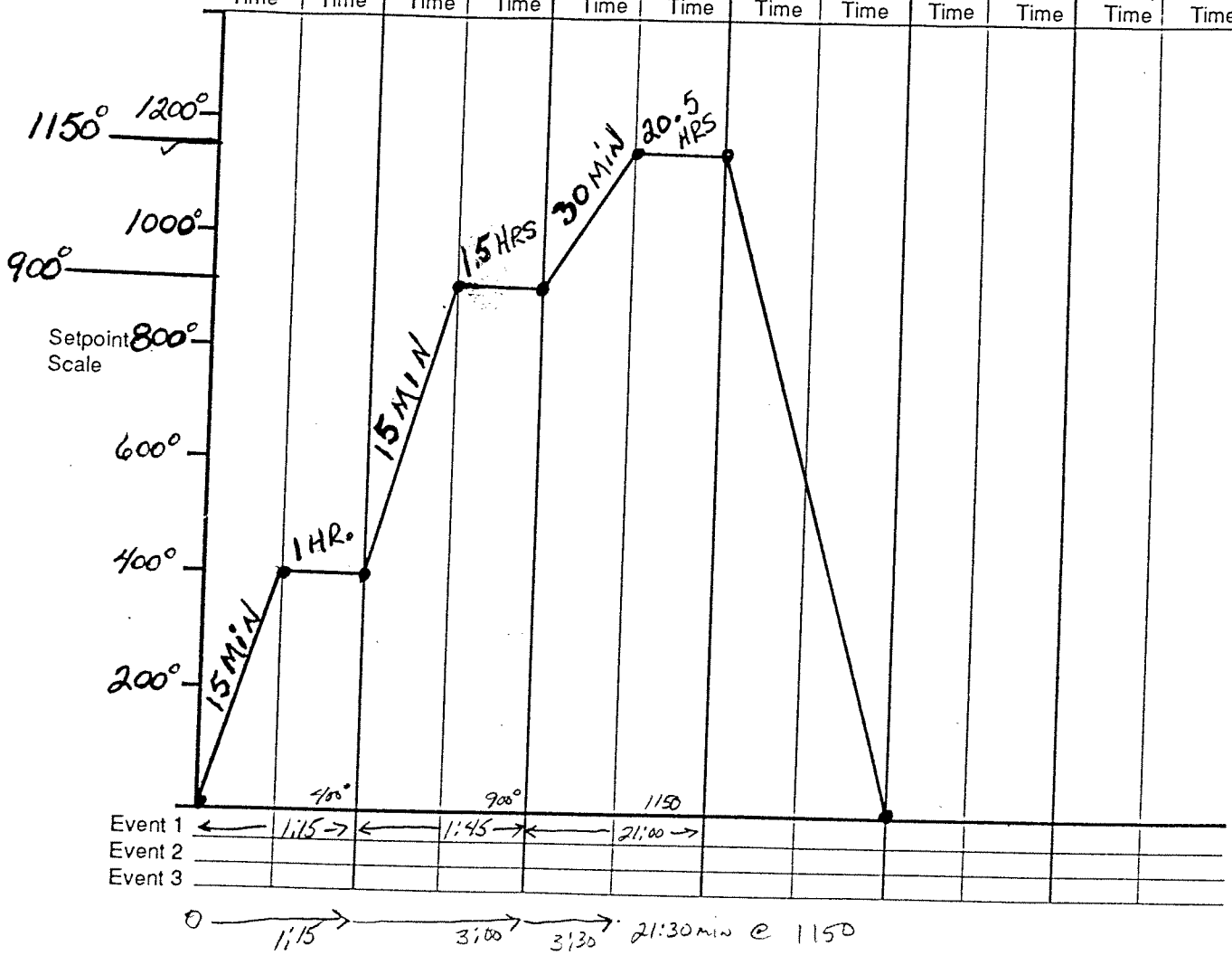
PAGE 66

Retort start @ 0630

Profile Worksheet

Profile Number b
Number of Segments

Segments	1		2		3		4		5		6	
	SP		SP		SP		SP		SP		SP	
	Ramp Time	Soak Time	Ramp Time	Soak Time	Ramp Time	Soak Time	Ramp Time	Soak Time	Ramp Time	Soak Time	Ramp Time	Soak Time



Profile End Action 0
Profile Loop Count 1
Deviation Hold After Ramp Up 0
Deviation Hold After Ramp Down 0
Profile Time Base 24 HRS
Profile Interrupt Action 0

as of 3-25-97

APPENDIX G-5 - Raw Materials - Mercury Analyses

Kennecott Rawhide Mining Company
Denton-Rawhide Mine

Air Quality Source Testing conducted by Horizon Air Measurement Services, Inc.
December 2 - 4, 2008

Supplemental Information

Throughput rates and weights

Horizontal Rotary Kiln
Carbon feed rate = 84 pounds per hour.

		Hg ppm			Hg ppm
Carbon Sample Pre-Test	Kiln B	**33**	Carbon sample Post-Test	Kiln A	**5**

Electrowinning Cell
32.5 gallons per minute

		Hg ppm			Hg ppm
Solution Sample Pre-Test	E Cell B	**0.19**	Solution Post-Test	E Cell A	**0.037**

Refinery Retort

Sludge Input (wet) weight	1372 pounds
Sludge Output (dry) weight	853 pounds

		Hg ppm			Hg ppm
Sludge sample Pre-Test	Retort B	**3640**	Sludge sample Post-Test	Retort A	**1730**

Refinery Induction Furnace

Furnace Charge weight	853 lbs dry sldg
	299 lbs flux
	1152 lb charge

ALS Chemex
EXCELLENCE IN ANALYTICAL CHEMISTRY
ALS USA Inc.
4977 Energy Way
Reno NV 89502
Phone: 775 356 5395 Fax: 775 355 0179 www.alschemex.com

To: **KENNECOTT RAWHIDE MINING CO**
P.O BOX 2070
FALLON NV 89407

Finalized Date: 9-JAN-2009
Account: RAWCOTT

Project: Rawhide Mine

CERTIFICATE OF ANALYSIS RE08175422

Sample Description	Method Analyte Units LOR	WEI-21 Recvd Wt. kg 0.02	Hg-CV42 Hg ppm 1	WEI-23g Wet Wt. g 0.1	WEI-22g Dry Wt. g 0.01
Kiln (Carbon) Pre		0.51	33	476.1	382.40
Kiln (Carbon) Post		0.51	5	473.9	368.00
Retort Pre		0.11	3640	73.4	62.70
Retort Post		0.11	1730	80.8	95.30
E-Cell Pre		0.52			
E-Cell Post		0.49			

Comments: Unable to provide Hg analysis for mill solution samples.

***** See Appendix Page for comments regarding this certificate *****

ALS Chemex
EXCELLENCE IN ANALYTICAL CHEMISTRY
ALS USA Inc.
4977 Energy Way
Reno NV 89502
Phone: 775 356 5395 Fax: 775 355 0179 www.alschemex.com

To: **KENNECOTT RAWHIDE MINING CO**
P.O BOX 2070
FALLON NV 89407

Finalized Date: 9-JAN-2009
Account: RAWCOTT

Project: Rawhide Mine

CERTIFICATE OF ANALYSIS RE08175422

Method	CERTIFICATE COMMENTS
Hg-CV42	Detection limits on samples requiring dilutions due to interferences or high concentration levels have been increased according to the dilution factor.

ALS Chemex
EXCELLENCE IN ANALYTICAL CHEMISTRY
ALS USA Inc.
4977 Energy Way
Reno NV 89502
Phone: 775 356 5395 Fax: 775 355 0179 www.alschemex.com

To: **KENNECOTT RAWHIDE MINING CO**
P.O BOX 2070
FALLON NV 89407

Finalized Date: 9-JAN-2009
Account: RAWCOTT

CERTIFICATE RE08175422

Project: Rawhide Mine
P.O. No.:
This report is for 6 Mill Sample samples submitted to our lab in Reno, NV, USA on 12-DEC-2008.
The following have access to data associated with this certificate:

DON DEINES		

SAMPLE PREPARATION

ALS CODE	DESCRIPTION
WEI-21	Received Sample Weight
WEI-22g	Dry Weight - Small Samples
LOG-22	Sample login - Rcd w/o BarCode
SPL-21	Split sample - riffle splitter
WSH-22	"Wash" pulverizers
DRY-23	Air Drying of Samples
PUL-34	Pulverization for high grade
WEI-23g	Wet Wt. of split - grams

ANALYTICAL PROCEDURES

ALS CODE	DESCRIPTION	INSTRUMENT
Hg-CV42	High Grade Hg - cold vapor/AA	FIMS

The results of this assay were based solely upon the content of the sample submitted. Any decision to invest should be made only after the potential investment value of the claim 'or deposit has been determined based on the results of assays of multiple samples of geological materials collected by the prospective investor or by a qualified person selected by him/her and based on an evaluation of all engineering data which is available concerning any proposed project.

