Air Quality Permitting
Statement of Basis

July 28, 2006

Tier II Operating Permit and Permit to Construct
No. T2-030317

Idaho State University, Pocatello

Facility ID No. 005-00029

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FINAL PERMIT

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Acronyms, Units, and Chemical Nomenclature

AFS	AIRS Facility Subsystem
AIRS	Aerometric Information Retrieval System
AQCR	Air Quality Control Region
BACT	Best Available Control Technology
CFR	Code of Federal Regulations
CO	carbon monoxide
DEQ	Department of Environmental Quality
EPA	Environmental Protection Agency
HAPs	Hazardous Air Pollutants
IDAPA	A numbering designation for all administrative rules in Idaho promulgated in accordance with the Idaho Administrative Procedures Act
ISU	Idaho State University
lb/hr	pound per hour
MACT	Maximum Available Control Technology
MMBtu/hr	Million British thermal units per hour
MMscf	million standard cubic feet
NAAQS	National Ambient Air Quality Standards
NESHAP	Nation Emission Standards for Hazardous Air Pollutants
NO_X	nitrogen oxides
NSPS	New Source Performance Standards
O&M	Operation and Maintenance
PM	Particulate Matter
PM_{10}	Particulate Matter with an aerodynamic diameter less than or equal to a nominal 10 micrometers
PSD	Prevention of Significant Deterioration
PTC	Permit to Construct
Rules	Rules for the Control of Air Pollution in Idaho
scf	standard cubic feet
SIP	State Implementation Plan
SM	synthetic minor
SM80	synthetic minor with emissions of 80% or more of the major source threshold value
SO_2	sulfur dioxide
T/yr	Tons per year
UTM	Universal Transverse Mercator
VOC	volatile organic compound

1. PURPOSE

The purpose for this memorandum is to satisfy the requirements of IDAPA 58.01.01 Sections 201 and 404.04, Rules for the Control of Air Pollution in Idaho (Rules) for Tier II operating permits and permits to construct.

2. FACILITY DESCRIPTION

Idaho State University (ISU) operates the following equipment:

- 25 boilers
- Pathological waste incinerator
- Four emergency generators
- Two kilns
- Burnoff furnace
- Melting furnace

All units operate on natural gas except Boiler No. 2, which operates on coal, and two of the generators, which use diesel.

3. FACILITY / AREA CLASSIFICATION

Idaho State University is defined as a synthetic minor facility because, without permit limits on the potential to emit the SO_2 and NO_x emissions would each exceed 100 tons per year. The AIRS classification is "SM80" because the potential to emit of SO_2 and NO_x are limited to less than major source levels. The permitted SO_2 emissions are 95.6 tons per year and the permitted NO_x emissions are 95.1 tons per year for the facility, which are greater than 80% of the 100 ton per year major source threshold values for SO_2 and for NO_x.

The facility is located within AQCR 61 and UTM zone 12. The facility is located in Bannock County which is designated as attainment for PM_{10} and unclassifiable for all other criteria pollutants (CO, NO_x, SO_2, lead, and ozone).

The AIRS information provided in Appendix C defines the classification for each regulated air pollutant at Idaho State University. This required information is entered into the EPA AIRS database.

4. APPLICATION SCOPE

The purpose of this Tier II operating permit and permit to construct is to:

- Renew the existing Tier II operating permit
- Incorporate PTC No. P-050306, issued November 1, 2005, for Boiler No. 4
- Supersede PTC No. P-020328, issued January 13, 2004, for a pathological waste incinerator
- Permit a baghouse on Boiler No. 2
- Write permit limits for Boilers No. 1 and No. 3 to limit operation as a part of facility-wide NAAQS compliance demonstration

- Add permit condition to prohibit coal usage in Boiler No. 2 during an air pollution episode

This permit incorporates and replaces the following permits:

- PTC No. P-050306, issued November 1, 2005
- PTC No. P-020328, issued January 13, 2004
- PTC No. 005-00029, issued November 16, 1999 for an ash barrel
- Tier II Operating Permit No. 005-00029, issued June 6, 1997

4.1 *Application Chronology*

June 27, 2003	Tier II application received.
July 30, 2003	Application declared complete.
August 26, 2003	Additional information received.
December 4, 2003	Test done for Boiler No. 2.
May 4, 2004	DEQ requested Tier II application update.
June 8, 2004	Amended Tier II application received.
July 7, 2004	Additional information received.
May 31, 2005	Revised emission inventory received as part of Boiler No. 4 PTC application.
February 24, 2006	Issued facility draft permit.
March 6, 2006	Received comment from DEQ Pocatello Regional Office.
March 30, 2006	Received comments from ISU.
May 1, 2006	Proposed permit issued.
May 18, 2006 – June 16, 2006	Public comment period held.

5. PERMIT ANALYSIS

This section of the Statement of Basis describes the regulatory requirements for this Tier II and PTC.

5.1 Equipment Listing

EQUIPMENT LISTING

Boiler No. 1
(Backup or standby boiler)
Manufacturer: Babcock & Wilcox Co.
Model: H-1329
Burner type: Horizontally fired
Rating: 32.05 MMBtu/hr
Fuel type: Natural gas

Boiler No. 2
Manufacturer: Babcock & Wilcox Co.
Model: H-1329
Burner type: Dry bottom
Rating: 23 MMBtu/hr
Fuel type: Coal

Baghouse
(for Boiler No. 2)
Manufacturer: Staclean Diffuser Co.
Efficiency: 99.9% for PM & PM10

Boiler No. 3
Manufacturer: Superior
Model: Not available
Burner type: Horizontally fired
Rating: 26.92 MMBtu/hr
Fuel type: Natural gas

Emergency Generator No. 1
Manufacturer: Intermountain Power
Model: Generac 2000
Burner type: Not available
Rating: 0.539 MMBtu/hr
Fuel type: Natural gas

Emergency Generator No. 2
Manufacturer: Spectrum
Model: 400DS60
Burner type: Not available
Rating: 1.38 MMBtu/hr
Fuel type: No. 1 or No. 2 fuel oil

Emergency Generator No. 3
Manufacturer: Generac Power System
Model: Generac6.8GN
Burner type: Not available
Rating: 0.884 MMBtu/hr
Fuel type: Natural gas

Emergency Generator No. 4
Manufacturer: Kohler
Model: 60REOZJB
Burner type: Not available
Rating: 4.154 MMBtu/hr
Fuel type: No. 1 or No. 2 fuel oil

Incinerator
Manufacturer: National Incinerator
Model: 2H46M
Incinerator type: Dual chamber
Burner type: Axial firing
Waste retention time: 60 minutes
Rated heating capacity: 1.6 MMBtu/hr
Max. hourly combustion rate: 0.8 MMBtu/hr
Fuel type: Natural gas

Boiler B8
Manufacturer: Monitor
Model: M723-40
Rating: 1.674 MMBtu/hr
Fuel type: Natural gas

Boiler B9
Manufacturer: Cleaver Brooks
Model: CB 80 HP
Rating: 2.678 MMBtu/hr
Fuel type: Natural gas

Boiler B10
Manufacturer: Monitor
Model: M723-60
Rating: 2.511 MMBtu/hr
Fuel type: Natural gas

Boiler B11
Manufacturer: Pacific National
Model: PS-60GS
Rating: 2.677 MMBtu/hr
Fuel type: Natural gas

Boiler B12
Manufacturer: Sellers
Model: 77 Commodore
Rating: 3.348 MMBtu/hr
Fuel type: Natural gas

Boiler B13
Manufacturer: National BD
Model: H2-2100A-CEBRCAG
Rating: 2.1 MMBtu/hr
Fuel type: Natural gas

Boiler B14
Manufacturer: Laars
Model: LC-2871
Rating: 2.87 MMBtu/hr
Fuel type: Natural gas

Boiler B15
Manufacturer: National
Model: 10-66
Rating: 2.25 MMBtu/hr
Fuel type: Natural gas

Boiler B16
Manufacturer: Smith
Model: N95-1075
Rating: 3.844 MMBtu/hr
Fuel type: Natural gas

Boiler B17
Manufacturer: Weil McLain
Model: LGB series 1
Rating: 1.3 MMBtu/hr
Fuel type: Natural gas

Boiler B18
Manufacturer: Weil McLain
Model: MGB-8
Rating: 1.19 MMBtu/hr
Fuel type: Natural gas

Boiler B19
Manufacturer: Not available
Model: Not available
Rating: 0.299 MMBtu/hr
Fuel type: Natural gas

Boiler B20
Manufacturer: Not available
Model: 211-20-WT-1
Rating: 3.0 MMBtu/hr
Fuel type: Natural gas

Boiler B21
Manufacturer: HydroTherm
Model: AM300
Rating: 0.299 MMBtu/hr
Fuel type: Natural gas

Boiler B22
Manufacturer: Raypak
Model: Not available
Rating: 0.726 MMBtu/hr
Fuel type: Natural gas

Kiln K23
Rating: 0.0028 MMBtu/hr
Fuel type: Natural gas

Kiln K24
Rating: 0.1 MMBtu/hr
Fuel type: Natural gas

Burnoff Furnace F25
Manufacturer: Johnson burner
Rating: 0.2 MMBtu/hr
Fuel type: Natural gas

Melting Furnace F26
Manufacturer: Pyramid burner
Rating: 0.1 MMBtu/hr
Fuel type: Natural gas

Boiler B27
Manufacturer: Crane
Model: 66A series
Rating: 1.75 MMBtu/hr
Fuel type: Natural gas

Boiler B28
Manufacturer: Crane
Model: Sunnydale 302
Rating: 0.525 MMBtu/hr
Fuel type: Natural gas

EQUIPMENT LISTING

Boiler B29
Manufacturer: Laars
Model: NB33854
Rating: 0.5 MMBtu/hr
Fuel type: Natural gas

Boiler B30
Manufacturer: Laars
Model: NB 33978
Rating: 0.5 MMBtu/hr
Fuel type: Natural gas

Boiler B31
Manufacturer: A. O. Smith
Model: TW225V-942
Rating: 0.225 MMBtu/hr
Fuel type: Natural gas

Boiler B32
Manufacturer: A. O. Smith
Model: BT365A BBO
Rating: 0.365 MMBtu/hr
Fuel type: Natural gas

Boiler B33
Manufacturer: Lochinvar Corp.
Model: CHN2070
Rating: 20.7 MMBtu/hr
Fuel type: Natural gas

Boiler B34
Manufacturer: Lochinvar Corp.
Model: CFN0990PM
Rating: 0.832 MMBtu/hr
Fuel type: Natural gas

Boiler B35
Manufacturer: A. O. Smith
Model: BTC197970/BTC275973
Rating: 0.275 MMBtu/hr
Fuel type: Natural gas

Boiler No. 4
Manufacturer: Keystone
Model: Victory
Rating: 60,000 lb steam/hr
72.84 MMBtu/hr
Fuel type: Natural gas

Art Department Ash Barrel
Burns wood chips and paper
Burns less than 100 lb/hr and 1,000 lb/yr
Located 100 meters from property line

5.2 *Emissions Inventory*

A complete emission inventory is shown in Appendix A. The emission inventory summary is presented below.

The SO_2 emissions from Boiler No. 2 are based on a source test conducted on December 4, 2003. The coal used during the test contained 0.49% sulfur, with a resulting SO_2 emission rate of 26.0 lb/hr. To allow the facility to use coal with a wider sulfur content range, the SO_2 permit limit was calculated by scaling up the SO_2 emission rate using the sulfur content in the coal used during the test and a higher allowable sulfur content of 0.9% (the regulatory limit is 1.0% sulfur in coal), as follows:

26 lb/hr SO_2 x 1/0.49% sulfur x 0.9% sulfur (sulfur % limit) = 47.76 lb/hr SO_2

The SO_2 modeled was 47.7 lb/hr and, combined with the other SO_2 sources at the facility, resulted in a modeled concentration that is 83.7% of the NAAQS for the 24-hour SO_2 standard (the 3-hour and the annual standards were less than 83.7%).

The test used 7.77 tons of coal in eight hours, for an average hourly rate of 0.97 tons per hour and an SO_2 emission rate of 26 lb/hr. The facility is allowed to burn a maximum of 3,854 tons of coal per year. The corresponding annual SO_2 limit, adjusted for allowable sulfur content, is calculated as follows:

26 lb SO_2/hr x 0.9/0.49 x (3,854 tons coal/yr)/(0.97 tons coal/hr) x 1 ton/2,000 lb = 94.87 tons SO_2/yr

The emissions from Boilers Nos. 8-22, 27-34, and 36 were estimated at 8,760 hours of operation per year (maximum capacity).

Particulates and NO_x emission estimates were also based on the December 4, 2003 source testing.

Table 5.1 EMISSION INVENTORY

Source	PM[a]		PM_{10}[b]		Sulfur Dioxide		VOC[c]		Nitrogen Oxides		Carbon Monoxide	
	(lb/hr)[d]	(T/yr)[e]	(lb/hr)[d]	(T/yr)[e]	(lb/hr)[d]	(T/yr)[e]	(lb/hr)[d]	(T/yr)[e]	(lb/hr)[d]	(T/yr)[e]	(lb/hr)[d]	(T/yr)[e]
Boiler #1 (2,400 hrs/yr)	0.239	0.29	0.239	0.29	0.0189	0.02	0.173	0.2	3.14	3.77	2.64	3.17
Boiler #2 Coal (3854 T/yr)	0.0253	0.0436	0.0128	0.022	47.7	94.9	0.0353	0.116	32.6	56.2	0.294	0.964
Natural gas (1,440 hrs/yr)	2.4E-4	1.7E-4	2.4E-4	1.7E-4	0.0189	0.0136	0.173	0.124	3.14	2.26	2.64	1.90
Max. emission	**0.0253**	**0.0436**	**0.0128**	**0.022**	**47.7**	**94.9**	**0.173**	**0.124**	**32.6**	**56.2**	**2.64**	**1.90**
Boiler #3 (6,552 hrs/yr)	0.201	0.657	0.201	0.657	0.0158	0.0519	0.145	0.476	1.32	4.32	2.22	7.26
Boiler No. 4 Natural Gas, 72.84 MMBtu/hr	0.54	1.8	0.54	1.8	0.04	0.1	0.39	1.3	3.57	11.7	6.00	19.7
Emergency Generators #1, 2, 3, and 4 (Based on 500 hours per year)	1.73	0.43	1.73	0.43	1.6	0.4	2.27	0.57	28.34	6.89	10.56	5.59
Incinerator	0.0693	0.3	0.0693	0.3	0.0724	0.3	0.01	0.04	0.267	1.2	0.02	0.09
Boilers (Items 8-22, 27-34, and 36) Kilns (Items 23 and 24) Burnoff Furnace (Item 25) Melting Furnace (Item 26)	0.22	0.98	0.22	0.98	0.02	0.08	0.16	0.71	2.94	12.89	2.47	10.83
Total:	**3.0**	**4.5**	**3.0**	**4.4**	**49.5**	**95.8**	**3.3**	**3.4**	**72.2**	**97.0**	**26.6**	**48.6**

a) Particulate Matter
b) Particulate Matter with an aerodynamic diameter less than or equal to a nominal 10 micrometers
c) Volatile Organic Compounds
d) Pounds per hour
e) Tons per year

Table 5.2 shows the potential to emit of the equipment in order to determine synthetic minor status.

