Jim Bridger Power Plant
P.O. Box 158
Point of Rocks, Wyoming 82942
(307) 382-9141

PACIFICORP
POWER SUPPLY

May 19, 2000

Mr. William Grimley
Emissions Measurement Center
Interstate 40 and Page Road
4930 Old Page Road
Room Number E-108
Durham, NC 27709

Attn: Electric Utility Steam Generating Unit Mercury Test Program

Dear Mr. Grimley:

Enclosed are three copies of the Mercury Emission Test Report for PacifiCorp's Jim Bridger Plant BW74.

Should you have any questions or concerns regarding this submittal, please contact Dale Gillespie at (307) 352-4281.

Sincerely,

Robert P. Arambel
Plant Manager

c: Environmental file-JB

AIR
POLLUTION
TESTING, INC.
DENVER, SALT LAKE CITY

Source Emissions Testing
Report for PacifiCorp:
Bridger Plant
Point of Rocks, Wyoming

Mercury Testing

Report prepared for:
PacifiCorp Environmental Services
1407 West North Temple
Salt Lake City, Utah 84140

Report reviewed by:

David Stewart
Director of Operations

Test Dates:
March 28 and 29, 2000

APT Project Number: PAC9401

DENVER OFFICE
12421 W. 49th Ave., Unit 1
Wheat Ridge, CO 80033
(303) 420-5949
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1. Introduction

Air Pollution Testing (APT) was contracted by Pacificorp to conduct a series of source tests on the inlet and outlet of Bridger Station's Unit #4 wet scrubber. The purpose of the testing program was to determine the operating efficiency of the wet scrubber for removal of particulate matter (PM) and elemental, oxidized and particle-bound mercury (Hg) from the flue gas. The testing was conducted as part of the U.S. Environmental Protection Agency (USEPA) Part III Mercury Information Collection Effort.

At Unit #4 inlet and outlet sampling locations, triplicate 120-minute sampling periods were conducted on March 28 and 29, 2000 while the unit maintained a load of approximately 520 MW.

The following table provides key project personnel, company affiliations, telephone and fax numbers.

Pacificorp : Bridger Station Unit #4 Mercury Testing Emissions Testing Program Contact Personnel		
Name, Title	*Company Address*	*Phone, FAX*
Frank Zampedri, Senior Environmental Analyst	PacifiCorp Environmental Services 1407 West North Temple Salt Lake City, Utah 84140	801-220-2169, 801-220-4307
Dale Gillespie, Environmental Engineer	PacifiCorp Bridger Plant 8 Miles N.E. of Point of Rocks P.O. Box 158 Point of Rocks, Wyoming 82942	307-352-4281, 307-352-4281
Paul Ottenstein, Program Manager	Air Pollution Testing, Inc. 12421 West 49th Avenue, Unit #2 Wheat Ridge, Colorado 80033	303-420-5949, 303-420-5920
David Stewart, Project & QA Manager		
Dr. Ron McLeod, Principal Scientist	Philip Analytical Services 5555 North Service Road Burlington, Ontario L7L 5H7 Canada	905-332-8788 x 236, 905-332-9165

Table 1.1: Emissions Testing Program Contact Personnel

2. Methods

APT tested in accordance with the following U.S. Environmental Protection Agency (EPA) and ASTM source emissions test methods. Methods 1 through 5 and 17 are referenced in *40 CFR Part 60, Appendix A*. The Ontario Hydro Method is a draft method currently being reviewed by ASTM Committee D-22 on Sampling and Analysis of Atmospheres, Subcommittee D22.03 on Ambient Atmospheres and Source Emissions.

- *Method 1 - Sample and Velocity Traverses for Stationary Sources*
- *Method 2 - Determination of Stack Gas Velocity and Volumetric Flow Rate (Type S Pitot Tube)*
- *Method 3 - Gas Analysis for the Determination of Dry Molecular Weight*
- *Method 4 - Determination of Moisture Content in Stack Gases*
- *Method 5 - Determination of Particulate Emissions from Stationary Sources*
- *Method 17 - Determination of Particulate Emissions from Stationary Sources (In-Stack Filtration Method)*
- *Draft Method - Standard Test Method for Elemental, Oxidized, Particle-Bound and Total Mercury in the Flue Gas Generated from Coal-Fired Stationary Sources (Ontario Hydro Method)*

3. Test Program Summary

The test program determined all parameters detailed in Table 3.1. At each sampling location, integrated samples were collected for off-site analysis to determine the speciated Hg and PM content of the gas streams. All samples were collected by APT personnel and delivered to Philip Analytical Services Corporation (PASC) in Ontario, Canada via overnight delivery. The sampling locations and sampling points are illustrated in Diagrams 3.1 and 3.2.