To: **KENNECOTT RAWHIDE MINING CO**
ATTN: DON DEINES
P.O BOX 2070
FALLON NV 89407

This is the Final Report and supersedes any preliminary report with this certificate number. Results apply to samples as submitted. All pages of this report have been checked and approved for release.

Signature:
Colin Ramshaw, Vancouver Laboratory Manager

APPENDIX G-6 - Test Log

Tues 12/2 JG, BJ, CM

on site @ 0630. Sign in with Spike + Don. 3025 BP.

set up trailer + equipment. Coordinate w/ Don on timing

Plan on Starting Retort @ 0930. Retort process Start @ 0650

Start R1 @ 0943 - 1120

Start R2 @ 1135 - 1312 1372 (wet lbs) processed

Start R3 @ 1325 - 1502 0.0286 tons/hr = 57.2% of limit

0.05 tons/hr limit

Recover trains + set up on Refinery Furnace.

Pack up + off site @ ~~0400~~ 1600

Wed 12/3 JB BJ CM

on site 0700 prepare solution + change Train sign in

set up on R. Furnace.

Start R1 @ 0745 - 0927	charge furnace @ 0747	Dry sludge = 3531 lb
Start R2 @ 0938 - 1117	Pour 3 pots of sludge @ 0915	Flux = 299 lbs
Start R3 @ 1129 - 1308	Pour 2 pots + Gold @ 1045	Limit 15 tons/hr
	Pour 2 pots + Gold @ 1252	

Break Down on Furnace + set up on Kiln.

Start R1 on Kiln @ Kiln Temp 1298 1304

OFF site @ 1630

JB

Thurs 12/4

on site @ 0700 ✓ in w/ Don

set up on EWC + START Kiln

Start R2 @ 0725-0903 1301 1301

Start R3 on Kiln @ 0921-1103 1304° 1294°

Break Down Equipment and Data Reduction

Start	R1	on ECW	@ 0758 - 0939	R1	GPM	22.5	22.5	22.8
					Temp°F	178	180	182
	R2	ECW	@ 0958 - 1140	R2	GPM	21.6	22.6	22.8
					Temp°F	178	180	182
	R3	ECW	@ 1146 - 1326	R3	GPM	22.6	22.8	22.8
					Temp	180	182	182

APPENDIX G-7 - Calibration and Quality Assurance Procedures

APEX INSTRUMENTS METHOD 5 PRE-TEST CONSOLE CALIBRATION
USING CALIBRATED CRITICAL ORIFICES
5-POINT ENGLISH UNITS

Meter Console Information	
Console Model Number	522/MB01
Console Serial Number	312038
DGM Model Number	T110
DGM Serial Number	999131

Calibration Conditions			
Date	Time	10-Sep-08	8:00:00 AM
Barometric Pressure		29.0	in Hg
Theoretical Critical Vacuum[1]		13.7	in Hg
Calibration Technician		BJ - Run #1	

Factors/Conversions		
Std Temp	528	°R
Std Press	29.92	in Hg
K_1	17.647	oR/in Hg

[1]For valid test results, the Actual Vacuum should be 1 to 2 in. Hg greater than the Theoretical Critical Vacuum shown above.

[2]The Critical Orifice Coefficient, K', must be entered in English units, $(ft^3 \cdot {}^oR^{1/2})/(in.Hg \cdot min)$.

Calibration Data

Run Time	Metering Console					Critical Orifice				
Elapsed	DGM Orifice ΔH	Volume Initial	Volume Final	Outlet Temp Initial	Outlet Temp Final	Serial Number	Coefficient	Amb Temp Initial	Amb Temp Final	Actual Vacuum
(Θ)	(P_m)	(V_m)	(V_{mf})	(t_{mi})	(t_{mf})		K'	(t_{amb})	(t_{amb})	
min	in H_2O	cubic feet	cubic feet	°F	°F		see above2	°F	°F	in Hg
23.0	0.3	437.750	444.696	76	76	RN-40	0.2306	77	77	24
15.0	0.6	444.696	451.374	76	76	RN-48	0.3411	78	78	23
20.0	1.1	451.374	462.732	76	77	RN-55	0.4387	78	78	21
15.0	1.9	462.732	474.252	77	77	RN-63	0.5948	78	78	20
12.0	3.1	474.252	486.230	77	78	RN-73	0.7772	78	78	18

Results

Standardized Data				Dry Gas Meter				
Dry Gas Meter		Critical Orifice		Calibration Factor		Flowrate	ΔH @	
($V_{m(std)}$)	($Q_{m(std)}$)	($Vcr_{(std)}$)	($Q_{cr(std)}$)	Value (Y)	Variation (ΔY)	Std & Corr ($Q_{m(std)(corr)}$)	0.75 SCFM (ΔH@)	Variation (ΔΔH@)
cubic feet	cfm	cubic feet	cfm			cfm	in H2O	
6.639	0.289	6.640	0.289	1.000	-0.007	0.289	1.680	-0.124
6.388	0.426	6.399	0.427	1.002	-0.006	0.427	1.808	0.004
10.867	0.543	10.974	0.549	1.010	0.002	0.549	1.883	0.080
11.035	0.736	11.159	0.744	1.011	0.004	0.744	1.860	0.057
11.498	0.958	11.665	0.972	1.014	0.007	0.972	1.787	-0.017
				1.007	Y Average		1.804	ΔH@ Average

Note For Calibration Factor Y, the ratio of the reading of the calibration meter to the dry gas meter, acceptable tolerance of individual values from the average is +-0.02.

I certify that the above Dry Gas Meter was calibrated in accordance with USEPA Methods, CFR Title 40, Part 60, Appendix A-3, Method 5, 16.2.3

Signature [signature] Date 9-10-08

APEX INSTRUMENTS METHOD 5 PRE-TEST CONSOLE CALIBRATION
USING CALIBRATED CRITICAL ORIFICES
5-POINT ENGLISH UNITS

Meter Console Information	
Console Model Number	522/MB05
Console Serial Number	40624
DGM Model Number	T110
DGM Serial Number	126641

Calibration Conditions			
Date	Time	09/10/08	2:35:00 PM
Barometric Pressure		29.0	in Hg
Theoretical Critical Vacuum[1]		13.7	in Hg
Calibration Technician		BJ - Run #2	

Factors/Conversions		
Std Temp	528	°R
Std Press	29.92	in Hg
K_1	17.647	oR/in Hg

[1]For valid test results, the Actual Vacuum should be 1 to 2 in. Hg greater than the Theoretical Critical Vacuum shown above.

[2]The Critical Orifice Coefficient, K', must be entered in English units, $(ft^3 \cdot {}^oR^{1/2})/(in.Hg \cdot min)$.

Run Time	Calibration Data									
	Metering Console					Critical Orifice				
Elapsed	DGM Orifice ΔH	Volume Initial	Volume Final	Outlet Temp Initial	Outlet Temp Final	Serial Number	Coefficient	Amb Temp Initial	Amb Temp Final	Actual Vacuum
(Θ)	(P_m)	(V_{mi})	(V_{mf})	(t_{mi})	(t_{mf})		K'	(t_{amb})	(t_{amb})	
min	in H_2O	cubic feet	cubic feet	°F	°F		see above2	°F	°F	in Hg
20.0	0.3	639.545	645.605	81	80	RN-40	0.2306	81	81	24
15.0	0.7	645.605	652.302	80	81	RN-48	0.3411	81	81	22
20.0	1.1	652.302	663.632	80	81	RN-55	0.4387	81	81	20
15.0	2.1	663.632	675.204	80	83	RN-63	0.5948	81	81	19
12.0	3.5	675.204	687.270	81	85	RN-73	0.7772	81	81	17

Results							
Standardized Data				Dry Gas Meter			
Dry Gas Meter		Critical Orifice		Calibration Factor		Flowrate	ΔH @
($V_{m(std)}$)	($Q_{m(std)}$)	($Vcr_{(std)}$)	($Q_{cr(std)}$)	Value	Variation	Std & Corr	0.75 SCFM	Variation
cubic feet	cfm	cubic feet	cfm	(Y)	(ΔY)	($Q_{m(std)(corr)}$)	(ΔH@)	(ΔΔH@)
						cfm	in H2O	
5.744	0.287	5.752	0.288	1.001	-0.008	0.288	1.807	-0.146
6.357	0.424	6.381	0.425	1.004	-0.005	0.425	1.922	-0.031
10.761	0.538	10.943	0.547	1.017	0.008	0.547	1.970	0.017
11.004	0.734	11.128	0.742	1.011	0.002	0.742	2.053	0.100
11.482	0.957	11.632	0.969	1.013	0.004	0.969	2.013	0.060
				1.009	Y Average		1.953	ΔH@ Average

Note For Calibration Factor Y, the ratio of the reading of the calibration meter to the dry gas meter, acceptable tolerance of individual values from the average is +-0.02.