Table 5.2 EMISSION INVENTORY, POTENTIAL TO EMIT (W/O CONTROLS)

Source	PM[a]	PM_{10}[b]	Sulfur Dioxide	VOC[c]	Nitrogen Oxides	Carbon Monoxide
	(T/yr)[d]	(T/yr)[d]	(T/yr)[d]	(T/yr)[d]	(T/yr)[d]	(T/yr)[d]
Boiler #1	1.05	1.05	0.08	0.76	13.76	11.56
Boiler #2	120.89	60.88	143.23	0.15	155.49	1.29
Boiler #3	0.88	0.88	0.07	0.64	5.78	9.71
Boiler #4	2.32	2.32	0.17	1.68	15.35	25.8
Emergency Generators #1, 2, 3, and 4	0.43	0.43	0.40	0.37	6.89	2.64
Incinerator	0.3	0.3	0.32	0.04	1.17	0.09
Boilers (Items 8-22, 27-34, and 36) Kilns (Items 23 and 24) Burnoff Furnace (Item 25) Melting Furnace (Item 26)	0.98	0.98	0.08	0.71	12.89	10.83
Total:	**126.85**	**66.84**	**144.35**	**4.35**	**211.33**	**61.92**

a) Particulate Matter
b) Particulate Matter with an aerodynamic diameter less than or equal to a nominal 10 micrometers
c) Volatile Organic Compounds
d) Tons per year

5.3 *Modeling*

The air dispersion modeling analysis was done for PTC No. P-050306 and included facility-wide modeling. This modeling showed compliance with applicable NAAQS. The DEQ air dispersion modeler stated that this memo is sufficient for the Tier II modeling analysis. The modeling memo showing the detailed modeling analysis is shown in Appendix B.

5.4 Regulatory Review

This section describes the regulatory analysis of the applicable air quality rules with respect to this PTC and Tier II operating permit.

IDAPA 58.01.01.201 ..... Permit to Construct Required

This PTC/Tier II operating permit incorporates PTC No. P-050306, issued November 1, 2005, for Boiler No. 4, supersedes PTC No. P-020328, issued January 13, 2004, for a pathological waste incinerator, and incorporates and replaces PTC No. 005-00029, issued November 16, 1999 for an ash barrel.

IDAPA 58.01.01.401 ..... Tier II Operating Permits

This permit is required in accordance with IDAPA 58.01.01.401.03, Tier II Operating Permit Required by the Department.

The Director may require or revise a Tier II operating permit for any stationary source or facility whenever the Department determines that:

a. Emission rate reductions are necessary to attain or maintain any ambient air quality standard or applicable prevention of significant deterioration (PSD) increment; or

b. Specific emission standards, or requirements on operation or maintenance are necessary to ensure compliance with any applicable emission standard or rule.

DEQ has evaluated the Tier II operating permit application and determined that emission limits and operational controls are required for Boilers No. 1, No. 2, and No. 3 in order to be consistent with the facility wide model that assures compliance with the NAAQS.

IDAPA 58.01.01.677 ..... Fuel Burning Equipment-Particulate Matter

This regulation was written for Boilers No. 1 and No. 3 as follows:

5.3 ***Particulate Emissions Limits***

PM emissions from the Boiler No. 1 stack or the Boiler No. 3 stack shall not exceed 0.015 grains per dry standard cubic foot (corrected to 3% oxygen) when burning gas as required in IDAPA 58.01.01.677.

IDAPA 58.01.01.625 ..... Visible Emissions

This regulation was written for Boilers No. 1 and No. 3 at section 5.4 of the permit.

40 CFR 60 Subpart Dc ..... Standards of Performance for Steam Generating Units

(a) Except as provided in paragraph (d) of this section, the affected facility to which this subpart applies is each steam generating unit for which construction, modification, or reconstruction is commenced after June 9, 1989 and that has a maximum design heat input capacity of 29 megawatts (MW) (100 million Btu per hour (Btu/hr)) or less, but greater than or equal to 2.9 MW (10 million Btu/hr).

Boiler No. 1 is rated at 32.05 MMBtu/hr and was constructed in 1947, and Boiler No. 3 is rated at 26.92 MMBtu/hr and was constructed in 1957. Because the boilers were constructed prior to June 9, 1989, Subpart Dc does not apply.

IDAPA 58.01.01.210..... Demonstration of Preconstruction Compliance with Toxic Standards

The TAP analyses for Boiler No. 4, the pathological waste incinerator, and the ash barrel were conducted as a part of the PTC analysis for each of those sources. A facility-wide TAP analysis was conducted and demonstrated compliance with the increments specified in IDAPA 58.01.01.585 and 586 by air dispersion modeling.

5.5 Fee Review

In accordance with IDAPA 58.01.01.407, a Tier II operating permit processing fee is due. Idaho State University is a synthetic minor source because, without permit limits on the potential to emit, the SO_2 and NO_x emissions would each exceed 100 tons per year. These emissions are limited by permit below major threshold levels. The total emissions from the facility are 249 tons per year. For synthetic minor stationary sources with permitted emissions of 100 tons or more per year, the processing fee is $10,000.

Table 5.1 TIER II PROCESSING FEE SUMMARY

Emissions Inventory	
Pollutant	**Permitted Emissions**
NO_X	97.0
SO_2	95.8
CO	48.6
PM_{10}	4.4
VOC	3.4
TAPS/HAPS	0.005
Total:	249.2
Fee Due	**$ 10,000.00**

5.6 Regional Review of Draft Permit

A facility draft permit was provided to the DEQ Pocatello Regional Office on February 24, 2006. A comment was received stating that it had been decided earlier to remove the art department burn barrel from the permit. This was done.

5.7 Facility Review of Draft Permit

A facility draft permit was provided to the facility on February 24, 2006. The facility's comments were incorporated.

6. PERMIT CONDITIONS

This section summarizes the changes that were made to the Tier II operating permit conditions with this renewal action.

NO_x and SO_2 were limited in the previous Tier II operating permit as follows:

1.1 Emissions of oxides of nitrogen (NO_x), particulate matter (PM), and particulate matter with an aerodynamic diameter less than or equal to ten (10) micrometers (PM-10) from the #2 Boiler stack shall not exceed any corresponding emission rate limit listed in Appendix A.

Appendix A

Emission Limits[a] – Hourly (lb/hr) and Annual[b] (T/yr)

Source Description	*SO_2*		*NO_x*	
	lb/hr	*T/yr*	*lb/hr*	*T/yr*
Steam Plant Boiler #2	*53.8*	*66.12*	*34.0*	*48.82*

a *As determined by a pollutant specific promulgated U.S. EPA method, or DEQ approved alternative, or as determined by DEQ's emission estimation methods used in this permit analysis.*

b *As determined by multiplying the actual or allowable (if actual is not available) pound per hour emission rate by the actual hours per year that the process operates.*

It can be noted that section 1.1 did not specifically mention SO_2, while Appendix A has a limit for SO_2. Also, PM and PM_{10} are not included in the table.

This permit condition has been revised. The emissions limits for NO_x have been reduced and a limit on SO_2 created to match the emission estimates modeled in the analysis for this Tier II operating permit action which demonstrates compliance with the NAAQS. Because the boiler emissions are now controlled by a baghouse, the particulate emissions have been reduced to less than one pound per hour. Because this emission rate is very low, the PM and PM_{10} emissions limits for lb/hr and T/yr are not needed to ensure compliance with the NAAQS and have been removed from the permit. The PM and PM_{10} emission rates are limited by permit conditions requiring use and maintenance of the baghouse.

The revised permit condition, renumbered as Permit Condition 3.3, limits the NO_x and SO_2 emissions as follows:

3.3 Emission Limits

The SO_2 and NO_X emissions from the Boiler No. 2 stack shall not exceed any corresponding emissions rate limits listed in Table 3.2.

Table 3.2 BOILER NO. 2 EMISSIONS LIMITS

Source Description	SO_2		NO_X	
	lb/hr	T/yr	lb/hr	T/yr
Boiler No. 2	47.7	94.9	32.6	56.2

The permit condition for opacity has been rewritten to clarify which emissions units are ducted to the common stack and to remove the statement that opacity will be determined using DEQ's "Procedures Manual for Air Pollution Control." Currently, the procedures contained in IDAPA 58.01.01.625 are used to determine compliance.

3.5 Opacity

Visible emissions from the common stack (Boiler No. 1 and Boiler No. 2 exhaust through the same stack) shall not exceed 20% opacity for a period or periods aggregating more than three minutes in any 60-minute period as determined by procedures contained in IDAPA 58.01.01.625.

Permit Condition 3.6

Permit Condition 3.6 was modified to limit the sulfur content of the coal used in Boiler No. 2 to 0.9% by weight. The previous permit limited sulfur to 1%. In the current permit analysis, the sulfur content was reduced so that modeling of the SO_2 emissions would demonstrate compliance with the NAAQS.

The current SO_2 emission estimate was modeled and demonstrated compliance with the NAAQS for SO_2.

Previous Permit Condition 2.4 from Tier II Operating Permit No. 005-00029 issued June 6, 1997

The #2 Boiler shall produce no more than 16,000 pounds of steam per hour when burning any combination of coal and natural gas.

Coal Usage

Limitations for coal usage had been established with the previous Tier II operating permit and remain the same.

Steaming Rate

The steaming rate was reduced from the previous permit based on information supplied by the facility on 7/12/04 which asserted that the maximum steam produced is 23,000 lb/hr.

Natural Gas Usage

Because the emission estimates for Boiler No. 2 were based on a maximum usage of 1,440 hours per year using natural gas, in lieu of limiting the hours of operation, a limit was written for the natural gas that would be used based on operating the boiler at maximum capacity for 1,440 hours per year, using the maximum MMscf of gas used for the year, as follows:

1,440 hours/year x 23 MMBtu/hour x 1 scf/1,020 Btu = 32.5 MMscf/year

The following permit condition was written to incorporate this limit:

3.9 Natural Gas Throughput Limit

Boiler No. 2 shall burn no more than 32.5 million standard cubic feet of natural gas per any consecutive 12-month period.

Because the PM_{10} emission estimates for Boiler No. 2 from coal combustion were based on the use of a new baghouse, the following permit conditions were written to ensure that the baghouse is used, maintained, and operated properly:

3.10 Baghouse Operating Requirement

The permittee shall use a baghouse to control PM_{10} emissions from Boiler No. 2 when burning coal.

3.11 Baghouse Pressure Drop

The permittee shall install, operate, and maintain a device to measure the pressure drop across the baghouse. The pressure drop shall be maintained within manufacturer's and Operation and Maintenance (O&M) Manual specifications. Documentation of the operating pressure drop specifications for the baghouse shall remain onsite at all times and shall be made available to Department representatives upon request.

3.12 Operations and Maintenance Manual Requirements

Within 60 days after startup, the permittee shall have developed an O&M manual for the baghouse on Boiler No. 2, which describes the procedures that will be followed to comply with General Provision 2 and the manufacturer specifications for the baghouse. The manual shall include the specification for the

acceptable pressure drop range. This manual shall remain onsite at all times and shall be made available to Department representatives upon request.

This permit limit was established during the analysis of potential emissions in the original Tier II operating permit. Without limitations, the estimated emissions of NO_x from the combustion of natural gas in the boiler cause the facility-wide NO_x emissions to exceed 100 tons per year. In the previous Tier II operating permit, the amount of steam was limited while natural gas and coal were fired at the same time in order to limit the NO_x emissions from natural gas.

In this current permit action, the amount of natural gas throughput is limited for Boiler No. 2 instead of limiting the amount of steam to limit the emissions of NO_x from the combustion of natural gas. In addition, the facility informed DEQ via e-mail dated 7/12/04 which stated that "either coal or gas is used as fuel but not together at the same time." Therefore, the permit condition regarding the combustion of natural gas and coal at the same time is not needed, and has been replaced with a permit condition which limits natural gas usage and requires tracking of natural gas use in Boiler No. 2. To monitor the amount of natural gas used in order to assess compliance with the natural gas throughput limit, the following permit condition was written for Boiler No. 2:

3.17 Natural Gas Throughput

The permittee shall monitor and record the amount, in million standard cubic feet, of natural gas burned by Boiler No. 2 each month and for the most recent 12-month period.

Permit Condition 3.4 and the corresponding recordkeeping requirement in Permit Condition 4.2 were removed and were replaced by a permit condition which requires tracking of natural gas use.

Previous Permit Condition 3.4

The permittee shall record the date and time of day when Boiler No. 2 begins and stops burning any combination of natural gas and coal.

To monitor the pressure drop across the baghouse for Boiler No. 2 to assess compliance with the baghouse pressure drop limitation, the following permit condition was written:

3.18 Pressure Drop Monitoring

The permittee shall monitor and record the pressure drop across the baghouse once per week, when operating.

Pocatello State Implementation Plan

During the development of the SIP, DEQ documented various control measures that are utilized in the area. For the past five to six years, ISU has been voluntarily switching from burning coal to natural gas when they are notified by DEQ. DEQ is unable to take credit (in the SIP) for this voluntary measure from ISU since the switch has not been enforceable (not tied to a permit). Because of this reason, DEQ listed the modification of ISU's permit as a contingency measure in the SIP (see page 83 and 83 of SIP).

Section 175 A of the Clean Air Act requires that contingency measures are in place for maintenance plans. The Portneuf Valley SIP contains the following three components: SIP, maintenance plan, and re-designation request, thereby making contingency measures necessary.

In Pocatello during the winter months, both voluntary and mandatory burn bans can be called. These bans are typically due to pollutant levels and inversion conditions. These burn bans are not necessarily tied to the air pollution emergency episodes, and the various stages of forecast and caution.

In order for DEQ to be able to take credit in the SIP for the emission reductions from ISU switching from coal to natural gas during a burn ban, the following permit condition was written:

New Permit Condition 3.20

"If PM_{10} reaches 70 $\mu g/m^3$ or greater for a 24 hour average DEQ will notify the ISU boiler room [weekdays 282-2209 or weekends 282-2696], that a burn ban has been initiated, and ISU shall switch from burning coal to natural gas within two hours of receiving the call. When 24-hour average falls below 70 $\mu g/m^3$, DEQ will again notify the ISU boiler room when they are able to switch back to coal."

Permit Condition 3.16 was written to correspond to the burning of coal and natural gas at the same time, which has been eliminated as discussed for Permit Condition 2.4. Permit Condition 3.16 was revised to require recording of the date and time when DEQ notifies ISU that a burn ban has been initiated, the date and time that Boiler No. 2 stops burning coal after received the notification, the date and time when DEQ notifies ISU is able to switch back to coal, and the date and time that ISU resumes burning coal after the notification is received in accordance with Permit Condition 3.20. ISU is not required to record the date and time of coal burning not related to burn bans.

3.16 Date and Time of Coal Burning

The permittee shall record the date and time for the following in accordance with Permit Condition 3.20:

- *DEQ notifies ISU that a burn ban has been initiated,*
- *Boiler No. 2 stops burning coal after received the notification,*
- *DEQ notifies ISU is able to switch back to coal,*
- *ISU resumes burning coal after the notification is received.*

Permit Condition 3.19.2 requires tracking of this information and has been modified from the original wording.

Previous Permit Condition 3.19.2:

The permittee shall maintain a monthly report containing the information required to be monitored and recorded by Permit Conditions 3.15 and 3.16 of this permit. The report shall clearly show when Boiler No. 2 has commenced burning only coal, the steam production rate when burning the aforementioned fuel, and when Boiler No. 2 has completed burning the aforementioned fuel.

Revised Permit Condition 3.19.2:

The permittee shall maintain a monthly report containing the information required to be monitored and recorded by Permit Conditions 3.15 and 3.16 of this permit.