At the inlet location, an in-stack filter (Method 17) and teflon probe were used for sample collection. At the outlet (stack) location, the lower flue gas temperature required on out-of-stack filter (Method 5) and glass probe for sample collection.

3.1 Sampling Locations

Diagrams 3.1 and 3.2 provide details of the sample port placement and the sampling point locations. Unit #4 Outlet sampling location was a 393.5" diameter vertical stack with four ports arranged at 90 degree angles from one another. Twelve representative points were sampled. Unit #4 Inlet sampling location was a 23' x 20'4" horizontal duct with six sample ports arranged along the top side. 24 representative points were sampled from 4 of the 6 ports. The outer most port on each side of the duct was eliminated from the sampling grid due to flow restrictions and turbulence caused by irregular duct configuration.

PacifiCorp : Bridger Station Unit #4 Mercury Testing Sampling and Analytical Methods Summary			
Parameter	*Sampling Method*	*Analytical Method*	*Laboratory*
Gas Flow	Methods 1 and 2	draft gauge, S-type pitot tube	APT On-Site
Oxygen, Carbon Dioxide (O_2, CO_2)	Method 3	wet chemical (Orsat)	
Moisture (H_2O)	Method 4	gravimetric	
Particulate Matter	Method 5 and 17	gravimetric	PASC Burlington, Ont
Speciated Mercury	Ontario Hydro Method	cold vapor atomic absorption (CVAAS)	

Table 3.1: Sampling and Analytical Methods Summary

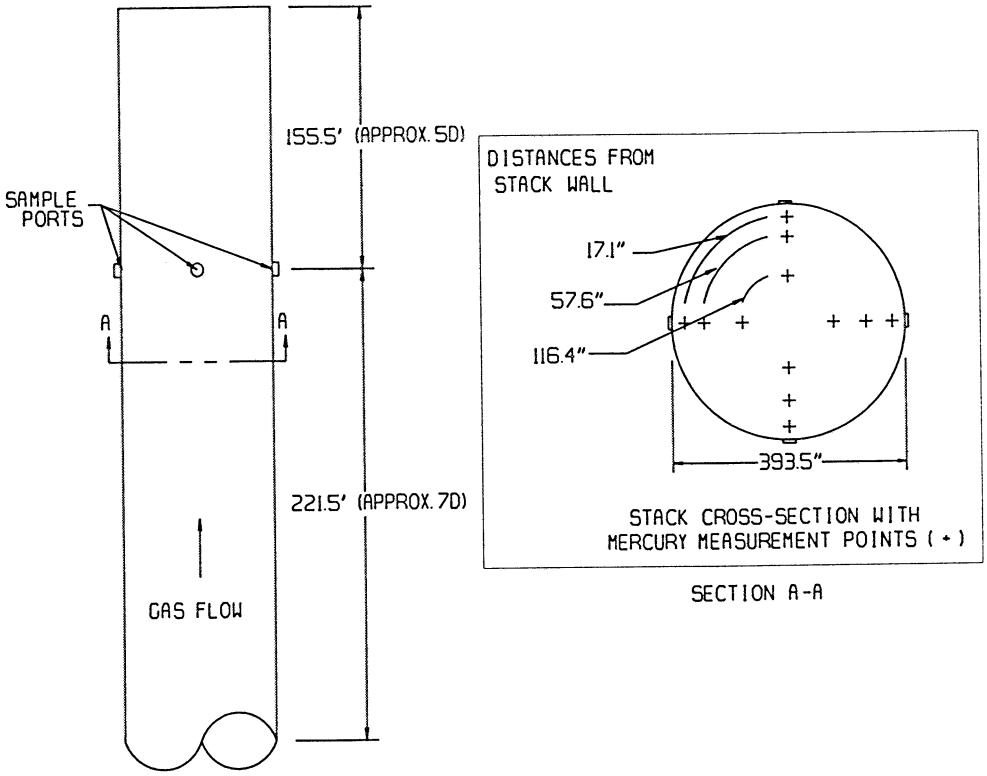

Diagram 3.1: Scrubber Exhaust Sampling Location Schematic (not to scale)