I certify that the above Dry Gas Meter was calibrated in accordance with USEPA Methods, CFR Title 40, Part 60, Appendix A-3, Method 5, 16.2.3

Signature [signature] Date 9-10-08

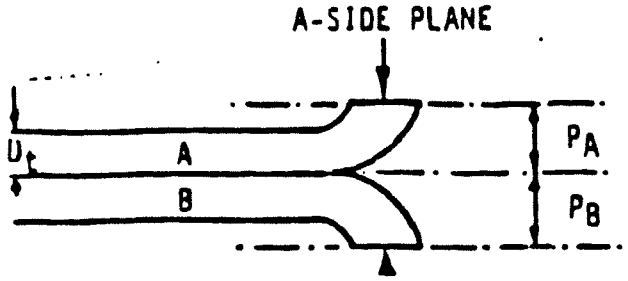
M17-3

TYPE S PITOT TUBE INSPECTION DATA FORM

Tubing diameter, D_t 0.374 in.

Pitot Tube Assembly Level? Yes / No

Pitot Tube Openings Damaged? Yes / No



NOTE: 1.068

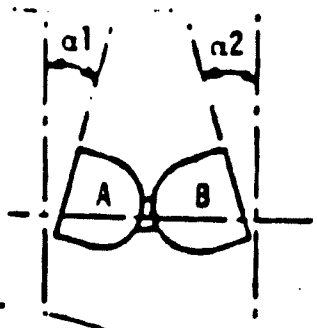
$1.05\ D_t < P < 1.50\ D_t$

$P_A = P_B$

0.3927 = 0.5610

P_A = 0.534 in.

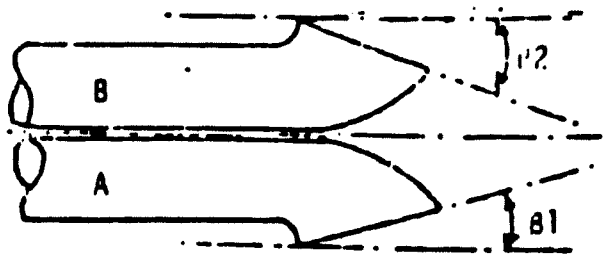
P_B = 0.534 in.



α_1 = 2.0°

α_2 = 2.0°

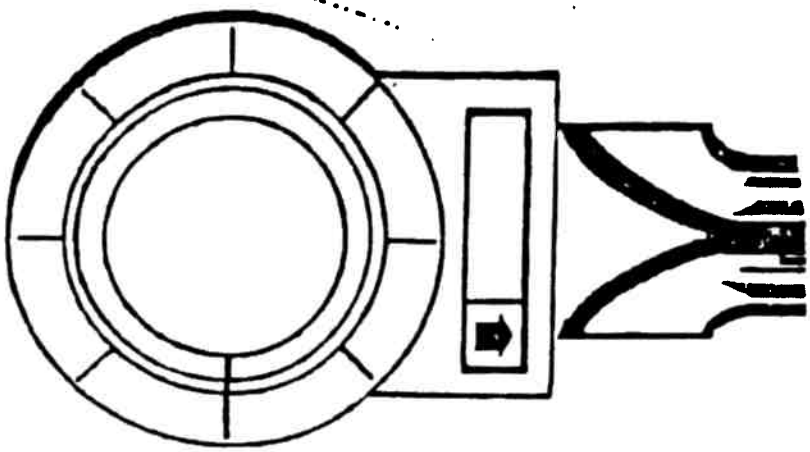
(<10°)

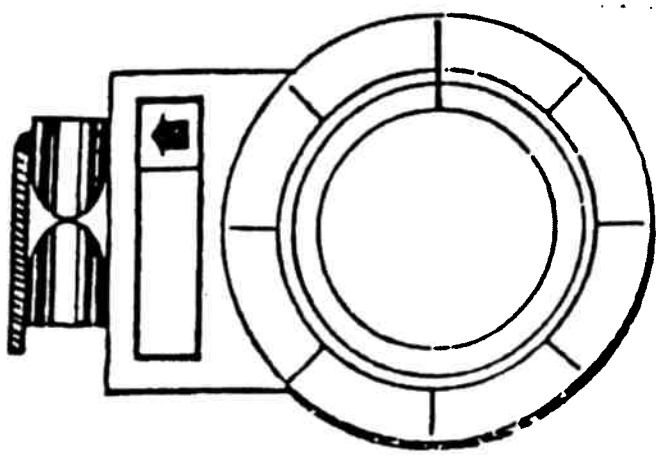


β_1 2.0

β_2 2.0

(< 5°)





Level Position to Find γ = 2.5

Z = A sin γ = 0.047 in. (< 1/8 in.)

Level Position to find θ 1.0

W = A sin θ = 0.019 in. (< 1/32 i

Comments

Checked by: [signature] Date: 9-9-08

Calibration Required? NO

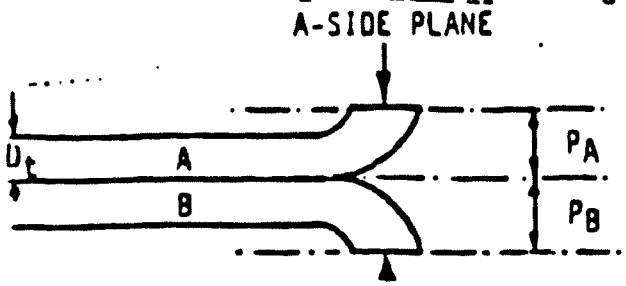
4-5

TYPE S PITOT TUBE INSPECTION DATA FORM

Tubing diameter, D_t 0.380 in.

Pitot Tube Assembly Level? Yes / No

Pitot Tube Openings Damaged? Yes / No



NOTE: 0.826

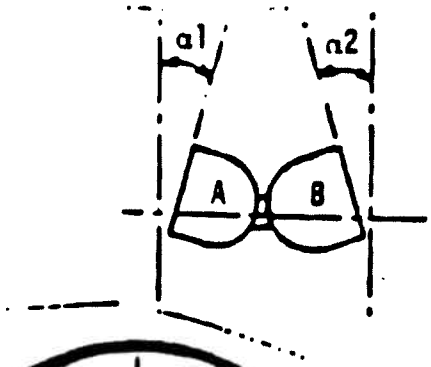
$1.05\ D_t < P < 1.50\ D_t$

$P_A = P_B$

0.3990 = 0.5700

P_A = 0.413 in.

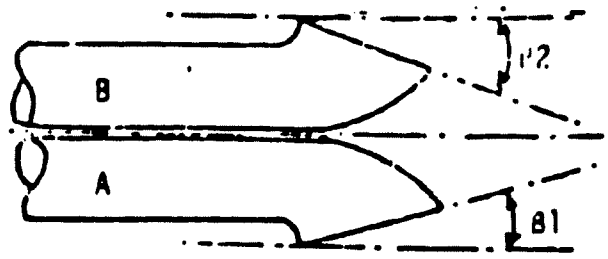
P_B = 0.413 in.



α_1 = 1.0 °

α_2 = 1.0 °

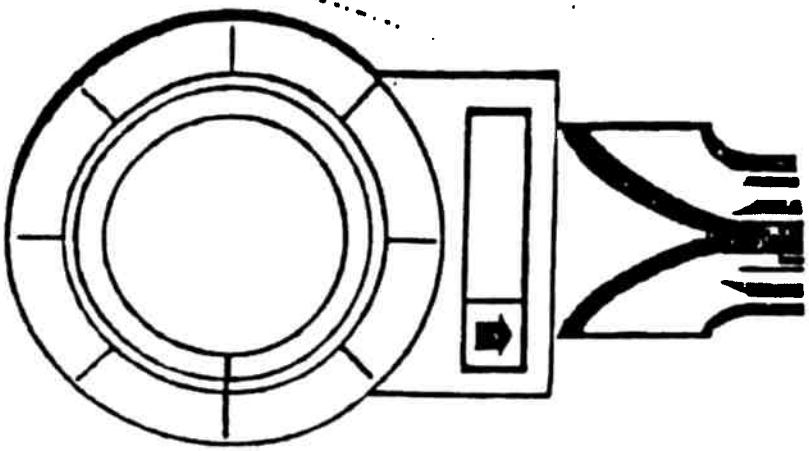
(<10°)

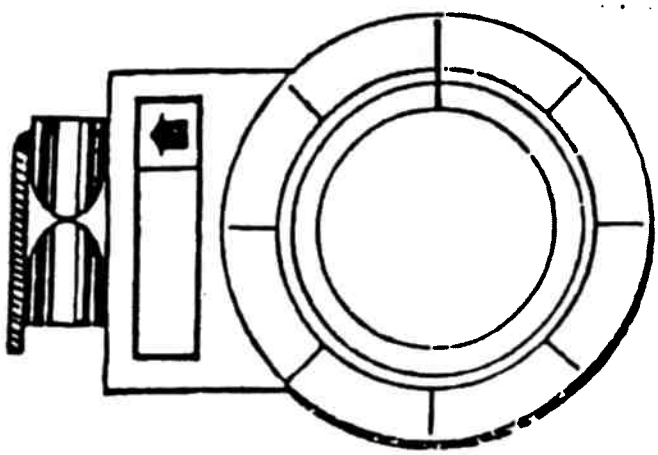


β_1 1.0

β_2 1.0

(< 5°)





Level Position to Find γ = 1.5

Z = A sin γ = 0.022 in. (< 1/8 in.)