Coal Throughput

The coal throughput limit and monitoring were revised to clarify that the yearly limit is "any consecutive 12-month period" and the monitoring is for one month and every consecutive 12-month period. All other permit conditions remain the same as Tier II Operating Permit No. 005-00029, issued

June 6, 1997. References to "the #2 Boiler" have been changed to "Boiler No. 2" for consistency with the Tier II operating permit renewal application and other recent correspondence for this boiler.

Boilers No. 1 and No. 3

The steam production rate was limited for Boilers No. 1 and No. 3 monthly and annually as a surrogate for limiting NO_x and PM_{10}. Annual air dispersion modeling was based on a limited number of hours of operation at maximum steam production rate. Monthly monitoring is required in order to calculate a rolling 12-month average to ensure the annual limit is not exceeded. The steam limits were calculated using the maximum hourly steam production multiplied by the requested annual hours of operation.

Boiler No. 1: 25,000 pounds steam/hr x 1,200 hours of operation per year = 30 MM lbs/year steam

Boiler No. 3: 21,000 pounds steam/hr x 6,552 hours of operation per year = 138 MM lbs/yr steam
The emission estimates used to demonstrate compliance with the NAAQS for Boilers No. 1 and No. 3 were based on natural gas throughput rates which are limited in the permit as follows:

5.5 Natural Gas Throughput Limit

Boiler No. 1 shall burn no more than 75.4 million standard cubic feet of natural gas per any consecutive 12-month period.

Boiler No. 3 shall burn no more than 173 million standard cubic feet of natural gas per any consecutive 12-month period.

5.6 Natural Gas Throughput

The permittee shall monitor and record the amount, in million standard cubic feet, of natural gas burned by Boiler No. 1 and Boiler No. 3, individually, each month and for the most recent 12-month period.

Incinerators

The Gail Life Sciences Incinerators #1 and #2 were removed and replaced by the pathological waste incinerator. The permit conditions associated with the Life Sciences incinerators were removed and replaced by the permit conditions from PTC No. P-020328, issued 1/13/04.

Permit Condition 4.9 was reworded to eliminate the prescriptive compliance determination method and leave that determination for the DEQ inspector.

Previous Permit Condition 4.9:

Secondary Chamber Operating Temperature

The secondary combustion chamber shall operate at an average hourly temperature of at least 1600°F for the combustion cycle and for at least ½ hour after the end of the combustion cycle. Compliance with this permit condition shall be determined by visual estimation of the recording made by the continuous temperature monitoring and recording device specified in Permit Condition 4.8.

Revised Permit Condition 4.9:

Secondary Chamber Operating Temperature

The secondary combustion chamber shall operate at an average hourly temperature of at least 1600 °F for the combustion cycle and for at least ½ hour after the end of the combustion cycle.

Ash Barrel

PTC No. 005-00029, issued November 16, 1999, for the art department ash barrel has been evaluated as part of this Tier II operating permit. The evaluation was made for the emissions from this unit based on its operational design capacity to determine if the barrel needed specific permit limitations. The ash barrel is used a few times a year to burn small amounts of wood chips and paper to create ashes. The ashes are applied to pottery in order to give the pottery a unique glaze. This operational design of the unit limits the potential to emit to quantities that are negligible. Because the emissions are negligible, the permit conditions in PTC No. 005-00029 are not required and have been removed in this PTC/Tier II operating permit modification. This source is now listed in Table 1.2 of the permit, Other Air Pollution Sources at the Facility.

The following are the permit conditions that were in PTC No. 005-00029 that have been removed:

Process Description

Idaho State University Art Department uses a burn barrel to burn wood chips and paper to create ashes. The ashes are applied to pottery in order to give the pottery a unique glaze.

Emission Control Description

The emissions from the ash barrel are uncontrolled.

Fuel Type

The permittee shall burn only wood products in the ash barrel.

Barrel Location

The ash barrel shall be located at least 100 meters inside the Idaho State University property boundary.

Stack Requirements

The ash barrel shall have a stack in place while burning is occurring and shall be operated in accordance with General Provision 2.

Throughput Limits

The maximum hourly throughput of wood to the ash barrel shall not exceed 100 pounds per hour. The maximum annual throughput of the ash barrel shall not exceed 1,000 pounds per any consecutive 12-month period.

Air Stagnation Advisory Days

No operation of the ash barrel shall occur during days of Air Stagnation Advisory.

Fuel Monitoring

Each day that the ash barrel is used, the permittee shall monitor and record the type of fuel used.

Barrel Location

Each day that the ash barrel is used, the permittee shall record a certification that the ash barrel is located at least 100 meters inside the Idaho State University property boundary.

Throughput Monitoring

Each day that the ash barrel is used, the permittee shall monitor and record the throughput of wood fuel, in pounds, for that day and for the most recent 12-month period. Each day that the ash barrel is used, the permittee shall monitor and record duration of burning in hours. The permittee shall divide the weight of wood burned that day by the duration of burning (in hours) to determine a pound per hour throughput. The most recent two years' compilation of data shall be kept on site and shall be made available to DEQ representatives upon request.

Certification of Documents

All documents including, but not limited to, records, monitoring data, supporting information, requests for confidential treatment, testing reports, and compliance certifications submitted to DEQ shall contain a certification by a responsible official. The certification shall state that, based on information and belief formed after reasonable inquiry, the statements and information in the document(s) are true, accurate, and complete.

Boiler No. 4

PTC No. P-050306, issued November 1, 2005, for Boiler No. 4 has been incorporated into this facility-wide Tier II operating permit without changes other than renumbering the permit conditions.

7. PUBLIC COMMENT

In accordance with IDAPA 58.01.01.404.01.c, a public comment period on the proposed Tier II operating permit and application materials was provided. The public comment period started on May 18, 2006 and ended on June 16, 2006. No comments regarding DEQ's proposed action were received.

8. RECOMMENDATION

Based on the review of the application materials, and all applicable state and federal regulations, staff recommends that DEQ issue Tier II Operating Permit and Permit to Construct No. T2-030317 to Idaho State University.

CZ/bf Permit No. T2-030317

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APPENDIX A

Emissions Inventory

Boiler #1

Emissions Estimates for Boiler #1: Based on maximum operating conditions

Date: 30-Aug-00

Location: Heat Plant - Building #20

Equipment Description	Fuel	Maximum Equipment Capacity		Emission Factors from EPA 42: Reference Table			Following estimates based on Emission Factors:	
						calculated	calculated	calculated
		lb/hr	MMBtu/hr		lb/10⁶ scf	lb/MMBtu	lb/hr	ton/yr
Boiler I	Gas	30,000	30.00					
CO				EPA 42 Table 1.4-1[1]	84	0.080	2.84 E+00	3.17 E+00
NO_x				EPA 42 Table 1.4-1[1]	100	0.098	3.14 E+00	3.77 E+00
SO_2				EPA 42 Table 1.4-2	0.60	0.00059	1.88 E-02	2.20 E-02
PM10				EPA 42 Table 1.4-2	7.60	0.0076	2.38 E-01	2.87 E-01
PM				EPA 42 Table 1.4-2	7.60	0.0076	2.38 E-01	2.87 E-01
Pb				EPA 42 Table 1.4-2	0.0005	4.90 E-07	1.57 E-05	1.88 E-05
VOC				EPA 42 Table 1.4-2	5.50	0.005	1.73 E-01	2.07 E-01
TOC				EPA 42 Table 1.4-2	11.00	0.011	3.46 E-01	4.15 E-01
2-Methylnaphthalene				EPA 42 Table 1.4-3	2.4 E-05	2.36 E-08	7.54 E-07	9.05 E-07
3-Methylchloranthrene				EPA 42 Table 1.4-3	1.8 E-05	1.76 E-08	5.65 E-06	6.79 E-06
7,12-Dimethylbenz(a)anthracene				EPA 42 Table 1.4-3	1.6 E-05	1.57 E-08	5.03 E-07	6.04 E-07
Acenaphthene				EPA 42 Table 1.4-3	1.8 E-05	1.76 E-08	5.65 E-06	6.79 E-06
Acenaphthylene				EPA 42 Table 1.4-3	1.8 E-05	1.76 E-08	5.65 E-06	6.79 E-06
Anthracene				EPA 42 Table 1.4-3	2.4 E-05	2.35 E-08	7.54 E-06	9.05 E-06
Arsenic				EPA 42 Table 1.4-4	2.0 E-04	1.96 E-07	6.28 E-05	7.54 E-05
Barium				EPA 42 Table 1.4-4	4.4 E-03	4.31 E-06	1.38 E-04	1.66 E-04
Benz(a)anthracene				EPA 42 Table 1.4-3	1.8 E-05	1.76 E-08	5.65 E-06	6.79 E-06
Benzene				EPA 42 Table 1.4-3	2.1 E-03	2.06 E-06	6.60 E-05	7.92 E-05
Benzo(a)pyrene				EPA 42 Table 1.4-3	1.2 E-05	1.18 E-08	3.77 E-06	4.52 E-06
Benzo(b)fluoranthene				EPA 42 Table 1.4-3	1.8 E-05	1.76 E-08	5.65 E-06	6.79 E-06
Benzo(g,h,i)perylene				EPA 42 Table 1.4-3	1.2 E-05	1.18 E-08	3.77 E-06	4.52 E-06
Benzo(k)fluoranthene				EPA 42 Table 1.4-3	1.8 E-05	1.76 E-08	5.65 E-06	6.79 E-06
Beryllium				EPA 42 Table 1.4-4	1.2 E-05	1.18 E-08	3.77 E-07	4.52 E-07
Boron				EPA 42 Table 1.4-3	2.1 E+00	2.06 E-03	6.60 E-02	7.92 E-02
Cadmium				EPA 42 Table 1.4-4	1.1 E-03	1.08 E-06	3.46 E-05	4.15 E-05
Chromium				EPA 42 Table 1.4-4	1.4 E-03	1.37 E-06	4.40 E-05	5.28 E-05
Chrysene				EPA 42 Table 1.4-3	1.8 E-05	1.76 E-08	5.65 E-06	6.79 E-06
Cobalt				EPA 42 Table 1.4-4	8.4 E-05	8.24 E-08	2.64 E-06	3.17 E-06
Copper				EPA 42 Table 1.4-4	8.5 E-04	8.33 E-07	2.67 E-05	3.21 E-05
Dibenz(a,h)anthracene				EPA 42 Table 1.4-3	1.2 E-05	1.18 E-08	3.77 E-06	4.52 E-06
Dichlorobenzene				EPA 42 Table 1.4-3	1.2 E-03	1.18 E-06	3.77 E-05	4.52 E-05
Ethane				EPA 42 Table 1.4-2	3.1 E+00	3.04 E-03	9.74 E-02	1.17 E-01
Fluoranthene				EPA 42 Table 1.4-3	3.0 E-05	2.94 E-08	9.42 E-06	1.13 E-05
Fluorene				EPA 42 Table 1.4-3	2.8 E-05	2.75 E-08	8.80 E-06	1.06 E-05
Formaldehyde				EPA 42 Table 1.4-3	7.5 E-02	7.35 E-05	2.35 E-03	2.83 E-03
Hexane				EPA 42 Table 1.4-3	1.8 E+00	1.76 E-03	5.65 E-02	6.79 E-02
Indeno(1,2,3-cd)pyrene				EPA 42 Table 1.4-3	1.8 E-05	1.76 E-08	5.65 E-06	6.79 E-06
Manganese				EPA 42 Table 1.4-4	3.8 E-04	3.73 E-07	1.19 E-05	1.43 E-05
Mercury				EPA 42 Table 1.4-4	2.6 E-04	2.55 E-07	8.17 E-06	9.80 E-06
Methane				EPA 42 Table 1.4-2	2.30	0.00225	7.23 E-02	8.67 E-02
Molybdenum				EPA 42 Table 1.4-4	1.1 E-03	1.08 E-06	3.46 E-05	4.15 E-05
Naphthalene				EPA 42 Table 1.4-3	6.1 E-04	5.98 E-07	1.92 E-05	2.30 E-05
Nickel				EPA 42 Table 1.4-4	2.1 E-03	2.06 E-06	6.60 E-05	7.92 E-05
Pentane				EPA 42 Table 1.4-2	2.6 E+00	2.55 E-03	8.17 E-02	9.80 E-02
Phenanthrene				EPA 42 Table 1.4-3	1.7 E-05	1.67 E-08	5.34 E-07	6.41 E-07
Propane				EPA 42 Table 1.4-2	1.6 E+00	1.57 E-03	5.03 E-02	6.04 E-02
Pyrene				EPA 42 Table 1.4-3	5.0 E-05	4.90 E-08	1.57 E-06	1.88 E-06
Selenium				EPA 42 Table 1.4-4	2.4 E-05	2.35 E-08	7.54 E-07	9.05 E-07
Toluene				EPA 42 Table 1.4-3	3.4 E-03	3.33 E-06	1.07 E-04	1.28 E-04
Vanadium				EPA 42 Table 1.4-4	2.3 E-03	2.25 E-06	7.23 E-05	8.67 E-05
Zinc				EPA 42 Table 1.4-4	2.9 E-03	2.84 E-06	9.11 E-05	1.09 E-04

Notes:

1. Emission factor for "Small Boilers" and "Uncontrolled".
2. Hours of operation Boiler I (used only as standby backup boiler) = 100 days/year x 24 hours/day = 2,400 hours/year
3. Computer Model Identifier: HP12 (Boiler #1 shares common stack with Boiler #2)

Abbreviations used:

lb Pounds of steam
MMBtu Million Btu
hr Hours
yr Years
lb Pounds of emissions
ton Tons of emissions

Emissions Estimate Revised Aug 28 1/30/2000
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Boiler #2

Emission Estimates for Boiler #2: Based on maximum Tier II PERMIT conditions

Date: 24-Jun-08

Location: Heat Plant - Bldg #20 **ANNUAL Coal Usage = 3,854 Tons/year**

Equipment EMISSIONS	Fuel	Maximum Equipment Capacity		MAXIMUM ESTIMATES: Emission Factors from EPA 42: Reference Table			Following estimates based on Emission Factors	
		tons/yr						
Boiler 2	Coal[1]	3,854						
CO				EPA 42 Table 1.1-3[2]	0.88	0.88	2.94 E-01	9.94 E-01
NO_x				EPA 42 Table 1.1-3[2]	12	12.00	7.68 E+00	2.31 E+01
SO_2				EPA 42 Table 1.1-3[2]; S%=0.75	(S%*38S)/(100%)	28.54	1.30 E+01	4.88 E+01
PM10				EPA 42 Table 1.1-6[3]; A%=2.04%	2.04	0.79	3.90 E+00	1.30 E+01
PM				EPA 42 Table 1.1-6[3]; A%=2.04%	10A	20.40	1.73 E+01	6.67 E+01
Pb				EPA 42 Table 1.1-17[4]	507 lb/10^{12} Btu	1.08 E-06	6.24 E-03	2.04 E-02
CH_4				EPA 42 Table 1.1-19	0.04	0.04	2.35 E-02	7.71 E-02
TNMOC				EPA 42 Table 1.1-19	0.08	0.08	3.60 E-02	1.16 E-01
N_2O				EPA 42 Table 1.1-19	0.03	0.03	1.76 E-02	5.76 E-02
HCl				EPA 42 Table 1.1-15	1.30	1.30	7.08 E-01	2.31 E+00
HF				EPA 42 Table 1.1-15	0.15	0.15	6.92 E-02	2.69 E-01
					lb/10^{12} Btu	lb/ton	lb/hr	tons/yr
Arsenic				EPA 42 Table 1.1-17	484	1.43 E-02	8.47 E-03	2.76 E-02
Beryllium				EPA 42 Table 1.1-17	81	1.69 E-03	9.97 E-04	3.27 E-03
Cadmium				EPA 42 Table 1.1-17	44	9.28 E-04	5.46 E-04	1.79 E-03
Chromium				EPA 42 Table 1.1-17	708	1.48 E-02	8.81 E-03	2.89 E-02
Manganese				EPA 42 Table 1.1-17	1,509	3.14 E-02	1.86 E-02	6.06 E-02
Mercury				EPA 42 Table 1.1-17	16	3.36 E-04	1.97 E-04	6.46 E-04
Nickel				EPA 42 Table 1.1-17	1,108	2.30 E-02	1.36 E-02	4.46 E-02
POM				EPA 42 Table 1.1-17	2.09	4.36 E-05	2.59 E-05	8.38 E-05