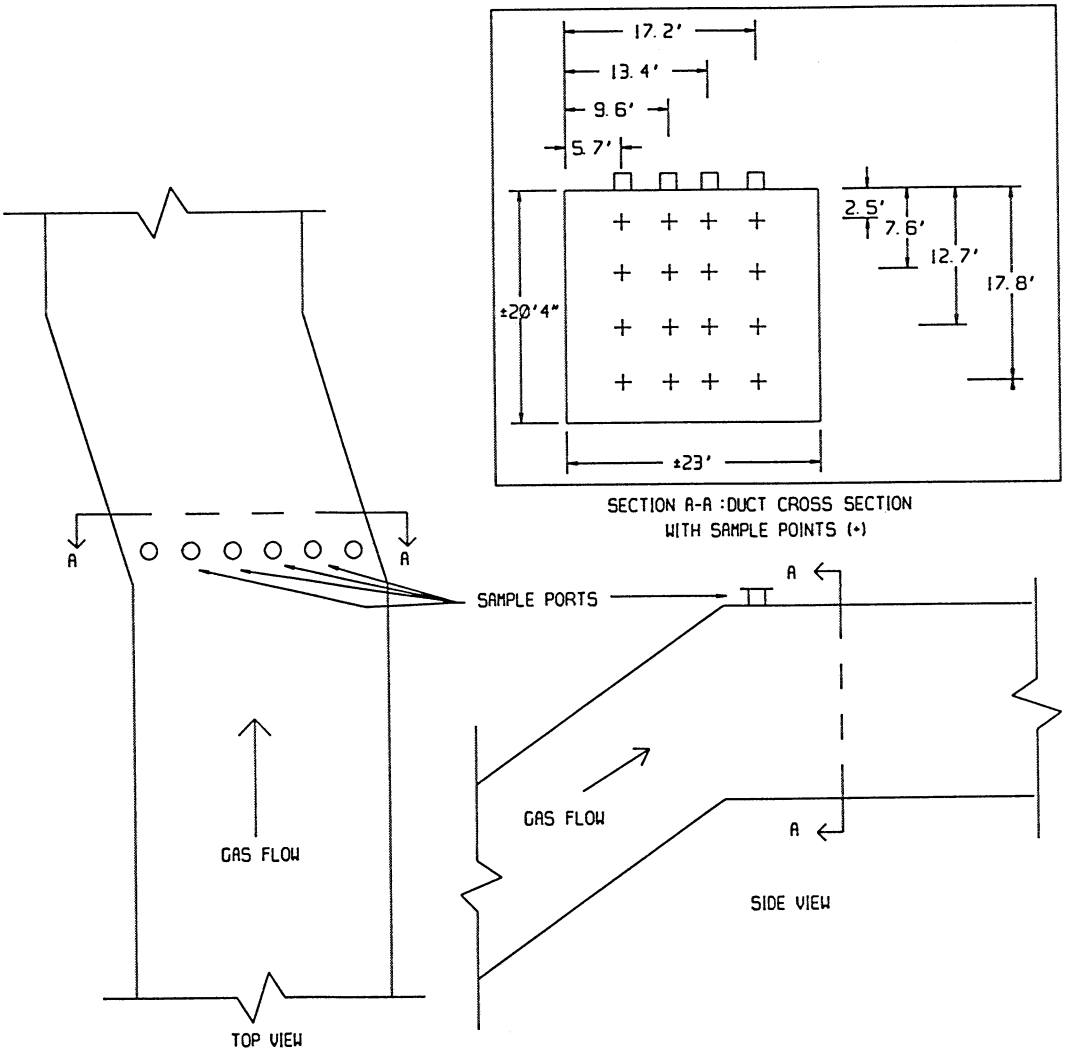

Diagram 3.2: Scrubber Inlet Sampling Location Schematic (not to scale)

4. Sampling and Analysis Details

4.1. Sampling Details

Gas flow rate, PM, and speciated Hg levels were determined in accordance with EPA Methods 1, 2, 3, 4, 5 (stack) or 17 (inlet), and ASTM Method D-22 Ontario Hydro Method. A summary of the testing parameters is provided in *Appendix 1 - Testing Parameters / Sample Calculations*. Copies of the field and laboratory data sheets are located in *Appendix 2 - Field and Laboratory Data*. Diagram 4.1 provides a schematic of the sampling train used at the scrubber stack. The scrubber inlet sampling train was similar, with the changes described below.

Each sampling period consisted of conducting a temperature and differential pressure traverse of the duct with a K-type thermocouple and an S-type pitot tube. Concurrently, a gas sample was extracted at an isokinetic flow rate.

At the stack, the gas passed through a glass in-stack nozzle, a heated glass probe liner, across a heated quartz fiber filter, through a series of 8 chilled glass impingers, and through a calibrated dry gas meter. An integrated gas sample was collected in a Tedlar bag. The average stack gas temperature was 179°F. Accordingly, the probe liner and filter housing were maintained at 120°C (248°F) throughout the sampling.