Level Position to find θ 1.5

W = A sin θ = 0.022 in. (< 1/32 i

Comments

Checked by: [signature] Date: 9-9-08

Calibration Required? NO

Nozzle Calibration Data
KIT C

Date: 09/04/08
Calibrated by: BJ Glass

NOZZLE ID	B-1 ±.001	B-2 ±.001	B-3 ±.001	Delta D (.004 Max)	Avg. D
C-1	0.154	0.155	0.155		0.155
C-2	0.186	0.186	0.186		0.186
C-3	0.212	0.213	0.212		0.212
C-4	0.250	0.250	0.250		0.250
C-5	0.285	0.285	0.285		0.285
C-6	0.315	0.315	0.315		0.315
C-7	0.500	0.500	0.500		0.500
C-8	0.720	0.720	0.720		0.720

Nozzle Calibration Data
KIT J

Date: 09/04/08
Calibrated by: BJ GLASS NOZZLES

NOZZLE ID	D-1 ±.001	D2 ±.001	D3 ±.001	Delta D (.004 Max)	Avg. D
J-1	0.126	0.126	0.126		0.126
J-2	0.188	0.188	0.189		0.188
J-3	0.220	0.221	0.220		0.220
J-4	0.277	0.277	0.278		0.277
J-5	0.312	0.312	0.312		0.312
J-6	0.375	0.375	0.375		0.375
J-7	0.440	0.442	0.444		0.442

Nozzle Calibration Data
Nozzle Kit G4

Date: 09/04/08
Calibrated by: BJ Glass

NOZZLE ID	B-1 ±.001	B-2 ±.001	B-3 ±.001	Delta D (.004 Max)	Avg. D
G4-1	0.155	0.155	0.155		0.155
G4-2	0.212	0.212	0.212		0.212
G4-3	0.240	0.241	0.240		0.240
G4-4	0.310	0.310	0.312		0.311
G4-5	0.346	0.345	0.345		0.345
G4-6	0.436	0.436	0.435		0.436
G4-7	0.500	0.500	0.501		0.500

STACK TEMPERATURE SENSOR CALIBRATION DATA- APEX PROBE ASSEMBLIES

Date 09/10/08
Calibrated by BJ

THERMOCOUPLE ID	ICE WATER REF 1	ICE WATER REF 2	ICE WATER REF 3	ICE WATER TC 1	ICE WATER TC 2	ICE WATER TC 3	ABSOLUTE T DIFF., % 1	ABSOLUTE T DIFF., % 2	ABSOLUTE T DIFF., % 3	BOILING WATER REF 1	BOILING WATER REF 2	BOILING WATER REF 3	BOILING WATER TC 1	BOILING WATER TC 2	BOILING WATER TC 3	ABSOLUTE T DIFF., % 1	ABSOLUTE T DIFF., % 2	ABSOLUTE T DIFF., % 3	BOILING OIL REF 1	BOILING OIL REF 2	BOILING OIL REF 3	BOILING OIL TC 1	BOILING OIL TC 2	BOILING OIL TC 3	ABSOLUTE T DIFF., % 1	ABSOLUTE T DIFF., % 2	ABSOLUTE T DIFF., % 3
Stainless Steel Probes																											
3-1	32	32	32	32	31	31	0.0	0.2	0.2	212	212	212	213	212	212	-0.1	0.0	0.0	538	538	536	532	535	534	0.6	0.3	0.2
4-2	32	32	32	30	32	32	0.4	0.0	0.0	212	212	212	210	210	210	0.3	0.3	0.3	534	536	534	531	531	531	0.3	0.5	0.3
4-3	32	32	32	32	30	31	0.0	0.4	0.2	212	212	212	208	209	210	0.6	0.4	0.3	546	545	544	540	542	542	0.6	0.3	0.2
4-4	32	32	32	32	30	31	0.0	0.4	0.2	212	212	212	208	209	210	0.6	0.4	0.3	546	545	544	540	542	542	0.6	0.3	0.2
4-5	32	32	32	32	30	31	0.0	0.4	0.2	212	212	212	208	209	210	0.6	0.4	0.3	546	545	544	540	542	542	0.6	0.3	0.2
6-2	32	32	32	30	29	30	0.4	0.6	0.4	212	212	212	208	209	209	0.6	0.4	0.4	540	540	543	536	537	544	0.4	0.3	-0.1
6-3	32	32	32	31	30	30	0.2	0.4	0.4	212	212	212	211	212	210	0.1	0.0	0.3	539	538	538	537	535	534	0.2	0.3	0.4
6-4	32	32	32	29	30	31	0.6	0.4	0.2	212	212	212	210	210	210	0.2	0.3	0.3	539	539	539	533	533	535	0.6	0.6	0.4
A6-5	32	32	32	30	31	31	0.4	0.2	0.2	212	212	212	213	213	212	-0.1	-0.1	0.0	538	539	539	535	535	535	0.3	0.4	0.4
A8-1	31	32	32	30	30	31	0.2	0.4	0.2	212	212	212	209	208	209	0.4	0.6	0.4	546	548	550	540	547	550	0.6	0.1	0.0
A8-2	33	32	32	31	31	31	0.2	0.2	0.2	212	212	212	211	212	210	0.1	0.0	0.3	540	539	540	536	536	536	0.4	0.3	0.4
A8-3	32	32	32	31	30	31	0.2	0.4	0.2	212	212	212	210	210	211	0.3	0.3	0.1	537	537	537	531	532	540	0.6	0.5	-0.3
10-1	32	32	32	32	31	31	0.0	0.2	0.2	212	212	212	211	212	209	0.1	0.0	0.4	537	535	536	534	535	534	0.3	0.0	0.2
M17-1	32	32	32	31	31	32	0.2	0.2	0.0	212	212	212	211	211	211	0.1	0.1	0.1	540	540	541	542	542	541	-0.2	-0.2	0.0
M17-2	32	32	32	32	33	33	0.0	-0.2	-0.2	212	212	212	212	211	210	0.0	0.1	0.3	541	539	539	539	539	540	0.2	0.0	-0.1
M17-3	32	32	32	31	32	31	0.2	0.0	0.2	212	212	212	211	211	212	0.1	0.1	0.0	543	545	545	544	546	547	-0.1	-0.1	-0.2
Inconel																											
10-2 inc	32	32	32	34	34	34	-0.4	-0.4	-0.4	212	212	212	213	213	213	-0.1	-0.1	-0.1	540	539	538	539	537	538	0.1	0.2	0.0
6-1 Inc	32	32	32	36	36	36	-0.8	-0.8	-0.8	212	212	212	210	210	208	0.3	0.3	0.6	549	550	549	543	540	540	0.6	1.0	0.9
Loose Thermocouple																											
6-5	32	32	32	34	35	34	-0.4	-0.6	-0.4	212	212	212	210	211	211	0.3	0.1	0.1	537	540	536	537	538	537	0.0	0.2	-0.1
6-6	32	32	32	32	32	32	0.0	0.0	0.0	212	212	212	212	210	210	0.0	0.3	0.3	538	539	541	539	539	539	-0.1	0.0	0.2
7-1	32	32	32	34	35	35	-0.4	-0.6	-0.6	212	212	212	210	210	210	0.3	0.3	0.3	543	544	544	546	547	548	-0.3	-0.3	-0.4
8-3	32	32	32	32	33	32	0.0	-0.2	0.0	212	212	212	210	212	213	0.3	0.0	-0.1	548	546	545	543	544	543	0.5	0.2	0.2

Note: If absolute temperature values of the reference thermometer being calibrated and the stack temperature sensors agree within 1.5 percent at each of the three calibration points, no correction is needed.

APPENDIX G-8 - Project Participants

RICHARD J. VACHEROT
Senior Air Quality Scientist
Technical Director

PROFESSIONAL HISTORY

Horizon Air Measurement Services, Inc. 10/88 - Present
ERT, Inc.(now ENSR Consulting & Eng.), 2/85 - 10/88
GCA Technology (now Alliance Technology), 11/83 - 2/85

EDUCATION

B.A., Biology and Environmental Science; Colby College, Waterville, Maine, 1982
Graduate Study; Air Resources Management, University of Lowell, Massachusetts, 1985

PROFESSIONAL EXPERIENCE

As principal of Horizon Air Measurement Services, Inc., Mr. Vacherot is responsible for all business activities including administrative duties, business development, and the development and completion of technical programs.