Notes:

1. Hours of operation (annual heating season) Boiler 2 = September 1st to May 30th = 273 days/year x 24 hours/day = 6,552 hours/year
2. Maximum capacity of burning coal (3854 tons/year or 25,000 pounds of steam/hour equivalent to a heat input rate 32x10^6 Btu/hour, when burning only coal) allowed as per Idaho State University's DEQ Operating Tier II permit [illegible] issued June 6, 1997.
3. Emission factor for "PC, dry bottom, wall-fired, sub-bituminous Pre-1987".
4. Emission factor for "Cumulative Emission (Inter (lb/tn), Uncontrolled".
5. Emission factor for "Pulverized coal, dry bottom".
6. As per the Boiler Coal Analysis dated January 24, 2008, the Ash content is 2.04, Sulfur is 0.75, and the Btu content is 10,488 Btu/lb.
   Also as per EPA 42 Table 1.1-3, footnote b, mentions that SO2 is 95% of fuel sulfur, and further states that with subbituminous coal about 10% more fuel sulfur is retained in the bottom ash and particulates because of the more alkaline nature of the coal ash.
7. Computer Model Identifier: MP12 (Boiler #2 shares common stack with Boiler #1)

Abbreviations used:

lb$_s$ Pounds of steam
MMBtu Million Btu
hr Hours
yr Years
lb$_e$ Pounds of emissions
ton$_e$ Tons of emissions
ton$_c$ Tons of coal

Emissions Estimate Revised Aug 28 1/20/2008
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Boiler #2

Emission Estimates for Boiler #2: Based on maximum Tier II PERMIT conditions — Date: 24-Jun-09

Location: Heat Plant - Bldg #26 — **HOURLY steam production = 25,090 lbs/hour**

Equipment [illegible]	Fuel	Maximum Equipment Capacity		Emission Factors from EPA 42			Following estimates based on Emission Factors	
				Reference Table		calculated	calculated	calculated
		Hourly Heat Input Rate[2] = Btu/hr	Hourly Coal Input Rate[2] = Ton/hr					
Boiler 2	Coal[6]	32×10^6	1.53		lb_e/ton_c	lb_e/ton_c	lb_e/hr	ton_e/yr
CO				EPA 42 Table 1.1-3[3]	0.58	0.60	7.65 E-01	9.04 E-01
NO_x				EPA 42 Table 1.1-3[3]	12	12.00	1.84 E+01	2.21 E+01
SO_2				EPA 42 Table 1.1-3[3], S%=0.79	(95%*38S)*(90%)	23.64	3.62 E+01	4.35 E+01
PM10				EPA 42 Table 1.1-5[4], A%=2.94%	2.5A	6.79	1.03 E+01	1.20 E+01
PM				EPA 42 Table 1.1-5[4], A%=2.94%	10A	29.40	4.50 E+01	5.67 E+01
Pb				EPA 42 Table 1.1-17[5]	507 lb/10^{12} Btu	1.09 E-06	1.62 E-05	2.04 E-05
CH_4				EPA 42 Table 1.1-19	0.04	0.04	6.12 E-02	7.71 E-02
TNMOC				EPA 42 Table 1.1-19	0.06	0.06	9.18 E-02	1.16 E-01
N_2O				EPA 42 Table 1.1-19	0.03	0.03	4.59 E-02	5.78 E-02
HCl				EPA 42 Table 1.1-15	1.20	1.20	1.84 E+00	2.31 E+00
HF				EPA 42 Table 1.1-15	0.15	0.15	2.30 E-01	2.89 E-01
					$lb_e/10^{12}$ Btu_c	lb_e/ton_c	lb_e/hr	ton_e/yr
Arsenic				EPA 42 Table 1.1-17	684	1.45 E-03	2.19 E-03	2.76 E-03
Beryllium				EPA 42 Table 1.1-17	81	1.69 E-04	2.59 E-04	3.27 E-04
Cadmium				EPA 42 Table 1.1-17	44	9.29 E-05	1.42 E-04	1.79 E-04
Chromium				EPA 42 Table 1.1-17	709	1.48 E-03	2.26 E-03	2.85 E-03
Manganese				EPA 42 Table 1.1-17	1,669	3.14 E-03	4.80 E-03	6.06 E-03
Mercury				EPA 42 Table 1.1-17	19	3.35 E-04	5.12 E-04	6.45 E-04
Nickel				EPA 42 Table 1.1-17	1,169	2.30 E-03	3.52 E-03	4.43 E-03
POM				EPA 42 Table 1.1-17	2.09	4.36 E-06	6.66 E-06	8.38 E-06

Notes:

1. Hours of operation (annual heating season) Boiler 2 = September 1st to May 30th = 273 days/year x 24 hours/day = **6,552 hours/year**
2. Maximum capacity of burning coal (2884 tons/year or 25,090 pounds of steam/hour equivalent) to a heat input rate 32x10^6 Btu/hour, when burning only coal) allowed as per Idaho State University's DEQ Operating Tier II permit #006-00029 issued June 6, 1997.
3. Emission factor for "PC, dry bottom, wall-fired, sub-bituminous Pre-1987".
4. Emission factor for "Cumulative Emission factor (filtrat), Uncontrolled".
5. Emission factor for "Pulverized coal, dry bottom".
6. As per Idaho State University's DEQ Operating Tier II permit #006-00029 issued June 6, 1997, "maximum hourly input rate = 25,090 lbs of steam/hr", and as per DEQ memorandum dated April 4, 1997 "the equivalent heat input rate is 32x10^6 Btu/hr when burning only coal", and from Stoker Coal Analysis dated January 24, 2005 the Btu content of coal is 10,469 Btu/lb; hence calculating the maximum hourly coal input = (32x10^6 Btu/hr) / (10,469 Btu/lb) = 3,056 lb/hr = (3,056 lb/hr) x (1 ton/2000 lb) = 1.53 Ton/hr.
7. Based on the maximum hourly coal input rate of 1.53 Ton/hr and the maximum annual permitted coal use of 3,884 Ton/yr, hence calculating the maximum total hours of coal usage annually = (3,884 Ton/yr) / (1.53 Ton/hr) = **2,519 hrs/yr**
8. As per the Stoker Coal Analysis dated January 24, 2005, the Ash content is 2.94, Sulfur is 0.79, and the Btu content is 10,469 Btu/lb. Also as per EPA 42 Table 1.1-3, footnote b, mentions that SO2 is 95% of fuel sulfur, and further states that with subbituminous coal about 10% more fuel sulfur is retained in the bottom ash and particulates because of the more alkaline nature of the coal ash.
9. Computer Model Identifier: HP12 (Boiler #2 shares common stack with Boiler #1)

Abbreviations used::

lb_s Pounds of steam
MMBtu Million Btu
hr Hours
yr Years
lb_e Pounds of emissions
ton_e Tons of emissions
ton_c Tons of coal

Emissions Estimate Revised Aug 26 1/20/2006
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Boiler #2

Emission Estimates for Boiler #2: Based on ACTUAL operating conditions — Date: 24-Jun-05

Location: Heat Plant - Bldg #26 — **HOURLY steam production = 20,000 lbs/hour**

Equipment Identification	Fuel	Maximum Equipment Capacity		Emission Factors from EPA 42			Following estimates based on Emission Factors	
				Reference Table				
Boiler 2	Coal	Hourly Heat Input Rate[2] = Btu/hr (6 x 10[6])	Hourly Coal Input Rate[2] = Ton/hr 1.16					
					lb/ton	lb/ton	lb/hr	ton/yr
CO				EPA 42 Table 1.1-3[3]	0.50	0.60	0.75 E-01	9.00 E-01
NO_x				EPA 42 Table 1.1-3[3]	12	12.00	1.38 E+01	2.32 E+01
SO_2				EPA 42 Table 1.1-3[3]; S%=0.79	(S%*2000/100%)	28.04	2.72 E+01	4.87 E+01
PM10				EPA 42 Table 1.1-6[4]; A%=2.04%	3.3A	6.72	7.78 E+00	1.31 E+01
PM				EPA 42 Table 1.1-6[4]; A%=2.04%	10A	20.40	3.38 E+01	5.90 E+01
Pb				EPA 42 Table 1.1-17[5]	867 lb/10[12]Btu	1.08 E-06	1.22 E-02	2.09 E-02
CH_4				EPA 42 Table 1.1-10	0.04	0.04	4.60 E-02	7.73 E-02
TNMOC				EPA 42 Table 1.1-10	0.09	0.09	6.90 E-02	1.16 E-01
N_2O				EPA 42 Table 1.1-10	0.03	0.03	3.45 E-02	5.78 E-02
HCl				EPA 42 Table 1.1-10	1.20	1.20	1.38 E+00	2.32 E+00
HF				EPA 42 Table 1.1-10	0.16	0.16	1.73 E-01	2.89 E-01
					lb/10[12] Btu	lb/ton	lb/hr	ton/yr
Arsenic				EPA 42 Table 1.1-17	411	1.43 E-03	1.65 E-02	2.76 E-02
Beryllium				EPA 42 Table 1.1-17	81	1.69 E-04	1.95 E-03	3.27 E-03
Cadmium				EPA 42 Table 1.1-17	44	9.20 E-04	1.07 E-02	1.79 E-02
Chromium				EPA 42 Table 1.1-17	700	1.46 E-03	1.68 E-02	2.80 E-02
Manganese				EPA 42 Table 1.1-17	1,500	3.14 E-03	3.61 E-02	6.05 E-02
Mercury				EPA 42 Table 1.1-17	16	3.35 E-05	3.85 E-04	6.45 E-04
Nickel				EPA 42 Table 1.1-17	1,100	2.30 E-03	2.64 E-02	4.44 E-02
POM				EPA 42 Table 1.1-17	2.09	4.38 E-06	5.03 E-05	8.40 E-05

Notes:

1. Hours of operation (annual heating season) Boiler 2 = September 1st to May 30th = 273 days/year x 24 hours/day = **6,552 hours/year**
2. Steam output of 20,000 lbs of steam/hr will require a heat input rate of (1,200 Btu/lb of steam x 20,000 lbs of steam/hr) = 24 E+06 Btu/hr
   Therefore input coal rate = (24x10[6] Btu/hr / 10,400 Btu/lb of coal / 2000 lb/ton) = 1.16 Ton/hr
3. Emission factor for "PC, dry bottom, wall-fired, sub-bituminous Pre-NSPS".
4. Emission factor for "Cumulative Emission factor (filter), Uncontrolled".
5. Emission factor for "Pulverized coal, dry bottom".
6. Based on the hourly coal input rate of 1.16 Ton/hr and the maximum annual permitted coal use of 3,804 Ton/yr, hence calculating the maximum total hours of coal usage annually = (3,804 Ton/yr) / (1.16 Ton/hr) = **3,280 hrs/yr**
7. As per the Boiler Coal Analysis dated January 24, 2005, the ash content is 2.04, Sulfur is 0.79, and the Btu content is 10,400 Btu/lb.
   Also as per EPA 42 Table 1.1-3, footnote b, mentions that SO2 is 80% of fuel sulfur, and further states that with subbituminous coal about 10% more fuel sulfur is retained in the bottom ash and particulates because of the more alkaline nature of the coal ash.
8. Computer Model Identifier: BP2B (Boiler #2 shares common stack with Boiler #1)

Abbreviations used:

- lb[m] Pounds of steam
- MMBtu Million Btu
- hr Hours
- yr Years
- lb[e] Pounds of emissions
- ton[e] Tons of emissions
- ton[c] Tons of coal

Emissions Estimate Revised Aug 20 1/20/2006
B2 Hourly Actual 1 of 1 @4:06 PM
Byrd