At the scrubber inlet, a teflon-coated, in-stack filter holder assembly was used in place of the out-of-stack filter used at the stack. Additionally, the probe liner material downstream of the filter assembly was changed to teflon. The filter assembly contained a 47 mm quartz filter. The scrubber inlet gas stream average temperature was 295°F. The teflon probe liner was maintained at 135°C (275°F) throughout the sampling.

Prior to sampling, the first three impingers were each seeded with 100 milliliters (ml) of potassium chloride (KCl). The fourth impinger was seeded with nitric peroxide (HNO_3/H_2O_2). The fifth, sixth, and seventh impingers were each seeded with 100 ml of acidified potassium permanganate ($KMnO_4$). The eighth impinger was seeded with approximately 250 grams of dried silica gel.

Following sampling, the moisture gain in the impingers was measured gravimetrically to determine the moisture content of the stack gas. The filters and a series of acetone rinses of the nozzle and sampling hardware upstream of the filters were quantitatively recovered for gravimetric analysis to determine the PM and particulate Hg content of the gas streams. The impinger contents were recovered according to the procedures provided in the Ontario Hydro Method to

determine the oxidized and elemental Hg content of the gas streams. The contents of the Tedlar bags were analyzed for oxygen and carbon dioxide content using an Orsat apparatus.

All of the above data were combined to calculate the gas velocity and volumetric flow rate in units of feet per second (ft/sec), actual cubic feet per minute (acfm), dry standard cubic feet per minute (dscfm), and pounds per hour (lb/hr). The PM levels were calculated in units of grains per dry standard cubic foot (gr/dscf) and lb/hr. Each Hg fraction (particulate bound, oxidized, elemental and total) was calculated in units of micrograms per dry standard cubic meter (µg/dscm) and lb/hr.