Prior to forming Horizon Air Measurement Services, Inc., Mr. Vacherot was responsible for the establishment and development of an emission testing group at the Camarillo, California office of ERT, Inc. in 1986. Originally the sole member, he expanded the capabilities and personnel to include two air quality engineers, two air quality scientists, and two technicians. Capabilities included the performance of US EPA Methods 1-25, NIOSH sampling methods, as well the development and performance of more esoteric, source-specific methods for specific toxic compounds.

Promoted to the Manager of the Air Measurement Division, Mr. Vacherot managed the combined ambient air monitoring and emissions testing groups (14 employees). In this position, Mr. Vacherot was responsible for technical development and activities, proposals, line management, staffing,and profitability of the division.

Previous to his establishment of the emissions testing group in Camarillo, Mr. Vacherot was employed as an air quality scientist at ERT's headquarters in Concord Massachusetts with the Air Toxics Chemistry and Engineering Group.

TECHNICAL SPECIALTIES

Mr. Vacherot has twenty-four years experience in:

- Technical Direction and Management of Criteria and Noncriteria Air Emissions Sampling Projects
- Criteria Emissions Compliance Testing
- Process Optimization Testing
- VOC Capture and Destruction Efficiency Testing
- Air Toxic Method Development and Validation
- Ambient Air Monitoring for Toxic Compounds
- Trial Burn Plan (RCRA Part B) Development and Testing Program Direction
- SCAQMD Method 25
- Design and Construction of Mobil Continuous Emissions Monitoring (CEM) Systems
- Design and Construction of Customized Emissions Testing Equipment

SPECIFIC PROJECT EXPERIENCE

Mr. Vacherot has managed/conducted emissions testing programs for the following types of sources:

- Landfill Gas Flares
- Mining and Milling Processes
- Hazardous Waste Incinerators
- VOC Coating Facilities
- IC Engines
- Power/Utility Plants
- Turbines/Cogeneration Systems
- Boilers
- Furnaces
- Water Treatment Facilities
- Control Devices - Scrubbers, Afterburners, Baghouses, Quench Towers, ESP's, SCR

Mr. Vacherot has co-authored several papers presented at the Air and Waste Management Associates annual meetings including the following:

"Quantification of Emissions From Barbecue Charcoal Ignition Products for Compliance With SCAQMD Rule 1174"

"Emission Control Strategies For Small Industrial Gas Turbines"

JOSEPH M. BENNETT
Air Quality Scientist II

PROFESSIONAL HISTORY

Horizon Air Measurement Services, Inc., 2006 - Present

EDUCATION

B.S. Natural Resources Management, California Polytechnic State University, San Luis Obispo, 2003

PROFESSIONAL EXPERIENCE

Mr. Bennett has two years of experience conducting field sampling and one year of direct experience in emissions testing. Mr. Bennett's primary speciality is the completion of Continuous Emissions Monitoring (CEM) source testing for various sources along with laboratory support. Mr. Bennett provides technical field oversight and assistance for emissions testing programs and has experience in a variety of SCAQMD, CARB, and EPA test methods. Mr. Bennett is proficient in preparation and execution of, and has assisted in the successful completion of emissions testing programs in accordance with SCAQMD Methods 1.1, 2.1, 2.2, 3.1, 4.1, 5.1, 5.2, 5.3, 6.1, 12.1, 10.1, 25.1, 25.2, 25.3, 100.1, 207.1; CARB Methods 1, 2, 3, 4, 5, 6, 10, 11, 100, 430, 436; EPA Methods 1, 2, 3, 3A, 4, 5, 6, 6C, 7E, 8, 10, 10A, 11, 18, 23, 26, 29, and EPA 323. Mr. Bennett also carries a current MSHA certification for mining safety.

TECHNICAL SPECIALTIES

Mr. Bennett's experience includes:

- RATA testing
- Criteria pollutant emissions testing
- Air toxics emissions testing
- Emission Data Reduction and Report Preparation

SPECIFIC PROJECT EXPERIENCE

Mr. Bennett has assisted in emissions testing and RATA programs for the following types of sources:

- Utility/Power Plants
- IC Engines
- Gas Turbines
- Landfill Flares
- Boilers
- Baghouses
- Furnaces
- Asphalt Plants
- Thermal Oxidizers
- Mining Processes
- Municipal Waste Incinerators

CRAIG MORAN
Air Quality Scientist II

PROFESSIONAL HISTORY

Horizon Air Measurement Services, Inc., April 2002 - Present

EDUCATION

B.S. degree in Environmental Science; Northern Arizona University, 2001

PROFESSIONAL EXPERIENCE

Mr. Moran has five years direct experience in emissions testing, data collection and analysis. In this capacity, Mr. Moran provides technical field support, laboratory support and data analysis for emissions testing programs. Mr. Moran is proficient in preparation and execution of, and has assisted in the completion of emissions testing programs in accordance with SCAQMD Methods 1-6, 12.1, 25.1, 25.3, 100.1, 205.1, 207.1, CARB Methods 1, 2, 3, 4, 5, 6, 8 and 100; and EPA Methods 1, 2, 3, 4, 5, 6, 6C, 7E, 8, 10, 10A, 20, 23, 25A, 26, 29, 101A and 201A. Mr. Moran also carries current certifications for Environmental Compliance Inspector and Industrial Waste Treatment operator issued by CWEA, as well as a current MSHA certification for mining safety.

TECHNICAL SPECIALTIES

- RATA testing
- Criteria pollutant emissions testing
- Air toxics emissions testing
- Emission Data Reduction and Report Preparation

SPECIFIC PROJECT EXPERIENCE

Mr. Moran has assisted with emissions testing on the following types of facilities:

- Utility power plants
- Boilers
- Internal combustion engines
- Gas turbines
- Thermal oxidizers
- Landfill gas flares
- Municipal waste facilities
- Asphalt production facilities
- Wastewater treatment plants
- Mining Processes
- Furnaces

WILLIAM M. JONES
Equipment Manager

PROFESSIONAL HISTORY

Horizon Air Measurement Services, Inc., January 2001 - Present

PROFESSIONAL EXPERIENCE

Mr. Jones has three years direct experience as equipment manager. Mr. Jones primary responsibility is the calibration, preparation, maintenance, repair, and demobilization of all Horizon equipment. Prior to his role as equipment manager Mr. Jones had three years direct experience in emissions testing and emissions testing project management. Mr. Jones' primary specialty is the management and completion of criteria testing programs for NO_x, CO, HC, SO_2 and other gaseous pollutants using Horizon's mobile CEMS van. Mr. Jones is proficient in a variety of SCAQMD, CARB, EPA, and BAAQMD test methods

TECHNICAL SPECIALTIES

- Equipment calibration, preparation, maintenance, repair and demobilization
- Vehicle maintenance
- Equipment inventory
- Equipment repair
- Emission testing project management
- RATA testing (NO_x, CO, O_2, CO_2, flow rate) for EPA Part 60/75, RECLAIM and Rule 218
- Continuous Emissions Monitoring (CEM) for gaseous criteria pollutants(NOx, CO, O_2, CO_2, HC)
- Criteria pollutant emissions testing
- Air toxics emissions testing
- Emission data reduction and report preparation

SPECIFIC PROJECT EXPERIENCE

Mr. Jones has completed emissions testing and RATA programs on the following types of facilities:

- Utility/power plants
- Boilers
- Internal combustion engines
- Gas turbines
- Mining processes
- Landfill Flares
- Baghouses
- Furnaces
- Asphalt Plants
- Thermal Oxidizers
- Municipal Waste Incinerators

APPENDIX G-9 - Related Correspondences

ndep
NEVADA DIVISION OF ENVIRONMENTAL PROTECTION
protecting the future for generations

STATE OF NEVADA
Department of Conservation & Natural Resources
DIVISION OF ENVIRONMENTAL PROTECTION

Jim Gibbons, Governor
Allen Biaggi, Director
Leo M. Drozdoff, P.E., Administrator

November 5, 2008

Mr. Don Deines
Operations Manager
Kennecott Rawhide Mining Company
P.O. Box 2070
Fallon, Nevada 89407-2070

RE: Source Test Protocol Review for 2008 Determination of Total Mercury Emissions, Including Tier-1 and Tier-2 Thermal Units
Class II Air Quality Operating Permit No. AP1041-1116.02 (FIN A0406)

Dear Mr. Deines:

The Nevada Division of Environmental Protection - Bureau of Air Quality Planning (NDEP-BAQP) reviewed the "Test plan (Protocol) to determine mercury emission rates from various sources" prepared on behalf of Kennecott Rawhide Mining Company (Kennecott) – Denton Rawhide Mine by Horizon Air Measurement Services, Inc. (Horizon), received on November 5, 2008. Kennecott operates under a Class II Air Quality Operating Permit No. AP1041-1116.02. On November 5, 2008, Kennecott confirmed that the tests are being conducted to comply in part with the Nevada Mercury Air Emissions Control Program's (NMCP) requirement for annual testing of Tier-1 and Tier-2 thermal units, as described under **Nevada Administrative Code (NAC) 445B.3675.2.(c)**.