Boiler #3

Emission Estimates for Boiler #3: Based on maximum operating conditions

Date: 24-Jun-08

Location: Heat Plant - Building #29

Equipment Description	Fuel	Maximum Equipment Capacity[2]		Emission Factors from EPA 42: Reference Table			Following estimates based on Emission Factors	
		lb/hr	MMBtu/hr		lb/10⁶ scf	lb/MMBtu	lb/yr	tons/yr
Boiler 3	Gas	21,000	25.20					
CO				EPA 42 Table 1.4-1[1]	84	0.080	3.22 E+05	7.26 E+00
NO_x				EPA 42 Table 1.4-1[1]	50	0.049	1.32 E+05	4.32 E+00
SO_2				EPA 42 Table 1.4-2	0.60	0.00058	1.09 E-02	5.19 E-05
PM10				EPA 42 Table 1.4-3	7.60	0.0076	2.01 E-01	8.97 E-04
PM				EPA 42 Table 1.4-3	7.60	0.0076	2.01 E-01	8.97 E-04
VOC				EPA 42 Table 1.4-3	0.0055	4.90 E-07	1.32 E-05	4.32 E-08
TOC				EPA 42 Table 1.4-3	8.00	0.008	1.45 E-01	4.76 E-04
2-Methylnaphthalene				EPA 42 Table 1.4-3	11.00	0.011	2.00 E-01	8.81 E-04
3-Methylchloranthrene				EPA 42 Table 1.4-3	2.4 E-05	2.35 E-08	6.33 E-07	2.06 E-09
7,12-Dimethylbenz(a)anthracene				EPA 42 Table 1.4-3	1.6 E-05	1.70 E-08	4.75 E-07	1.86 E-09
Acenaphthene				EPA 42 Table 1.4-3	1.8 E-05	1.67 E-08	4.32 E-07	1.38 E-09
Acenaphthylene				EPA 42 Table 1.4-3	1.8 E-05	1.70 E-08	4.75 E-07	1.86 E-09
Anthracene				EPA 42 Table 1.4-3	1.8 E-05	1.70 E-08	4.75 E-07	1.86 E-09
Arsenic				EPA 42 Table 1.4-3	2.4 E-05	2.35 E-08	6.33 E-07	2.06 E-09
Benzene				EPA 42 Table 1.4-4	2.0 E-03	1.96 E-07	5.28 E-06	1.73 E-08
Benzo(a)anthracene				EPA 42 Table 1.4-4	4.4 E-05	4.31 E-08	1.16 E-04	3.80 E-04
Benzo(b)fluoranthene				EPA 42 Table 1.4-3	1.6 E-05	1.70 E-08	4.75 E-07	1.86 E-09
Benzo(g,h,i)perylene				EPA 42 Table 1.4-3	2.1 E-05	2.06 E-08	5.54 E-07	1.82 E-04
Benzo(k)fluoranthene				EPA 42 Table 1.4-3	1.2 E-05	1.18 E-08	3.17 E-07	1.04 E-07
Beryllium				EPA 42 Table 1.4-3	1.8 E-05	1.70 E-08	4.75 E-07	1.86 E-09
Butane				EPA 42 Table 1.4-3	1.2 E-05	1.18 E-08	3.17 E-07	1.04 E-07
Cadmium				EPA 42 Table 1.4-3	1.6 E-05	1.70 E-08	4.75 E-07	1.86 E-09
Chrysene				EPA 42 Table 1.4-3	1.2 E-05	1.18 E-08	3.17 E-07	1.04 E-09
Cobalt				EPA 42 Table 1.4-3	2.1 E+00	2.06 E-03	5.54 E-02	1.82 E-01
Copper				EPA 42 Table 1.4-4	1.1 E-03	1.08 E-06	2.90 E-05	9.51 E-08
Dibenzo(a,h)anthracene				EPA 42 Table 1.4-4	1.4 E-03	1.37 E-06	3.70 E-05	1.21 E-04
Dichlorobenzene				EPA 42 Table 1.4-3	1.6 E-05	1.70 E-08	4.75 E-07	1.86 E-09
Ethane				EPA 42 Table 1.4-4	8.4 E-05	8.24 E-08	2.22 E-06	7.26 E-09
Fluoranthene				EPA 42 Table 1.4-4	6.5 E-04	6.37 E-07	1.24 E-05	7.26 E-08
Fluorene				EPA 42 Table 1.4-3	1.2 E-05	1.18 E-08	3.17 E-07	1.04 E-07
Formaldehyde				EPA 42 Table 1.4-3	1.2 E-05	1.18 E-08	3.17 E-07	1.04 E-09
Hexane				EPA 42 Table 1.4-3	3.1 E+00	3.04 E-03	8.18 E-02	2.69 E-01
Indeno(1,2,3-cd)pyrene				EPA 42 Table 1.4-3	3.0 E-05	2.94 E-08	7.92 E-07	2.59 E-07
Manganese				EPA 42 Table 1.4-3	2.8 E-05	2.75 E-08	7.39 E-07	2.42 E-07
Mercury				EPA 42 Table 1.4-3	7.5 E-02	7.35 E-05	1.98 E-03	6.49 E-03
Methane				EPA 42 Table 1.4-3	1.9 E+00	1.86 E-03	4.75 E-02	1.56 E-01
Molybdenum				EPA 42 Table 1.4-3	1.8 E-05	1.70 E-08	4.75 E-07	1.86 E-07
Naphthalene				EPA 42 Table 1.4-4	3.8 E-04	3.73 E-07	1.00 E-05	3.28 E-08
Nickel				EPA 42 Table 1.4-4	2.8 E-04	2.75 E-07	8.88 E-05	2.26 E-08
Pentane				EPA 42 Table 1.4-2	2.39	0.00234	6.57 E-02	1.19 E-01
Phenanthrene				EPA 42 Table 1.4-4	1.1 E-03	1.08 E-06	2.90 E-05	9.51 E-08
Propane				EPA 42 Table 1.4-3	6.1 E-04	5.98 E-07	1.61 E-05	5.27 E-06
Pyrene				EPA 42 Table 1.4-4	2.1 E-03	2.06 E-06	5.54 E-05	1.82 E-04
Selenium				EPA 42 Table 1.4-3	2.6 E+00	2.55 E-03	6.86 E-02	2.25 E-01
Toluene				EPA 42 Table 1.4-3	1.7 E-05	1.67 E-08	4.49 E-07	1.47 E-09
Vanadium				EPA 42 Table 1.4-3	1.6 E+00	1.57 E-03	4.22 E-02	1.38 E-01
Zinc				EPA 42 Table 1.4-3	4.9 E-05	4.80 E-08	1.32 E-07	4.32 E-07
				EPA 42 Table 1.4-4	2.4 E-05	2.35 E-08	6.33 E-07	2.06 E-09
				EPA 42 Table 1.4-3	3.4 E-05	3.33 E-08	8.97 E-06	2.94 E-04
				EPA 42 Table 1.4-3	2.3 E-05	2.25 E-08	6.07 E-06	1.99 E-04
				EPA 42 Table 1.4-4	2.9 E-02	2.84 E-05	7.65 E-04	2.51 E-09

Notes:

1. Emission factor for "Small Boilers", "Controlled - Low NO_x burners".
2. Hours of operation of boiler (heating season: Sept 1 to May 31) = 273 days/year x 24 hours/day = 6,552 hours/year
3. Due to operational and safety (firing) issues the boiler is not operated to generate more than 21,000 lbs of steam/hour.
4. Designated Model Identifier: NP3

Abbreviations used:

lb_s Pounds of steam
MMBtu million Btu
hr Hours
yr Years
lb_e Pounds of emissions
$tons_e$ Tons of emissions

Emissions Estimate Revised Aug 28 1/20/2008
B3 1 of 1 @4:06 PM
Spot

Emergency Generator #1

Emission Estimates for Emergency Generator #1 Date: 24-Jun-09

Location: Holt Arena Building #61

Equipment	Fuel	Maximum Equipment Capacity		Emission Factors from EPA 42			Following estimates based on Emission Factors	
				Reference Table				
Emergency Generator #1	Gas		0.030			lb/MMBtu	lb/hr	ton/yr
CO				EPA 42 Table 3.2-3		3.72 E+00	2.01 E+00	1.00 E-01
NO_x				EPA 42 Table 3.2-3		2.21 E+00	1.19 E+00	5.96 E-02
SO_2				EPA 42 Table 3.2-3		5.88 E-04	3.17 E-04	1.58 E-05
PM10				EPA 42 Table 3.2-3		9.50 E-02	5.12 E-02	2.56 E-03
PM				EPA 42 Table 3.2-3	lb/10^6 scf	9.50 E-02	5.24 E-02	2.67 E-03
Pb				EPA 42 Table 1.4-2	5.0000	4.90 E-07	2.64 E-07	1.32 E-08
VOC				EPA 42 Table 3.2-3		2.96 E-02	1.60 E-02	7.98 E-04
TOC				EPA 42 Table 3.2-3		3.00 E-01	1.62 E-01	8.08 E-03
1,1,2,2-Tetrachloroethane				EPA 42 Table 3.2-3		2.53 E-05	1.36 E-05	6.82 E-07
1,1,2-Trichloroethane				EPA 42 Table 3.2-3		1.53 E-05	8.26 E-06	4.13 E-07
1,3-Butadiene				EPA 42 Table 3.2-3		6.63 E-04	3.57 E-04	1.78 E-05
1,3-Dichloropropene				EPA 42 Table 3.2-3		1.27 E-05	6.85 E-06	3.42 E-07
Acetaldehyde				EPA 42 Table 3.2-3		2.79 E-03	1.50 E-03	7.52 E-05
Acrolein				EPA 42 Table 3.2-3		2.63 E-03	1.42 E-03	7.09 E-05
Benzene				EPA 42 Table 3.2-3		1.56 E-03	8.82 E-04	4.39 E-05
Carbon Tetrachloride				EPA 42 Table 3.2-3		1.77 E-05	9.54 E-06	4.77 E-07
Chlorobenzene				EPA 42 Table 3.2-3		1.29 E-05	6.95 E-06	3.48 E-07
Chloroform				EPA 42 Table 3.2-3		1.37 E-05	7.38 E-06	3.69 E-07
Ethane				EPA 42 Table 3.2-3		7.04 E-02	3.79 E-02	1.89 E-03
Ethylbenzene				EPA 42 Table 3.2-3		2.48 E-05	1.34 E-05	6.69 E-07
Ethylene dibromide				EPA 42 Table 3.2-3		2.13 E-05	1.15 E-05	5.74 E-07
Formaldehyde				EPA 42 Table 3.2-3		2.05 E-02	1.10 E-02	5.52 E-04
Methane				EPA 42 Table 3.2-3		2.30 E-01	1.24 E-01	6.20 E-03
Methanol				EPA 42 Table 3.2-3		3.06 E-03	1.65 E-03	8.25 E-05
Methylene Chloride				EPA 42 Table 3.2-3		4.12 E-05	2.22 E-05	1.11 E-06
Naphthalene				EPA 42 Table 3.2-3		9.71 E-05	5.25 E-05	2.62 E-06
Polycyclic Aromatic hydrocarbons				EPA 42 Table 3.2-3		1.41 E-04	7.60 E-05	3.80 E-06
Styrene				EPA 42 Table 3.2-3		1.19 E-05	6.41 E-06	3.21 E-07
Toluene				EPA 42 Table 3.2-3		5.58 E-04	3.01 E-04	1.50 E-05
Vinyl Chloride				EPA 42 Table 3.2-3		7.18 E-06	3.87 E-06	1.94 E-07
Xylene				EPA 42 Table 3.2-3		1.95 E-04	1.05 E-04	5.25 E-06

Notes:

1. Hours of operation of emergency generator = 100 hours/year
2. Computer Model Identifier: HOLT1

Abbreviations used:

MMBtu Million Btu
hr Hours
yr Years
lb Pounds of emissions
ton Tons of emissions

Emissions Estimate Revised Aug 26 1/20/2009
GEN 1 1 of 1 @4:10 PM
Syd

Emergency Generator #2

Emission Estimates for Emergency Generator #2 Date: 22-Aug-03

Location: Physical Science Building #03

Equipment EMISSIONS	Fuel	Maximum Equipment Capacity	Emission Factors from EPA 42: Reference Table	calculated	Following estimates based on Emission Factors calculated	calculated
		MMBtu/hr		lb/MMBtu	lb/hr	ton/yr
Emergency Generator #2	Diesel	1.300				
CO			EPA 42 Table 3.3-1	0.85	1.31 E+00	6.56 E-02
NO_x			EPA 42 Table 3.3-1	4.41	6.08 E+00	3.04 E-01
SO_2			EPA 42 Table 3.3-1	0.29	4.00 E-01	2.00 E-02
PM10			EPA 42 Table 3.3-1	0.31	4.28 E-01	2.14 E-02
PM			EPA 42 Table 3.3-1	0.31	4.28 E-01	2.14 E-02
TOC			EPA 42 Table 3.3-1	0.35	4.83 E-01	2.42 E-02
1,3-Butadiene			EPA 42 Table 3.3-2	3.91 E-05	5.40 E-05	2.70 E-06
Acenaphthene			EPA 42 Table 3.3-2	1.42 E-05	1.96 E-05	9.80 E-06
Acenaphthylene			EPA 42 Table 3.3-2	5.06 E-05	6.98 E-05	3.49 E-07
Acetaldehyde			EPA 42 Table 3.3-2	7.67 E-04	1.06 E-03	5.28 E-05
Acrolein			EPA 42 Table 3.3-2	9.25 E-05	1.28 E-04	6.38 E-06
Anthracene			EPA 42 Table 3.3-2	1.87 E-06	2.58 E-06	1.29 E-07
Benzene			EPA 42 Table 3.3-2	9.33 E-04	1.29 E-03	6.44 E-05
Benzo(a)anthracene			EPA 42 Table 3.3-2	1.68 E-06	2.32 E-06	1.16 E-07
Benzo(a)pyrene			EPA 42 Table 3.3-2	1.88 E-07	2.59 E-07	1.30 E-08
Benzo(b)fluoranthene			EPA 42 Table 3.3-2	9.91 E-08	1.37 E-07	6.84 E-09
Benzo(g,h,i)perylene			EPA 42 Table 3.3-2	4.89 E-07	6.75 E-07	3.37 E-08
Benzo(k)fluoranthene			EPA 42 Table 3.3-2	1.55 E-07	2.14 E-07	1.07 E-08
Chrysene			EPA 42 Table 3.3-2	3.53 E-07	4.87 E-07	2.44 E-08
Dibenz(a,h)anthracene			EPA 42 Table 3.3-2	5.83 E-07	8.05 E-07	4.02 E-08
Fluoranthene			EPA 42 Table 3.3-2	7.61 E-06	1.05 E-05	5.26 E-07
Fluorene			EPA 42 Table 3.3-2	2.92 E-05	4.03 E-05	2.01 E-06
Formaldehyde			EPA 42 Table 3.3-2	1.19 E-03	1.63 E-03	8.14 E-05
Indeno(1,2,3-cd)pyrene			EPA 42 Table 3.3-2	3.75 E-07	5.18 E-07	2.59 E-08
Naphthalene			EPA 42 Table 3.3-2	8.48 E-05	1.17 E-04	5.85 E-06
Phenanthrene			EPA 42 Table 3.3-2	2.94 E-05	4.06 E-05	2.03 E-06
Propylene			EPA 42 Table 3.3-2	2.58 E-03	3.56 E-03	1.78 E-04
Pyrene			EPA 42 Table 3.3-2	4.78 E-06	6.60 E-06	3.30 E-07
Toluene			EPA 42 Table 3.3-2	4.09 E-04	5.64 E-04	2.82 E-05
Xylenes			EPA 42 Table 3.3-2	2.85 E-04	3.93 E-04	1.97 E-05

Notes:

1. Hours of operation of emergency generator = 100 hours/year
2. Computer Model Identifier: PYS1

Abbreviations used:

MMBtu Million Btu
hr Hours
yr Years
lbs Pounds of emissions
tons Tons of emissions

Emissions Estimate Revised Aug 28 1/29/2008
GEN 2 1 of 1 @4:18 PM
Syed

Emergency Generator #3

Emission Estimates for Emergency Generator #3 Date: 24-Jun-08

Location: Public Safety Building #27

Equipment [redacted]	Fuel	Maximum Equipment Capacity	[redacted]	Emission Factors from EPA 42: Reference Table		[redacted]	Following estimates based on Emission Factors: [redacted]	[redacted]
Emergency Generator #3	Gas		[redacted] 0.724			[redacted]	[redacted]	[redacted]
CO				EPA 42 Table 3.2-3		3.72 E+00	7.22 E-01	2.60 E-01
NO_x				EPA 42 Table 3.2-3		2.21 E+00	4.29 E-01	1.54 E-01
SO_2				EPA 42 Table 3.2-3		5.88 E-04	1.14 E-04	4.11 E-05
PM10				EPA 42 Table 3.2-3		9.50 E-05	1.84 E-05	6.63 E-06
PM				EPA 42 Table 3.2-3	$lb_m/10^6$ scf	9.99 E-05	1.92 E-05	6.91 E-06
Pb				EPA 42 Table 1.4-2	0.0005	4.86 E-07	8.81 E-08	3.42 E-08
VOC				EPA 42 Table 3.2-3		2.96 E-03	5.74 E-03	2.07 E-03
TOC				EPA 42 Table 3.2-3		3.08 E-01	6.05 E-02	2.18 E-02
1,1,2,2-Tetrachloroethane				EPA 42 Table 3.2-3		2.53 E-05	4.91 E-06	1.77 E-06
1,1,2-Trichloroethane				EPA 42 Table 3.2-3		1.53 E-05	2.97 E-06	1.07 E-06
1,3-Butadiene				EPA 42 Table 3.2-3		6.63 E-04	1.29 E-04	4.65 E-05
1,3-Dichloropropene				EPA 42 Table 3.2-3		1.27 E-06	2.46 E-07	8.87 E-07
Acetaldehyde				EPA 42 Table 3.2-3		2.79 E-03	5.41 E-04	1.95 E-04
Acrolein				EPA 42 Table 3.2-3		2.63 E-03	5.10 E-04	1.84 E-04
Benzene				EPA 42 Table 3.2-3		1.88 E-03	3.67 E-04	1.32 E-04
Carbon Tetrachloride				EPA 42 Table 3.2-3		1.77 E-05	3.43 E-06	1.24 E-06
Chlorobenzene				EPA 42 Table 3.2-3		1.29 E-05	2.50 E-06	9.01 E-07
Chloroform				EPA 42 Table 3.2-3		1.37 E-05	2.66 E-06	9.57 E-07
Ethane				EPA 42 Table 3.2-3		7.04 E-02	1.37 E-02	4.92 E-03
Ethylbenzene				EPA 42 Table 3.2-3		2.48 E-05	4.81 E-06	1.73 E-06
Ethylene dibromide				EPA 42 Table 3.2-3		2.13 E-05	4.13 E-06	1.49 E-06
Formaldehyde				EPA 42 Table 3.2-3		2.05 E-02	3.98 E-03	1.43 E-03
Methane				EPA 42 Table 3.2-3		2.30 E-01	4.46 E-02	1.61 E-02
Methanol				EPA 42 Table 3.2-3		3.06 E-03	5.94 E-04	2.14 E-04
Methylene Chloride				EPA 42 Table 3.2-3		4.12 E-05	7.99 E-06	2.88 E-06
Naphthalene				EPA 42 Table 3.2-3		9.71 E-06	1.88 E-06	6.78 E-07
Polycyclic aromatic hydrocarbons				EPA 42 Table 3.2-3		1.41 E-04	2.74 E-05	9.88 E-06
Styrene				EPA 42 Table 3.2-3		1.19 E-05	2.31 E-06	8.31 E-07
Toluene				EPA 42 Table 3.2-3		5.56 E-04	1.08 E-04	3.90 E-05
Vinyl Chloride				EPA 42 Table 3.2-3		7.16 E-05	1.39 E-05	5.01 E-07
Xylene				EPA 42 Table 3.2-3		1.95 E-04	3.79 E-05	1.36 E-05