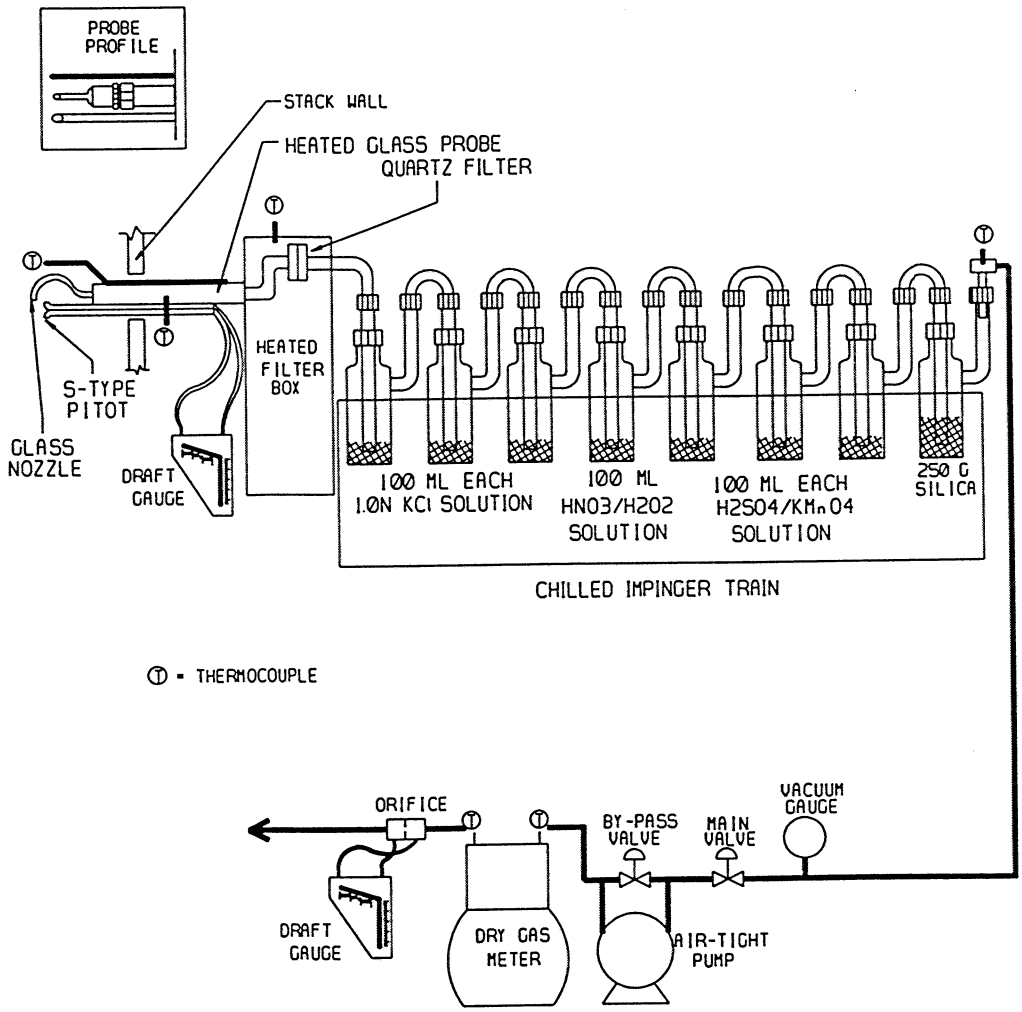

Diagram 4.1: EPA Methods 1 - 5 and Ontario Hydro Speciated Mercury Sampling Train Schematic

4.2. Quality Control / Quality Assurance

A mobile analytical trailer prepared and dedicated for the project was provided to maintain a clean, temperature controlled environment for sample train preparation and sample recovery. The trailer was located by the inlet sampling location.

4.2.1. Pre-Mobilization Quality Assurance Samples

Prior to departure for the test program, filters and aliquots of all reagents were analyzed for Hg. These analyses all indicated acceptably low background levels of mercury. All glassware was washed in accordance with the Ontario Hydro Method recommended procedures. Following this washing, a final rinse was conducted with 0.1N HNO_3. This final rinse solution was recovered and remains on hold at Philip Analytical for future analysis if glassware contamination is questioned.

4.2.2. On-Site Quality Assurance Samples

Solution, filter and field blanks were collected during the field sampling. No mercury was detected in any solution blank or any field blank fraction.

A field blank was collected at the inlet and outlet sampling locations during the testing campaign. Field blank collection procedures were as detailed in the Ontario Hydro Method.

4.3. Problems

4.3.1. Voided Run

The outlet sampling location Run #2 sampling train failed to meet the post test leak rate requirements. Both inlet and outlet samples were voided and a Run #4 was conducted.

4.4 Calculations

For pollutant sample fractions with "not detected" mercury values, the detection limits were used for calculations. For solution blank fractions with "not detected" mercury values, zero was used for calculations. This provides maximum possible mercury values for all pollutant samples.

5. Results

The results of the testing are presented in Table 5.1. Any testing parameters not found in the table may be found in *Appendix 1 - Testing Parameters / Sample Calculations*. The following terms and abbreviations are used in the table.

kdscfm - thousands of dry standard (68°F, 1 atm.) cubic feet per minute

temp. - temperature

gr/dscf - grains per dry standard cubic foot

ug/dscm - micrograms per dry standard cubic meter

lb/hr - pounds per hour

PacifiCorp : Bridger Station Unit #4 Mercury Testing
Test Results

gas parameter	Scrubber Inlet				Scrubber Outlet - Stack				Control Efficiency
	Run #1	Run #2	Run #3	**Average**	Run #1	Run #2	Run #3	**Average**	
gas flow (kdscfm)	833.8	795.0	803.4	**810.7**	1287.3	1256.0	1271.0	**1271.4**	
gas temperature (°F)	297	294	293	**295**	129	128	129	**129**	
% isokinetic	103.3	101.0	101.1	**101.8**	101.0	102.1	100.3	**101.1**	
Pollutant Data									
particulate (gr/dscf)	0.019	0.026	0.015	**0.020**	0.0049	0.0057	0.0056	**0.0054**	**71.7%**
elemental Hg (µg/dscm)	4.4	4.7	3.8	**4.3**	5.6	5.5	5.0	**5.4**	**-25.3%**
particulate Hg (µg/dscm)	0.04	0.37	0.06	**0.16**	0.053	0.039	0.028	**0.040**	**36.8%**
oxidized Hg (µg/dscm)	2.1	1.7	1.5	**1.8**	0.212	0.248	0.168	**0.209**	**88.0%**
total Hg (µg/dscm)	6.6	6.8	5.4	**6.3**	5.9	5.8	5.2	**5.6**	**9.7%**
particulate (lb/hr)	137	175	107	**140**	53.7	60.8	60.8	**58.5**	
elemental Hg (lb/hr)	0.014	0.014	0.012	**0.013**	0.027	0.026	0.024	**0.026**	
particulate Hg (lb/hr)	0.0001	0.0011	0.0002	**0.0005**	0.00026	0.00018	0.00013	**0.00019**	
oxidized Hg (lb/hr)	0.007	0.005	0.005	**0.005**	0.00102	0.00116	0.00080	**0.00100**	
total Hg (lb/hr)	0.021	0.020	0.016	**0.019**	0.028	0.027	0.025	**0.027**	

Table 5.1: Testing Results