The NDEP-BAQP has the following comments regarding the planned source tests. As described below, EPA Method 29 is the NDEP-BAQP's preferred method of determining emissions of total mercury from applicable sources under the NMCP. EPA Method 29 shall be run in conjunction with EPA Methods 1 through 5 to determine the total mercury (Hg) mass emission rate (in lbs-Hg/hour) for each unit. Because Method 29 includes the sampling and analysis of particulate matter, the tests must achieve acceptable isokinetic sampling rates.

The NDEP-BAQP requires that the amount of particulate matter (PM) collected in the front half of the Method 29 sampling train is determined during the tests. Section 8.2.6 of Method 29 describes the proper procedure, which requires an acetone rinse (rather than nitric acid) to conduct the PM determination. **The NDEP-BAQP also requires collection of a minimum sample volume of 60 dscf during each test run or no less than two hours in an effort to collect the minimum sample during each test run. The absence of cyclonic flow must be verified before testing any system**

The Protocol identifies the following units for testing:

- Carbon Regeneration Kiln
- Mercury Retort

- Refinery Furnace
- Electrowinning Cells

The NDEP-BAQP requires analysis of the mercury content of a representative sample(s) of the ore, concentrate or other material processed during the source testing of each system or unit. For laboratory units, a minimum of one representative sample shall be taken during each day that a particular emissions unit is tested. **For all other units, the NDEP-BAQP requires that a representative sample shall be taken during each test run.** Total mercury content shall be determined using EPA Method 7471A (cold vapor atomic adsorption analysis). In units where multiple samples are processed in a batch system, for example in a drying oven, a representative composite sample may be analyzed. The analysis shall determine the Hg content (in parts per billion, or at elevated concentrations in parts per million) of the rock, ore or other material, and shall be submitted in the source test report.

The source tests must be conducted in accordance with any applicable requirements established in Class II Air Quality Operating Permit No. AP1041-1116.02, and with the applicable state and federal regulations. Any deviations to the federal reference test methods must be approved by the Director prior to conducting the tests. Please refer to the attachment, **"SOURCE TESTING AND TEST REPORTING GUIDELINES,"** for a complete description of the general requirements for source testing.

Any emission limit or opacity limit exceeded at the time of the source test must be reported within 24 hours) to the NDEP-BAQP as required by **NAC 445B.232 "Excess emissions."** Emissions exceedances will be evaluated in accordance with the Air Quality regulations and may result in a Notice of Alleged Air Quality Violation and Order (NOAV). Failure to properly report an exceedance of a permitted emissions limit is also subject to a potential NOAV.

The NDEP-BAPC requires the submittal of a complete test report in accordance with **NAC 445B.252 "Testing and sampling."** When submitting the source test data, ensure that the System Number and Unit Number identify the emission unit as specified in the permit. **Please put documentation of relevant operating parameters (e.g., process throughput, heat input), and all sampling and analytical results for the material or fuel processed, in a single appendix in the source test report.** Please refer Horizon to the "**GUIDELINES**" (attached) for the reporting requirements and preferred report format. The NDEP-BAQP reserves the right to have Kennecott resubmit the test report if the guidelines are not met. Test Reports must be submitted to the NDEP-BAQP within 60 days of the conclusion of the tests.

Testing is scheduled to be conducted on December 1 through December 5, 2008. Because of the duration of the test program, please notify this office at least 24 hours in advance of any changes to the test dates. NDEP-BAQP staff may be present for the testing.

If you have any further questions regarding this matter, please call Ken McIntyre at (775) 687-9493 or call Rob Bamford at (775) 687-9330.

Sincerely,

Rob Bamford
Supervisor, Mercury Control Program
Bureau of Air Pollution Control

RB/nh

Enc. SOURCE TEST REPORT GUIDELINES
EPA M5_PM SOURCE TEST DATA TEMPLATE

c w/enc.: Mr. Richard J. Vacherot
Horizon Air Measurement Services, Inc.
996 Lawrence Drive, Suite 108
Newbury Park, California 91320

c w/out enc.: File (A0406)

Route to w/o enc.: Michael Elges, NDEP
Larry Kennedy, NDEP
Rob Bamford

CERTIFIED MAIL: 7007 0150 0003 7528 3126

SOURCE TESTING AND TEST REPORTING GUIDELINES

TESTING REQUIREMENTS

Source tests shall be conducted in accordance with the requirements established in the facility's Air Quality Operating Permit and with applicable state and federal regulations.

- Any deviations to the federal reference test methods shall be approved by the Director prior to conducting the tests. The absence of cyclonic flow must be verified before testing any system.
- Source tests shall be conducted at the maximum fuel consumption rate, production rate, or other operating parameters established in the Permit. **The hourly documentation for these parameters during the source test shall be included in the source test report.** If any test is conducted at less than permitted maximum capacity, or at a lower fuel rate, production rate or heat input rate, the test results will be evaluated against the permit operating conditions and the permit may need to be revised accordingly.
- **For all particulate matter test runs, the NDEP-BAPC has established minimum sampling volumes and sampling times (test run durations).** Test runs shall be conducted for a minimum of one hour, and shall either collect a minimum sample volume of 1.7 dry standard cubic meters (dscm, or 60 dscf) or be conducted for up to 2 hours to maximize the sample volume.
- For all gaseous species test runs, the NDEP-BAPC requires minimum test duration of 1 hour.
- The NDEP-BAPC requires the **analysis of a representative sample of the ore, fuel** or other material processed or combusted during the source testing of each system if the emissions may be affected by the composition of the material in the process. **The NDEP-BAPC requires that a minimum of one sample shall be taken during each day that a particular emissions unit is tested, but may require that a sample be taken during each test run.** The analysis report shall state the date the sample was analyzed and refer to the emission unit through which the ore/material was processed. The analysis report shall include content (sulfur, metals, moisture, etc...) of the ore, fuel, or other material and shall be submitted in the source test report.
- Any emission limit or operating parameter exceeded at the time of the source test **must be reported within 24 hours** to NDEP-BAPC as required in the Nevada Administrative Code (NAC) 445B.232 "Excess emissions; Scheduled maintenance, testing or repairs; notification of director; malfunction, upset, startup, shutdown or human error." Reported permit exceedances will be evaluated in accordance with the Air Quality regulations and may result in a Notice of Alleged Air Quality Violation and Order (NOAV). Failure to properly report an exceedance of a permitted emissions limit represents the basis for a NOAV.
- Any calibration gases used for source tests shall be **certified prior to the tests and have valid certification dates** during the tests. Only a certified independent laboratory shall certify the calibration gases.

The NDEP-BAPC may reject emissions tests for any of the following reasons:

1) Failure to comply with all provisions of NAC 445B.252 "Testing and sampling."
2) Any deviation from U.S. EPA Reference Test Methods unless specifically approved by the NDEP-BAPC.
3) For any source subject to the New Source Performance Standards (NSPS) 40 CFR Part 60, failure to meet any additional testing requirements stated in the applicable Subpart.
4) Failure to achieve isokinetic sampling rates (+/- 10% Method 5 for PM, +/- 20% Method 201A for PM10) for any of the three required test runs.
5) Failure to provide relevant process and production information for the period of each test run.
6) Failure to achieve the operating conditions (e.g., throughput rate, heat input rate, fuel flow rate, emission limits) specified in Section IV or V of the Air Quality Operating Permit during each test run.

SOURCE TEST REPORTING GUIDELINES

For comprehensive and consistent reporting, the NDEP-BAPC requires the submittal of a complete test report in accordance with NAC 445B.252 "Testing and sampling." The NDEP-BAPC reserves the right to require the report resubmitted if these guidelines and the following format are not followed.

- ***Immediately report any excess emissions:*** Any emission limit or opacity limit exceeded during a source test must be reported within 24 hours to the NDEP-BAPC, as required by NAC 445B.232.

- ***Clearly identify any permit or testing deviations:*** Any excess emissions or other permit deviations that occur during the test program, and any deviations from the specified testing methods or procedures, **shall be clearly identified in the first three pages of the report**.

- ***Explain operating deviations:*** Any process upsets that occur, and any failures to achieve that the operating conditions or parameters specified in Section IV or V of the Air Quality Operating Permit, during each test run shall be identified and explained **within the first three pages of the report**.