Notes:

1. Hours of operation of emergency generator • 726 hours/year
2. Computer Model Identifier: [redacted]

Abbreviations used:

MMBtu Million Btu
hr Hours
yr Years
lb_m Pounds of emissions
ton_m Tons of emissions

Emissions Estimate Revised Aug 28 1/20/2009
GEN 3 1 of 1 @4:10 PM
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Incinerator

Incinerator Emission Estimates Date: 24-Jun-08

Location: Gale Life Science - Building #65

Total material incinerated: annually 3,023 lb/yr 1.51 tons/yr
Hours of operation[1]: annually 1,248 hrs/yr

EMISSIONS	EMISSION ESTIMATES: Emission Factors from EPA 42: Medical Waste Incineration — Reference Table[2]	Value	EMISSION ESTIMATES: following estimates based on Emission Factors — lb/hr	tons/yr	MEASURED EMISSION RATES[3] from manufacturer's emissions test report — lb/hr
CO	EPA 42 Table 2.3-1	2.96 E+00	4.82 E-03	2.82 E-03	2.09 E-02
NOx	EPA 42 Table 2.3-1	3.58 E+00	5.46 E-03	3.40 E-03	2.70 E-01
SO2	EPA 42 Table 2.3-1	2.17 E+00	3.32 E-03	2.07 E-03	
PM10	EPA 42 Table 2.3-10	88% of PM	4.05 E-03	2.53 E-03	
Lead	EPA 42 Table 2.3-2	7.39 E-02	1.12 E-04	6.96 E-05	
Total Particulate Matter (PM)	EPA 42 Table 2.3-2	4.67 E+00	7.15 E-03	4.46 E-03	6.58 E-02
TOC	EPA 42 Table 2.3-2	2.98 E-01	4.59 E-04	2.86 E-04	
Aluminum	EPA 42 Table 2.3-4	1.09 E-02	1.61 E-05	1.00 E-05	
Antimony	EPA 42 Table 2.3-4	1.38 E-02	1.98 E-05	1.22 E-05	
Arsenic	EPA 42 Table 2.3-4	2.42 E-04	3.71 E-07	2.31 E-07	
Barium	EPA 42 Table 2.3-5	3.34 E-03	4.89 E-06	3.10 E-06	
Beryllium	EPA 42 Table 2.3-5	6.25 E-06	9.57 E-09	5.97 E-09	
Cadmium	EPA 42 Table 2.3-5	5.48 E-06	8.39 E-09	5.24 E-09	
Chlorine	EPA 42 Table 2.3-10	1.06 E-01	1.61 E-04	1.00 E-04	
Chromium	EPA 42 Table 2.3-6	7.78 E-04	1.19 E-06	7.41 E-07	
Copper	EPA 42 Table 2.3-6	1.25 E-02	1.91 E-05	1.19 E-05	
HBr	EPA 42 Table 2.3-9	4.33 E-02	6.63 E-05	4.14 E-05	
HCl	EPA 42 Table 2.3-3	3.36 E+01	5.13 E-02	3.20 E-02	
Hydrogen Fluoride	EPA 42 Table 2.3-10	1.49 E-01	2.28 E-04	1.42 E-04	
Iron	EPA 42 Table 2.3-6	1.44 E-02	2.21 E-05	1.38 E-05	
Manganese	EPA 42 Table 2.3-7	5.87 E-04	8.98 E-07	5.42 E-07	
Mercury	EPA 42 Table 2.3-7	1.07 E-01	1.64 E-04	1.02 E-04	
Nickel	EPA 42 Table 2.3-7	5.90 E-04	9.04 E-07	5.64 E-07	
Silver	EPA 42 Table 2.3-8	2.38 E-04	3.46 E-07	2.16 E-07	
Thallium	EPA 42 Table 2.3-8	1.10 E-05	1.68 E-08	1.05 E-08	
Total PCBs	EPA 42 Table 2.3-3	4.65 E-05	7.12 E-08	4.44 E-08	
TCDD 2,3,7,8-	EPA 42 Table 2.3-11	5.47 E-08	8.38 E-11	5.23 E-11	
TCDD Total	EPA 42 Table 2.3-11	1.00 E-06	1.53 E-09	9.56 E-10	
HxCDD 1,2,3,6,7,8-	EPA 42 Table 2.3-11	3.76 E-10	5.76 E-13	3.61 E-13	
HxCDD 1,2,3,7,8,9-	EPA 42 Table 2.3-11	1.21 E-09	1.85 E-12	1.16 E-12	
HpCDD 1,2,3,4,6,7,8-	EPA 42 Table 2.3-11	5.23 E-09	8.01 E-12	5.00 E-12	
OCDD - Total	EPA 42 Table 2.3-11	2.21 E-08	3.38 E-11	2.11 E-11	
Total CDD	EPA 42 Table 2.3-11	2.13 E-06	3.26 E-09	2.04 E-09	
TCDF 2,3,7,8-	EPA 42 Table 2.3-13	2.40 E-07	3.68 E-10	2.29 E-10	
TCDF Total	EPA 42 Table 2.3-13	7.21 E-06	1.10 E-08	6.89 E-09	
PeCDF 1,2,3,7,8-	EPA 42 Table 2.3-13	7.59 E-10	1.16 E-12	7.23 E-13	
PeCDF 2,3,4,7,8-	EPA 42 Table 2.3-13	2.07 E-09	3.17 E-12	1.98 E-12	
HxCDF 1,2,3,4,7,8-	EPA 42 Table 2.3-13	7.58 E-09	1.16 E-11	7.22 E-12	
HxCDF 1,2,3,6,7,8-	EPA 42 Table 2.3-13	2.59 E-09	3.96 E-12	2.42 E-12	
HxCDF 2,3,4,6,7,8-	EPA 42 Table 2.3-13	7.19 E-09	1.10 E-11	6.86 E-12	
HpCDF 1,2,3,4,6,7,8-	EPA 42 Table 2.3-13	1.78 E-08	2.76 E-11	1.66 E-11	
HpCDF 1,2,3,4,7,8,9-	EPA 42 Table 2.3-13	2.72 E-09	4.17 E-12	2.60 E-12	
OCDF - Total	EPA 42 Table 2.3-13	7.42 E-08	1.14 E-10	7.09 E-11	
Total CDF	EPA 42 Table 2.3-13	7.16 E-06	1.10 E-07	6.83 E-08	

Notes:

1. Hours of operation (annual) = 8 hrs/day x 3 days/week x 52 weeks/year = 1,248 hours/year.
2. Emission factors in the EPA 42 tables are for "Uncontrolled" typical of incinerator.
3. These emission rates were used in the "air distribution modeling".
4. Computer Model Identifier: LF21

Abbreviations used:

MMBtu Million Btu
hr Hours
yr Years
lb Pounds of emissions
tons Tons of emissions

Emissions Estimate Revised Aug 26 1/30/2009
INCIN 1 of 1 @4:10 PM
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Item #8: Boiler

Emission Estimates

Date: 01-Jul-04

(Listed as item 8 on the "Campus Inventory" list)

Location: Student Union Building #14

Pollutant	Fuel	Maximum Shipment Capacity	[redacted]	Emission Factors from EPA 42s: Reference Table	[redacted]	[redacted]	Following estimates based on Emission Factors: [redacted]	[redacted]
	Gas		[redacted]					
CO				EPA 42 Table 1.4-1	84	0.082	[redacted]	[redacted]
NO_x				EPA 42 Table 1.4-1	100	0.098	[redacted]	[redacted]
SO_2				EPA 42 Table 1.4-2	0.60	[redacted]	[redacted]	[redacted]
PM10				EPA 42 Table 1.4-3	7.60	0.0076	[redacted]	[redacted]
PM				EPA 42 Table 1.4-3	7.60	0.0076	[redacted]	[redacted]
Pb				EPA 42 Table 1.4-2	0.0005	4.90 E-07	[redacted]	[redacted]
VOC				EPA 42 Table 1.4-2	5.50	0.005	[redacted]	[redacted]
TOC				EPA 42 Table 1.4-2	11.00	0.011	[redacted]	[redacted]
2-Methylnaphthalene				EPA 42 Table 1.4-3	2.4 E-05	2.35 E-08	[redacted]	[redacted]
3-Methylchloranthrene				EPA 42 Table 1.4-3	1.8 E-06	1.76 E-09	[redacted]	[redacted]
7,12-Dimethylbenz(a)anthracene				EPA 42 Table 1.4-3	1.6 E-05	1.57 E-08	[redacted]	[redacted]
Acenaphthene				EPA 42 Table 1.4-3	1.8 E-06	1.76 E-09	[redacted]	[redacted]
Acenaphthylene				EPA 42 Table 1.4-3	1.8 E-06	1.76 E-09	[redacted]	[redacted]
Anthracene				EPA 42 Table 1.4-3	2.4 E-06	2.35 E-09	[redacted]	[redacted]
Arsenic				EPA 42 Table 1.4-4	2.0 E-04	1.96 E-07	[redacted]	[redacted]
Barium				EPA 42 Table 1.4-4	4.4 E-03	4.31 E-06	[redacted]	[redacted]
Benz(a)anthracene				EPA 42 Table 1.4-3	1.8 E-06	1.76 E-09	[redacted]	[redacted]
Benzene				EPA 42 Table 1.4-3	2.1 E-03	2.06 E-06	[redacted]	[redacted]
Benzo(a)pyrene				EPA 42 Table 1.4-3	1.2 E-06	1.18 E-09	[redacted]	[redacted]
Benzo(b)fluoranthene				EPA 42 Table 1.4-3	1.8 E-06	1.76 E-09	[redacted]	[redacted]
Benzo(g,h,i)perylene				EPA 42 Table 1.4-3	1.2 E-06	1.18 E-09	[redacted]	[redacted]
Benzo(k)fluoranthene				EPA 42 Table 1.4-3	1.8 E-06	1.76 E-09	[redacted]	[redacted]
Beryllium				EPA 42 Table 1.4-4	1.2 E-05	1.18 E-08	[redacted]	[redacted]
Boron				EPA 42 Table 1.4-3	2.1 E+00	2.06 E-03	[redacted]	[redacted]
Cadmium				EPA 42 Table 1.4-4	1.1 E-03	1.08 E-06	[redacted]	[redacted]
Chromium				EPA 42 Table 1.4-4	1.4 E-03	1.37 E-06	[redacted]	[redacted]
Chrysene				EPA 42 Table 1.4-3	1.8 E-06	1.76 E-09	[redacted]	[redacted]
Cobalt				EPA 42 Table 1.4-4	8.4 E-05	8.24 E-08	[redacted]	[redacted]
Copper				EPA 42 Table 1.4-4	8.5 E-04	8.33 E-07	[redacted]	[redacted]
Dibenz(a,h)anthracene				EPA 42 Table 1.4-3	1.2 E-06	1.18 E-09	[redacted]	[redacted]
Dichlorobenzene				EPA 42 Table 1.4-3	1.2 E-06	1.18 E-09	[redacted]	[redacted]
Fluoranthene				EPA 42 Table 1.4-3	3.1 E+00	3.04 E-03	[redacted]	[redacted]
Fluorene				EPA 42 Table 1.4-3	3.0 E-06	2.94 E-09	[redacted]	[redacted]
Formaldehyde				EPA 42 Table 1.4-3	2.8 E-06	2.75 E-09	[redacted]	[redacted]
Hexane				EPA 42 Table 1.4-3	7.5 E-02	7.35 E-05	[redacted]	[redacted]
Indeno(1,2,3-cd)pyrene				EPA 42 Table 1.4-3	1.8 E+00	1.76 E-03	[redacted]	[redacted]
Manganese				EPA 42 Table 1.4-3	1.8 E-06	1.76 E-09	[redacted]	[redacted]
Mercury				EPA 42 Table 1.4-4	3.8 E-04	3.73 E-07	[redacted]	[redacted]
Methane				EPA 42 Table 1.4-4	2.3 E-01	2.25 E-07	[redacted]	[redacted]
Molybdenum				EPA 42 Table 1.4-2	2.30	0.00225	[redacted]	[redacted]
Naphthalene				EPA 42 Table 1.4-4	1.1 E-03	1.08 E-06	[redacted]	[redacted]
Nickel				EPA 42 Table 1.4-3	8.1 E-04	8.00 E-07	[redacted]	[redacted]
Pentane				EPA 42 Table 1.4-4	2.1 E-05	2.06 E-08	[redacted]	[redacted]
Phenanthrene				EPA 42 Table 1.4-3	2.8 E+00	2.75 E-03	[redacted]	[redacted]
Propane				EPA 42 Table 1.4-3	1.7 E-05	1.67 E-08	[redacted]	[redacted]
Pyrene				EPA 42 Table 1.4-3	1.6 E+00	1.57 E-03	[redacted]	[redacted]
Selenium				EPA 42 Table 1.4-3	5.0 E-05	4.90 E-08	[redacted]	[redacted]
Toluene				EPA 42 Table 1.4-4	2.4 E-03	2.35 E-06	[redacted]	[redacted]
Vanadium				EPA 42 Table 1.4-3	3.4 E-03	3.33 E-06	[redacted]	[redacted]
Zinc				EPA 42 Table 1.4-4	2.3 E-02	2.25 E-05	[redacted]	[redacted]
				EPA 42 Table 1.4-4	2.9 E-02	2.84 E-05	[redacted]	[redacted]

Notes:

1. Emission factor for "Small Boilers" and "Uncontrolled".
2. Potential hours of operation of boiler (annual) = [redacted]
3. Actual hours of operation of boiler (quarter: June 1 to August 31) = 92 days/yr/24 hr/day = 2,208 hours/year
4. Boiler used during summer for hot water and kitchen.
5. Identifier #88.

Abbreviations used:

MMBtu Million Btu
hr Hours
yr Years
lb_m Pounds of emissions
ton_m Tons of emissions

Emissions ISU Small Equip 6/24/2003
88 1 of 1 [redacted]
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Item #9: Boiler

Emission Estimates

Date: 01-Jul-04

(Listed as item #9 on the "Campus inventory" list).

Location: Reed Gym Building #45

EMISSIONS	Fuel	Maximum Equipment Capacity		Emission Factors from EPA 42: Reference Table			Following estimates based on Emission Factors: calculated	calculated
	Gas		1.24		lb/106 ft3	lb/MMBtu	lb/yr	tons/yr
CO				EPA 42 Table 1.4-1	84	0.082	1.10 E-01	4.83 E-01
NO_x				EPA 42 Table 1.4-1	100	0.098	1.31 E-01	5.78 E-01
SO_2				EPA 42 Table 1.4-2	0.60	0.000588	7.86 E-04	3.45 E-03
PM10				EPA 42 Table 1.4-2	7.60	0.0074	9.96 E-03	4.37 E-02
PM				EPA 42 Table 1.4-2	7.60	0.0074	9.96 E-03	4.37 E-02
VOC				EPA 42 Table 1.4-2	0.0066	4.60 E-07	6.88 E-07	2.87 E-06
TOC				EPA 42 Table 1.4-2	5.50	0.006	7.22 E-03	3.16 E-02
2-Methylnaphthalene				EPA 42 Table 1.4-2	11.00	0.011	1.44 E-02	6.32 E-02
3-Methylchloranthrene				EPA 42 Table 1.4-3	2.4 E-05	2.35 E-08	3.15 E-08	1.38 E-07
7,12-Dimethylbenz(a)anthracene				EPA 42 Table 1.4-3	1.8 E-05	1.76 E-08	2.36 E-08	1.03 E-07
Acenaphthene				EPA 42 Table 1.4-3	1.6 E-05	1.57 E-08	2.10 E-08	9.20 E-08
Acenaphthylene				EPA 42 Table 1.4-3	1.8 E-05	1.76 E-08	2.36 E-08	1.03 E-07
Anthracene				EPA 42 Table 1.4-3	1.8 E-05	1.76 E-08	2.36 E-08	1.03 E-07
Acridine				EPA 42 Table 1.4-3	2.4 E-05	2.35 E-08	3.15 E-08	1.38 E-07
Benzene				EPA 42 Table 1.4-4	2.0 E-04	1.96 E-07	2.62 E-07	1.15 E-06
Benzo(a)anthracene				EPA 42 Table 1.4-4	4.4 E-03	4.31 E-06	5.76 E-06	2.52 E-05
Benzene				EPA 42 Table 1.4-3	1.8 E-05	1.76 E-08	2.36 E-08	1.03 E-07
Benzo(b)pyrene				EPA 42 Table 1.4-3	2.1 E-03	2.06 E-06	2.76 E-06	1.21 E-05
Benzo(g)chrysene				EPA 42 Table 1.4-3	1.2 E-05	1.18 E-08	1.58 E-08	6.90 E-08
Benzo(g,h,i)perylene				EPA 42 Table 1.4-3	1.8 E-05	1.76 E-08	2.36 E-08	1.03 E-07
Benzo(k)fluoranthene				EPA 42 Table 1.4-3	1.2 E-05	1.18 E-08	1.58 E-08	6.90 E-08
Beryllium				EPA 42 Table 1.4-3	1.8 E-05	1.76 E-08	2.36 E-08	1.03 E-07
Butane				EPA 42 Table 1.4-4	1.2 E-05	1.18 E-08	1.58 E-08	6.90 E-08
Cadmium				EPA 42 Table 1.4-3	2.1 E+00	2.06 E-03	2.76 E-03	1.21 E-02
Chromium				EPA 42 Table 1.4-4	1.1 E-03	1.08 E-06	1.44 E-06	6.32 E-06
Chrysene				EPA 42 Table 1.4-4	1.4 E-03	1.37 E-06	1.84 E-06	8.05 E-06
Cobalt				EPA 42 Table 1.4-3	1.8 E-05	1.76 E-08	2.36 E-08	1.03 E-07
Copper				EPA 42 Table 1.4-4	8.4 E-05	8.24 E-08	1.10 E-07	4.83 E-07
Dibenzo(a,h)anthracene				EPA 42 Table 1.4-4	8.5 E-04	8.33 E-07	1.12 E-06	4.89 E-06
Dichlorobenzene				EPA 42 Table 1.4-3	1.2 E-05	1.18 E-08	1.58 E-08	6.90 E-08
Ethane				EPA 42 Table 1.4-3	1.2 E-05	1.18 E-08	1.58 E-08	6.90 E-08
Fluoranthene				EPA 42 Table 1.4-3	3.1 E+00	3.04 E-03	4.07 E-03	1.78 E-02
Fluorene				EPA 42 Table 1.4-3	3.0 E-05	2.94 E-08	3.94 E-08	1.72 E-07
Formaldehyde				EPA 42 Table 1.4-3	2.8 E-05	2.75 E-08	3.68 E-08	1.61 E-07
Hexane				EPA 42 Table 1.4-3	7.6 E-05	7.35 E-08	9.85 E-08	4.31 E-07
Indeno(1,2,3-cd)pyrene				EPA 42 Table 1.4-3	1.8 E+00	1.76 E-03	2.36 E-03	1.03 E-02
Manganese				EPA 42 Table 1.4-3	1.8 E-05	1.76 E-08	2.36 E-08	1.03 E-07
Mercury				EPA 42 Table 1.4-4	3.0 E-04	2.75 E-07	4.98 E-07	2.18 E-06
Methane				EPA 42 Table 1.4-4	2.6 E-04	2.56 E-07	3.41 E-07	1.49 E-06
Molybdenum				EPA 42 Table 1.4-2	2.30	0.00226	3.03 E-03	1.32 E-02
Naphthalene				EPA 42 Table 1.4-4	1.1 E-03	1.08 E-06	1.44 E-06	6.32 E-06
Nickel				EPA 42 Table 1.4-4	9.1 E-04	8.96 E-07	6.21 E-07	2.61 E-06
Pentane				EPA 42 Table 1.4-4	2.1 E-03	2.06 E-06	2.76 E-06	1.21 E-05
Phenanthrene				EPA 42 Table 1.4-3	2.6 E+00	2.55 E-03	3.41 E-03	1.49 E-02
Propane				EPA 42 Table 1.4-3	1.7 E-05	1.67 E-08	2.23 E-08	9.77 E-08
Pyrene				EPA 42 Table 1.4-3	1.6 E+00	1.57 E-03	2.10 E-03	9.20 E-03
Selenium				EPA 42 Table 1.4-3	8.0 E-05	4.90 E-08	6.56 E-08	2.87 E-07
Toluene				EPA 42 Table 1.4-4	2.4 E-03	2.35 E-06	3.15 E-06	1.38 E-05
Vanadium				EPA 42 Table 1.4-3	3.4 E-03	3.33 E-06	4.46 E-06	1.95 E-05
Zinc				EPA 42 Table 1.4-4	2.3 E-03	2.25 E-06	3.02 E-06	1.32 E-05
				EPA 42 Table 1.4-4	2.9 E-03	2.84 E-06	3.81 E-06	1.67 E-05

Notes:

1. Emission factor for "Small Boilers" and "Uncontrolled".
2. Potential hours of operation of boiler (annual) = 8,760 hours/year
3. Actual hours of operation of boiler (summer: June 1 to August 31) = 92 days/yr x 24 hr/day = 2,208 hours/year
4. Boiler used during summer for swimming pool and domestic hot water.
5. Identifier 286.

Abbreviations used:

mmBtu Million Btu
hr Hours
yr Years
lb Pounds of emissions
tons/yr Tons of emissions

Emissions ISU Small Equip 6/24/2004
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Item #10: Boiler

Emission Estimates

Date: 01-Jul-04

(Listed as item #10 on the "Campus Inventory" list).

Location: Garrison - Building #63

[illegible]	Fuel	Maximum Equipment Capacity	[illegible]	Emission Factors from EPA 42: Reference Table	[illegible]	[illegible]	Following estimates based on Emission Factors: [illegible]	[illegible]
	Gas		[illegible] 5.700		$lb/10^6$ scf	$lb/MMBtu$	lb/hr	ton/yr
CO				EPA 42 Table 1.4-1	84	[illegible]	[illegible]	2.72 E-01
NO_x				EPA 42 Table 1.4-1	100	[illegible]	7.30 E-03	3.23 E-01
SO_2				EPA 42 Table 1.4-2	0.6	[illegible]	4.43 E-04	1.94 E-03
PM10				EPA 42 Table 1.4-2	7.6	[illegible]	5.61 E-03	2.46 E-02
PM				EPA 42 Table 1.4-2	7.6	[illegible]	5.61 E-03	2.46 E-02
Pb				EPA 42 Table 1.4-2	[illegible]	4.90 E-07	3.66 E-07	1.62 E-06
VOC				EPA 42 Table 1.4-2	5.5	[illegible]	4.06 E-03	1.78 E-02
TOC				EPA 42 Table 1.4-2	11.00	0.011	8.12 E-03	3.56 E-02
2-Methylnaphthalene				EPA 42 Table 1.4-3	2.4 E-05	2.35 E-08	1.77 E-08	7.76 E-08
2-Methylchrysene				EPA 42 Table 1.4-3	1.8 E-05	1.76 E-08	1.33 E-08	5.82 E-08
7,12-Dimethylbenz(a)anthracene				EPA 42 Table 1.4-3	1.6 E-05	1.57 E-08	1.18 E-08	5.17 E-08
Acenaphthene				EPA 42 Table 1.4-3	1.8 E-05	1.76 E-08	1.33 E-08	5.82 E-08
Acenaphthylene				EPA 42 Table 1.4-3	1.8 E-05	1.76 E-08	1.33 E-08	5.82 E-08
Anthracene				EPA 42 Table 1.4-3	2.4 E-05	2.35 E-08	1.77 E-08	7.76 E-08
Arsenic				EPA 42 Table 1.4-4	2.0 E-01	1.96 E-07	1.48 E-07	6.47 E-07
Barium				EPA 42 Table 1.4-4	4.4 E-01	4.31 E-07	3.25 E-07	1.42 E-06
Benz(a)anthracene				EPA 42 Table 1.4-3	1.8 E-05	1.76 E-08	1.33 E-08	5.82 E-08
Benzene				EPA 42 Table 1.4-3	2.1 E-03	2.06 E-06	1.55 E-06	6.79 E-06
Benz(a)pyrene				EPA 42 Table 1.4-3	1.2 E-05	1.18 E-08	8.88 E-10	3.88 E-09
Benz(b)fluoranthene				EPA 42 Table 1.4-3	1.8 E-05	1.76 E-08	1.33 E-08	5.82 E-08
Benz(k)fluoranthene				EPA 42 Table 1.4-3	1.2 E-05	1.18 E-08	8.88 E-10	3.88 E-09
Benzo(g,h,i)perylene				EPA 42 Table 1.4-3	1.8 E-05	1.76 E-08	1.33 E-08	5.82 E-08
Beryllium				EPA 42 Table 1.4-4	1.2 E-05	1.18 E-08	8.88 E-09	3.88 E-08
Boron				EPA 42 Table 1.4-4	2.1 E+00	2.06 E-03	1.55 E-03	6.79 E-03
Cadmium				EPA 42 Table 1.4-4	1.1 E-03	1.08 E-06	8.12 E-07	3.56 E-06
Chromium				EPA 42 Table 1.4-4	1.4 E-03	1.37 E-06	1.03 E-06	4.53 E-06
Chrysene				EPA 42 Table 1.4-3	1.8 E-05	1.76 E-08	1.33 E-08	5.82 E-08
Cobalt				EPA 42 Table 1.4-4	8.4 E-05	8.24 E-08	6.20 E-08	2.72 E-07
Copper				EPA 42 Table 1.4-4	8.5 E-01	8.33 E-07	6.26 E-07	2.75 E-06
Dibenz(a,h)anthracene				EPA 42 Table 1.4-3	1.2 E-05	1.18 E-08	8.88 E-10	3.88 E-09
Dichlorobenzene				EPA 42 Table 1.4-3	1.2 E-03	1.18 E-06	8.88 E-07	3.88 E-06
Ethane				EPA 42 Table 1.4-3	3.1 E+00	3.04 E-03	2.28 E-03	1.00 E-02
Fluoranthene				EPA 42 Table 1.4-3	3.0 E-05	2.94 E-08	2.21 E-08	9.70 E-08
Fluorene				EPA 42 Table 1.4-3	2.8 E-05	2.75 E-08	2.07 E-08	9.08 E-08
Formaldehyde				EPA 42 Table 1.4-3	7.5 E-02	7.36 E-05	5.54 E-05	2.43 E-04
Hexane				EPA 42 Table 1.4-2	1.8 E+00	1.76 E-03	1.33 E-03	5.82 E-03
Indeno(1,2,3-cd)pyrene				EPA 42 Table 1.4-3	1.8 E-05	1.76 E-08	1.33 E-08	5.82 E-08
Manganese				EPA 42 Table 1.4-4	3.8 E-01	3.73 E-07	2.81 E-07	1.23 E-06
Mercury				EPA 42 Table 1.4-4	2.6 E-01	2.55 E-07	1.92 E-07	8.41 E-07
Methane				EPA 42 Table 1.4-2	2.3	0.00226	1.70 E-03	7.44 E-03
Molybdenum				EPA 42 Table 1.4-4	1.1 E-01	1.08 E-07	8.12 E-07	3.56 E-06
Naphthalene				EPA 42 Table 1.4-3	6.1 E-04	5.98 E-07	4.50 E-07	1.97 E-06
Nickel				EPA 42 Table 1.4-4	2.1 E-03	2.06 E-06	1.55 E-06	6.79 E-06
Pentane				EPA 42 Table 1.4-2	2.6 E+00	2.55 E-03	1.92 E-03	8.41 E-03
Phenanthrene				EPA 42 Table 1.4-3	1.7 E-05	1.67 E-08	1.26 E-08	5.50 E-08
Propane				EPA 42 Table 1.4-2	1.6 E+00	1.57 E-03	1.18 E-03	5.17 E-03
Pyrene				EPA 42 Table 1.4-3	5.0 E-05	4.90 E-08	3.69 E-08	1.62 E-07
Selenium				EPA 42 Table 1.4-4	2.4 E-05	2.35 E-08	1.77 E-08	7.76 E-08
Toluene				EPA 42 Table 1.4-3	3.4 E-03	3.33 E-06	2.51 E-06	1.10 E-05
Vanadium				EPA 42 Table 1.4-4	2.3 E-05	2.25 E-08	1.70 E-08	7.44 E-08
Zinc				EPA 42 Table 1.4-4	2.9 E-01	2.84 E-07	2.14 E-07	9.36 E-07

Notes:

1. Emission factor for "Small Boilers" and "Uncontrolled".
2. Potential hours of operation of boiler (annual) = [illegible] hours/year
3. Actual hours of operation of boiler (summer: June 1 to August 31) = 90 days/yr x 10 hr/day = 1,[illegible] hours/year
4. Boiler used during summer for kitchen and hot water.
5. Identifier #[illegible].

Abbreviations used:

MMBtu million Btu
hr hours
yr Years
lb Pounds of emissions
ton Tons of emissions

Emissions Info Small Equip 6/24/2004
Sht 1 of 1 @ [illegible]
Spud

Item #11: Boiler

Emission Estimates

Date: 01-Jul-04

(Listed as item #11 on the "Campus Inventory" list).