- ***Identify Systems & Units:*** **Identify any emissions unit tested using the System Number and/or Unit Number as it is identified in the air quality operating permit.**

- ***Use permit units for operating parameters:*** The hourly documentation for the pollutant emissions rates and operating parameters (production rate, fuel consumption rate, heat input rate, etc.) shall be reported in the same measurement units as specified in the permit.

- ***Include test run data:*** The report shall include legible, complete, "raw" data sheets and explanations of any process upset(s) during the source test. If additional runs are conducted, supporting documentation shall be included in the report regarding the reason for those runs. The NDEP-BAPC will determine validity of each test run and which test runs will be validated for the purpose of determining compliance. The report shall include start and stop times of each test run with an explanation of any time breaks during or between test runs.

- ***Appendices:*** The NDEP-BAPC encourages the use of appropriately referenced appendices to contain sampling information, analytical data, "raw" test data, or other supporting information.

- ***Laboratory certification***: Provide a copy of the analytical lab(s) EPA certification.

- ***Include documentation of EPA Reference Method I:*** The test report shall include Reference Method 1 calculations and identification of any stack anomalies. The report shall include a Reference Method 1 determination of cyclonic flow. Traverse point descriptions should include stack information and a diagram of the thickness of the stack wall and the length of the test port if these items dictate traverse point locations.

- ***Submit report in 60 days:*** The source test report shall be submitted within 60 days of the completion of the source test. Failure to submit the report within 60 days is a violation of NAC 445B.252 "Testing and sampling," and is subject to potential enforcement action.

The NDEP-BAPC requires the following submissions:

(a) one printed copy of the completed source test report,

(b) a summary sheet for each tested source, including all source test results, and

(c) a compact disk(s) containing the complete text of the report (analysis, raw data, diagrams, etc.) in electronic PDF format and an electronic EXCEL spreadsheet(s) containing the data collected during each particulate matter source test run. A copy of the required EXCEL spreadsheets is attached; please call the NDEP-BAPC Compliance & Enforcement Branch me to obtain an electronic version.

SOURCE TEST REPORT FORMAT

A. Cover Page

1. Facility Name and Location
2. Source Permit Number
3. Emission Systems Source Tested
4. Testing Company or agency, name and address
5. Certification by Source Testing Company that the sampling and analytical procedures and the data presented in the report are authentic and accurate.

B. Deviation Report **(within the first three pages of the report)**

1. Identify any emissions exceedances, exceedances of permitted operating parameters or other permit deviations during the source test.
2. Identify and explain any process upsets or other anomalies that occur during the test program.
3. Identify and discuss any deviations from the EPA Reference Methods.
4. Identify any deviations from standard analytical procedures.
5. Describe any errors in quality assurance procedures.

C. Table of Contents

D. Introduction

1. Test purpose
2. Test location
3. Test dates
4. System processes
5. Pollutants tested
6. Observers' names, titles, and their industry or agency.
7. Other relevant background information

E. One Page Summary of Test Parameters & Results for Each Unit Tested

1. Emission results reported in same System and Units numbers specified in the permit for each source tested emission unit.
   a. Permitted emission limits (indicate any exceedances).
2. Visible Emission (Opacity) Observation Summary (if required.)

F. Test Data & Sampling Method (for each source tested)

1. Original raw field data (A printout shall be made if field data is originally recorded on a computer. Each sheet of the printout shall be signed and dated by the test team leader).
   a. Original opacity observation field reports
   b. Visible Emission Observer's Certification.
2. Electronic copy of Excel spreadsheet (PM SOURCE TEST DATA TEMPLATE) containing the data collected during each particulate matter source test run.
3. Description of System, process, any control devices, and control equipment flow diagram.
4. Raw data showing verification of the absence of cyclonic flow.
5. Process startups, shutdowns, and other operational changes during tests, such as the time of start and stop, shall be explained and noted.
6. Applicable federal test reference sample calculations.

G. Operating/Process Data

1. Process data, throughput and production data pertaining to operational permit limits for each system tested.
2. System, process and control device-operating parameters during the test as compared to normal operation. Control device parameters should include pressure drop, flow rates, make-up water rates, recycle water solids content for scrubbers; voltages, currents, spark rates and rapping cycle times for electrostatic precipitators; pressure drops and cleaning cycles for baghouses.
3. Characterization of the gas stream to the control device.
4. Type of raw material used, fuel products. Operational data signed and dated by the plant official.
5. Certification by a facility representative that the production rate and/or heat input rate during the source test, are reported accurately.

Appendices

Facility Process Information for each emission system or unit
1. Process throughput data, heat input data, and/or other operating parameters
2. Sampling and analytical results for material processed and/or fuel combusted

Description of EPA Reference Methods.
1. Test reference method procedures.

Sampling and Analysis Procedures
1. Sampling port location and dimensional cross-section diagram.
2. Sampling point description, including labeling system.
3. Sampling train description. Including nozzle size and leak test methods with results.

Lab Samples and Procedures
1. Description of collected samples and Chain of Custody for any collected samples from point of collection to post analysis.
2. Laboratory report, with chain of custody.
3. Laboratory Certification

Calibration and quality assurance procedures and results
1. Calibration gases expiration date.

Source Test log.

Project participants and titles.

Related correspondence.

Particulate Emissions - Source Test Data

Source Name:
Permit no.
System tested: System no. ___, Emission unit _____
Description:
Pollutants sampled:
Test Date:
Testing Firm:

Run no. 1

Traverse Point	Time (sampling interval)	Stack velocity (pitot head)		Dry Gas Meter - Orifice pressure	Dry Gas Meter Reading	Stack Temp.	Dry Gas Meter	Dry Gas Meter
		Δp in. H_2O	sqrt Δp $(in. H_2O)^{1/2}$	ΔH in. H_2O	(Vol.) ft^3	T_s °F	T_{in} °F	T_{out} °F
				initial reading:				
1			0.0000					
2			0.0000					
3			0.0000					
4			0.0000					
5			0.0000					
6			0.0000					
7			0.0000					
8			0.0000					
9			0.0000					
10			0.0000					
11			0.0000					
12			0.0000					
13			0.0000					
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30			0.0000					
31			0.0000					
32			0.0000					
33			0.0000					
34			0.0000					
35			0.0000					
36			0.0000					

O_2 % dry

CO_2 % dry

APPENDIX G-10 - Standard Procedures

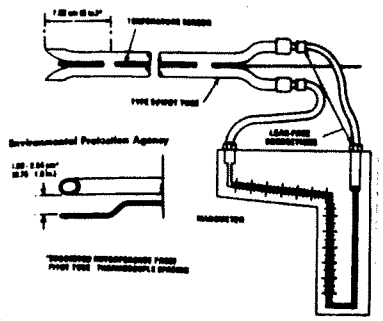
Method:	**Sample Velocity Traverses for Stationary Sources**
Applicable for Methods:	EPA Method 1, SCAQMD Method 1.1, CARB Method 1
Principle:	To aid in the representative measurements of pollutant emissions and/or total volumetric flow rate from a stationary source, a measurement site where the effluent stream is flowing in a known direction is selected, and the cross section of the stack is divided into a number of equal areas. A traverse point is then located within these equal areas. The method cannot be used when, 1) flow is cyclonic or swirling, 2) stack is smaller than about 0.30 meter (12 inches) in diameter or 3) the measurement of the site is less than two stack or duct diameters downstream or less than a half diameter upstream from the flow disturbance.

Method: **Stack Gas Velocity and Volumetric Flow Rate**

Applicable for Methods: EPA Method 2, CARB 2, SCAQMD Method 2.1

Principle: The average gas velocity in a stack gas is determined from the gas density and from measurement of the average velocity head with a type S or standard pitot tube.

Sampling Procedure: Set up the apparatus as shown in the figure. Measure the velocity head and temperature at the traverse points specified by EPA Method 2, CARB Method 2 or SCAQMD Method 2.1. Measure the static pressure in the stack and determine the atmospheric pressure. The stack gas molecular weight is determined from independent measurements of O_2, CO_2 and H_2O concentrations.



Sample Recovery: and Analyses: The stack gas velocity is determined from the measured average velocity head, the measured dry concentrations of O_2 and CO_2 and the measured concentration of H_2O. The velocity is determined from the following set of equations:

Where,

ΔP = velocity head, inches in H_2O
Ts = gas/temperature, degrees R
Ps = absolute static pressure
Mwd = dry molecular weight
Mw = molecular weight
Cp = pitot flow coefficient

Dry molecular weight of stack gas

$$Mwd = 0.44\ (\%CO_2) + 0.32\ (\%O_2) + 0.28\ (\%N_2 + \%CO)$$

Molecular weight of stack gas, wet basis

$$M_w = (M_{wd}\ x\ M_d) + 18\ (1 - M_d)$$

$$Where,\ M_d = \frac{100 - Bws}{100}$$

Stack gas velocity

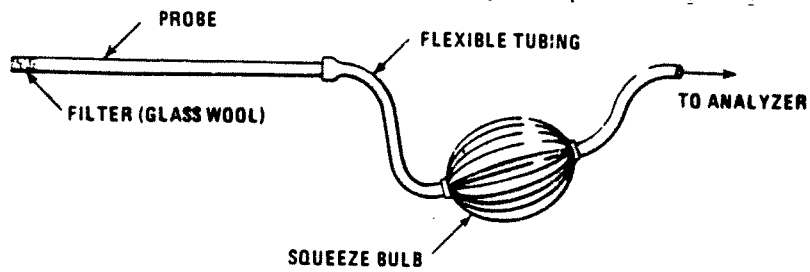
$$(V_s)\ avg. = (5130)\ C_p\ x\ \sqrt{\Delta P}\ avg.\ x\ \sqrt{T_s}\ x\ \left(\frac{1}{P_s\ x\ M_w}\right)^{1/2}$$

Method: **Gas Analysis for Dry Molecular Weight and Excess Air**

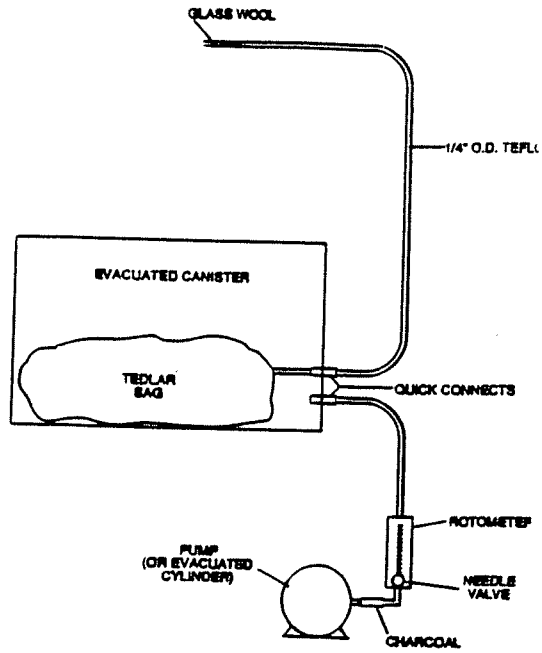
Applicable for Methods: EPA Method 3, SCAQMD Method 3.1, CARB Method 3

Sampling Procedure:

a) Single Point, Grab Sampling - set up equipment as shown in the figure. Position probe at the centroid of the stack. Purge sample line and draw sample straight to the Orsat/Dyrite analyzer and immediately analyze for percent CO_2 & O_2



b) Integrated Gas Sampling Train - set up equipment as shown in the figure. Position probe at the centroid of the stack. Purge sample line and draw sample into the Tedlar bag. Fill bag concurrent to the criteria pollutant sample, analyze samples immediately.



c) Multi-Point Integrated Sampling - set up equipment the same as b) integrated gas sampling. Follow procedures from (b) except traverse all points and sample at each point for an equal length of time.

* To determine the percentage of gas that is N_2 and CO by subtracting the sum of the percent CO_2 and percent O_2 from 100.

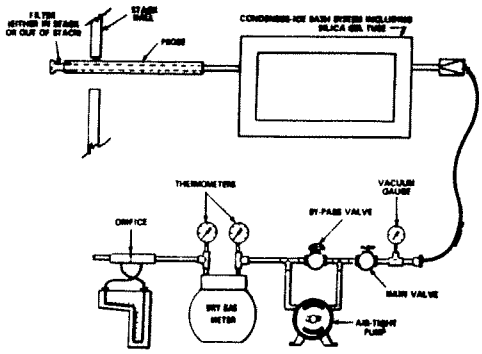
* Dry molecular weight calculation of stack gases:

$$Md = 0.440\ (\%\ CO_2) + 0.320\ (\%\ O_2) + 0.280\ (\%\ N_2 + \%\ CO)$$

To Remember:

The equation above does not consider argon in air (about 0.9% molecular weight of 39.9). A negative error of about 0.4 percent is introduced.

Method:	**Determination of Moisture in Stack Gases**
Applicable for Methods:	EPA Method 4, CARB Method 4, SCAQMD Method 4.1
Principle:	A gas sample is extracted at a constant rate from the source; moisture is removed from the stream and determined either volumetrically or gravimetrically.
Sampling Procedure:	Set up train as shown in the following figure. Sample is drawn at a constant rate through a sufficiently heated probe. The probe is connected to the impinger train by Teflon or glass tubing. The train consists of two greenburg smith impinger (SCAQMD 4.1) or one modified and 1 greenburg smith impinger (CARB & EPA) each containing 100 ml of water, an empty impinger as a knock-out and an impinger containing silica gel to protect the pump from moisture.



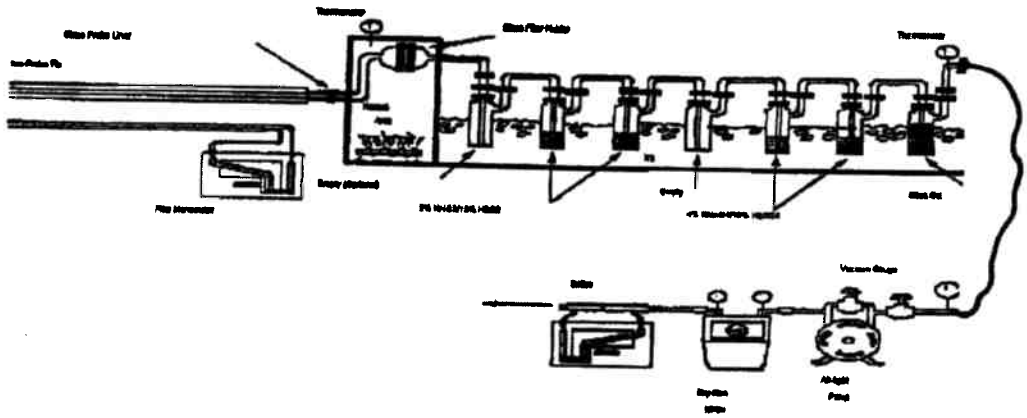
Sample Recovery: and Analyses:	Following testing, moisture content is determined gravimetrically or volumetrically from initial and final impinger contents weights or volume.

Method: **Determination of Multiple Metals Emissions From Stationary Sources**

Reference: EPA Method 29

Principle: Stack sample is withdrawn isokinetically from the source, with particulate emissions collected in the probe and on a heated filter and gaseous emissions collected in a series of chilled impingers containing an aqueous solution of dilute nitric acid combined with dilute hydrogen peroxide in two impingers, and acidic potassium permanganate solution in two impingers. The subsequent sample fractions are digested in acid and analyzed for mercury by CVAAS and metals species using AAS, ICAP or ICP-MS.

Sampling Procedure: The sample is drawn isokinetically through a heated glass nozzle/probe. The probe is connected to a heated quartz filter which is then connected to an impinger train by Teflon tubing or glass. The train consists of one modified impinger (1st) and one standard Greenburg-Smith impinger (2nd) which contain 100 ml of 5% HNO_3/10% H_2O_2 solution each; one empty modified impinger (3rd); and two modified impingers (4th and 5th) with approximately 100 ml of 4% $KMnO_4$/10% H_2SO_4, and impinger #6 with approximately 200 g of silica gel. Sample is withdrawn isokinetically from each predetermined sample point (using Method 1) through the sample train which is followed by a vacuum line, pump, dry gas meter and calibrated orifice.



Sample Recovery

Container #1 - The filter is covered in its original petri dish.

Container #2 - The front half of the sample train is rinsed with 100 ml with 0.1N HNO_3 into a Nalgene container. (This rinse may be preceded with an acetone rinse if particulate matter is to be quantified).

Container #3 - The contents of impingers 1, 2, and 3 and the filter back half are rinsed with 0.1N HNO_3 into a precleaned glass sample bottle.

Container #4 - Impinger 4 is rinsed with 0.1N HNO_3 into a precleaned sample bottle.

Container #5 - Impingers 5 and 6 are rinsed with acidified potassium permangenate into a precleaned glass sample bottle.

Container #6 - If visible particulate is present, impingers 5 and 6 are rinsed with 25 ml of 8N HCl followed by 200 ml of DI H_2O in a glass sample container.

A blank train and reagent blank are collected and analyzed in the same manner as the samples.

Sample Analyses: An acid digestion is performed on sample containers 1, 2 and 3. An aliquot (10%) is removed for mercury analyses. The remaining samples are analyzed for individual metal species using ICAP, AA or ICP-MS. Containers #4, 5, 6 and the container 1, 2 and 3 aliquots are analyzed for mercury using CVAAS.