Location: Turner - Building #64

Emission Source	Fuel	Maximum Equipment Capacity		Emission Factors from EPA 42: Reference Table			Following estimates based on Emission Factors:	
	Gas		1.320					
CO				EPA 42 Table 1.4-1	84	[illegible]	1.10 E-01	4.83 E-01
NO_x				EPA 42 Table 1.4-1	100	[illegible]	1.31 E-01	5.75 E-01
SO_2				EPA 42 Table 1.4-2	0.60	[illegible]	7.86 E-04	3.45 E-03
PM10				EPA 42 Table 1.4-2	7.60	[illegible]	9.95 E-03	4.37 E-02
PM				EPA 42 Table 1.4-2	7.60	[illegible]	9.95 E-03	4.37 E-02
Pb				EPA 42 Table 1.4-2	0.0005	4.90 E-07	6.55 E-07	2.87 E-06
VOC				EPA 42 Table 1.4-2	5.50	[illegible]	7.22 E-03	3.16 E-02
TOC				EPA 42 Table 1.4-2	11.00	[illegible]	1.44 E-02	6.32 E-02
2-Methylnaphthalene				EPA 42 Table 1.4-3	2.4 E-05	2.36 E-08	3.15 E-05	1.38 E-07
3-Methylchloranthrene				EPA 42 Table 1.4-3	1.8 E-06	1.76 E-09	2.36 E-06	1.03 E-08
7,12-Dimethylbenz(a)anthracene				EPA 42 Table 1.4-3	1.6 E-05	1.57 E-08	2.10 E-05	9.20 E-08
Acenaphthene				EPA 42 Table 1.4-3	1.8 E-06	1.76 E-09	2.36 E-06	1.03 E-08
Acenaphthylene				EPA 42 Table 1.4-3	1.8 E-06	1.76 E-09	2.36 E-06	1.03 E-08
Anthracene				EPA 42 Table 1.4-3	2.4 E-06	2.35 E-09	3.15 E-06	1.38 E-08
Arsenic				EPA 42 Table 1.4-4	2.0 E-04	1.96 E-07	2.62 E-07	1.15 E-06
Barium				EPA 42 Table 1.4-4	4.4 E-03	4.31 E-06	5.76 E-06	2.53 E-05
Benzo(a)anthracene				EPA 42 Table 1.4-3	1.8 E-06	1.76 E-09	2.36 E-06	1.03 E-08
Benzene				EPA 42 Table 1.4-3	2.1 E-03	2.06 E-06	2.76 E-03	1.21 E-02
Benzo(a)pyrene				EPA 42 Table 1.4-3	1.2 E-06	1.18 E-09	1.58 E-06	6.90 E-09
Benzo(b)fluoranthene				EPA 42 Table 1.4-3	1.8 E-06	1.76 E-09	2.36 E-06	1.03 E-08
Benzo(k)fluoranthene				EPA 42 Table 1.4-3	1.2 E-06	1.18 E-09	1.58 E-06	6.90 E-09
Benzo(g,h,i)perylene				EPA 42 Table 1.4-3	1.8 E-06	1.76 E-09	2.36 E-06	1.03 E-08
Beryllium				EPA 42 Table 1.4-4	1.2 E-06	1.18 E-09	1.58 E-06	6.90 E-09
Butane				EPA 42 Table 1.4-3	2.1 E+00	2.06 E-03	2.76 E-03	1.21 E-02
Cadmium				EPA 42 Table 1.4-4	1.1 E-03	1.08 E-06	1.44 E-06	6.32 E-06
Chromium				EPA 42 Table 1.4-4	1.4 E-03	1.37 E-06	1.84 E-06	8.06 E-06
Chrysene				EPA 42 Table 1.4-3	1.8 E-06	1.76 E-09	2.36 E-06	1.03 E-08
Cobalt				EPA 42 Table 1.4-4	8.4 E-05	8.24 E-08	1.10 E-07	4.83 E-07
Copper				EPA 42 Table 1.4-4	8.5 E-04	8.33 E-07	1.12 E-06	4.90 E-06
Dibenzo(a,h)anthracene				EPA 42 Table 1.4-3	1.2 E-06	1.18 E-09	1.58 E-06	6.90 E-09
Dichlorobenzene				EPA 42 Table 1.4-3	1.2 E-06	1.18 E-09	1.58 E-06	6.90 E-09
Ethane				EPA 42 Table 1.4-3	3.1 E+00	3.04 E-03	4.07 E-03	1.78 E-02
Fluoranthene				EPA 42 Table 1.4-3	3.0 E-06	2.94 E-09	3.94 E-06	1.72 E-08
Fluorene				EPA 42 Table 1.4-3	2.8 E-06	2.75 E-09	3.68 E-06	1.61 E-08
Formaldehyde				EPA 42 Table 1.4-3	7.6 E-02	7.35 E-05	9.85 E-05	4.31 E-04
Hexane				EPA 42 Table 1.4-3	1.8 E+00	1.76 E-03	2.36 E-03	1.03 E-02
Indeno(1,2,3-cd)pyrene				EPA 42 Table 1.4-3	1.8 E-06	1.76 E-09	2.36 E-06	1.03 E-08
Manganese				EPA 42 Table 1.4-4	3.8 E-04	3.73 E-07	4.99 E-07	2.18 E-06
Mercury				EPA 42 Table 1.4-4	2.6 E-04	2.55 E-07	3.41 E-07	1.49 E-06
Methane				EPA 42 Table 1.4-2	2.30	[illegible]	3.03 E-03	1.32 E-02
Molybdenum				EPA 42 Table 1.4-4	1.1 E-03	1.08 E-06	1.44 E-06	6.32 E-06
Naphthalene				EPA 42 Table 1.4-3	6.1 E-04	5.99 E-07	8.01 E-07	3.51 E-06
Nickel				EPA 42 Table 1.4-4	2.1 E-03	2.06 E-06	2.76 E-06	1.21 E-05
Pentane				EPA 42 Table 1.4-3	2.6 E+00	2.55 E-03	3.41 E-03	1.49 E-02
Phenanthrene				EPA 42 Table 1.4-3	1.7 E-06	1.67 E-09	2.23 E-06	9.77 E-09
Propane				EPA 42 Table 1.4-3	1.6 E+00	1.57 E-03	2.10 E-03	9.20 E-03
Pyrene				EPA 42 Table 1.4-3	5.0 E-06	4.90 E-09	6.56 E-06	2.87 E-08
Selenium				EPA 42 Table 1.4-4	2.4 E-05	2.35 E-08	3.15 E-05	1.38 E-07
Toluene				EPA 42 Table 1.4-3	3.4 E-03	3.33 E-06	4.46 E-03	1.95 E-02
Vanadium				EPA 42 Table 1.4-4	2.3 E-03	2.25 E-06	3.02 E-06	1.32 E-05
Zinc				EPA 42 Table 1.4-4	2.9 E-02	2.84 E-05	3.81 E-05	1.67 E-04

Notes:

1. Emission factor for "Small Boilers" and "Uncontrolled".
2. Potential hours of operation of boiler (yr/max) = [illegible] hours/year
3. Actual hours of operation of boiler (summer: June 1 to August 31) = 92 days/yr x 12 hr/day = 1,104 hours/year
4. Boiler used during summer for hot water.
5. Identifier #B11.

Abbreviations used:

- MMBtu Million Btu
- hr Hours
- yr Years
- lb Pounds of emissions
- MM_{lb} Tons of emissions

Emissions ISU Small Equip 6/24/2003
B11 1 of 1 @2:37PM
Byod

Item #12: Boiler

Emission Estimates

Date: 01-Jul-01

(Listed as Item 012 on the "Campus Inventory" list).

Location: Gale Life Science (Biology) - Building #45

Pollutant	Fuel	Maximum Equipment Capacity		Emission Factors from EPA 42			Following estimates based on Emission Factors	
				Reference Table	[illegible]	[illegible]	[illegible]	[illegible]
	Gas		[illegible] 3.679					
CO				EPA 42 Table 1.4-1	84	[illegible]	3.21 E-01	[illegible]
NO_x				EPA 42 Table 1.4-1	100	[illegible]	3.82 E-01	1.18 E-00
SO_2				EPA 42 Table 1.4-2	0.60	[illegible]	1.89 E-00	[illegible]
PM10				EPA 42 Table 1.4-2	7.60	[illegible]	2.00 E-02	6.74 E-02
TSP				EPA 42 Table 1.4-2	7.60	[illegible]	2.00 E-02	6.74 E-02
Pb				EPA 42 Table 1.4-2	0.0005	4.50 E-07	1.31 E-00	3.78 E-00
VOC				EPA 42 Table 1.4-2	5.50	0.006	1.44 E-00	6.32 E-00
TOC				EPA 42 Table 1.4-3	11.00	0.011	3.00 E-02	1.30 E-01
2-Methylnaphthalene				EPA 42 Table 1.4-3	2.4 E-08	2.36 E-08	6.30 E-08	2.76 E-07
3-Methylchloranthrene				EPA 42 Table 1.4-3	1.8 E-08	1.76 E-08	4.73 E-08	2.07 E-07
7,12-Dimethylbenz(a)anthracene				EPA 42 Table 1.4-3	1.6 E-08	1.57 E-08	4.20 E-08	1.84 E-07
Acenaphthene				EPA 42 Table 1.4-3	1.8 E-08	1.76 E-08	4.73 E-08	2.07 E-07
Acenaphthylene				EPA 42 Table 1.4-3	1.8 E-08	1.76 E-08	4.73 E-08	2.07 E-07
Anthracene				EPA 42 Table 1.4-3	2.4 E-08	2.35 E-08	6.30 E-08	2.76 E-07
Arsenic				EPA 42 Table 1.4-4	2.0 E-04	1.96 E-07	5.25 E-07	2.30 E-06
Barium				EPA 42 Table 1.4-4	4.4 E-03	4.31 E-06	7.10 E-06	5.00 E-06
Benzo(a)anthracene				EPA 42 Table 1.4-3	1.8 E-08	1.76 E-08	4.73 E-08	2.07 E-07
Benzene				EPA 42 Table 1.4-3	2.1 E-03	2.06 E-06	5.51 E-06	2.41 E-05
Benzo(b)pyrene				EPA 42 Table 1.4-3	1.2 E-08	1.18 E-08	3.15 E-08	1.38 E-07
Benzo(g)fluoranthene				EPA 42 Table 1.4-3	1.8 E-08	1.76 E-08	4.73 E-08	2.07 E-07
Benzo(k)fluoranthene				EPA 42 Table 1.4-3	1.2 E-08	1.18 E-08	3.15 E-08	1.38 E-07
Benzo(j,k)fluoranthene				EPA 42 Table 1.4-3	1.8 E-08	1.76 E-08	4.73 E-08	2.07 E-07
Beryllium				EPA 42 Table 1.4-4	1.2 E-05	1.18 E-10	3.15 E-10	1.38 E-07
Butane				EPA 42 Table 1.4-3	2.1 E-03	2.06 E-06	5.51 E-06	2.41 E-05
Cadmium				EPA 42 Table 1.4-4	1.1 E-03	1.08 E-06	2.89 E-06	1.26 E-05
Carbon				EPA 42 Table 1.4-4	1.4 E-02	1.37 E-05	3.66 E-05	1.61 E-04
Chrysene				EPA 42 Table 1.4-3	1.8 E-08	1.76 E-08	4.73 E-08	2.07 E-07
Cobalt				EPA 42 Table 1.4-4	8.4 E-05	8.24 E-08	2.21 E-07	9.68 E-07
Copper				EPA 42 Table 1.4-4	8.5 E-05	8.33 E-08	2.23 E-07	9.77 E-07
Dibenzo(a,h)anthracene				EPA 42 Table 1.4-3	1.2 E-08	1.18 E-08	3.15 E-08	1.38 E-07
Dichlorobenzene				EPA 42 Table 1.4-3	1.2 E-08	1.18 E-08	3.15 E-08	1.38 E-07
Ethane				EPA 42 Table 1.4-3	3.1 E-03	3.04 E-06	8.14 E-06	3.56 E-05
Fluoranthene				EPA 42 Table 1.4-3	3.0 E-08	2.94 E-08	7.88 E-08	3.45 E-07
Fluorene				EPA 42 Table 1.4-3	2.8 E-08	2.75 E-08	7.36 E-08	3.22 E-07
Formaldehyde				EPA 42 Table 1.4-3	7.5 E-02	7.36 E-05	1.97 E-04	8.63 E-04
Hexane				EPA 42 Table 1.4-3	1.8 E+00	1.76 E-03	4.73 E-03	2.07 E-02
Indeno(1,2,3-cd)pyrene				EPA 42 Table 1.4-3	1.8 E-08	1.76 E-08	4.73 E-08	2.07 E-07
Manganese				EPA 42 Table 1.4-4	3.8 E-04	3.73 E-07	9.98 E-07	4.37 E-06
Mercury				EPA 42 Table 1.4-4	2.6 E-04	2.55 E-07	6.83 E-07	2.99 E-06
Methane				EPA 42 Table 1.4-3	2.30	[illegible]	6.04 E-03	2.64 E-02
Molybdenum				EPA 42 Table 1.4-4	1.1 E-03	1.08 E-06	2.89 E-06	1.26 E-05
Naphthalene				EPA 42 Table 1.4-3	6.1 E-04	5.99 E-07	1.60 E-06	7.01 E-06
Nickel				EPA 42 Table 1.4-4	2.1 E-03	2.06 E-06	5.51 E-06	2.41 E-05
Pentane				EPA 42 Table 1.4-3	2.6 E+00	2.55 E-03	6.83 E-03	2.99 E-02
Phenanthrene				EPA 42 Table 1.4-3	1.7 E-08	1.67 E-08	4.46 E-08	1.95 E-07
Propane				EPA 42 Table 1.4-3	1.6 E+00	1.57 E-03	4.20 E-03	1.84 E-02
Pyrene				EPA 42 Table 1.4-3	5.0 E-08	4.90 E-08	1.31 E-07	5.75 E-07
Selenium				EPA 42 Table 1.4-4	2.4 E-05	2.35 E-08	6.30 E-08	2.76 E-07
Toluene				EPA 42 Table 1.4-3	3.4 E-03	3.33 E-06	8.91 E-06	3.91 E-05
Vanadium				EPA 42 Table 1.4-4	3.3 E-03	3.24 E-06	8.64 E-06	3.84 E-05
Zinc				EPA 42 Table 1.4-4	2.9 E-03	2.84 E-06	7.61 E-06	3.33 E-05

Notes:

1. Emission factor for "Small Boilers" and "Uncontrolled".
2. Potential hours of operation of boiler (annual) = [illegible] hours/year
3. Actual hours of operation of boiler (summer,June 1 to August 31) =92 days/year24 hours/day 2,208 hours/year
4. Boiler used during summer for hot water ski and steam.
5. Number 0012.

Abbreviations used:

MMBtu Million Btu
hr Hours
yr Years
lb_m Pounds of emissions
ton_m Tons of emissions

Emissions ISU Small Equip 6/24/2008
012 1 of 1 @2:57PM
Syed

Item #13: Boilers

Emission Estimates

Date: [illegible]

(Listed as item 013 on the "Campus Inventory" list).

Location: Bell Arena Building [illegible]

Pollutant	Fuel	Maximum Equipment Capacity	[illegible]	Emission Factors from EPA AP-42 Reference Table	[illegible]	[illegible]	Following estimates based on Emission Factors [illegible]	[illegible]
	Gas	Total of 4 boilers: each boiler with rat output of [illegible] Firing rate = [illegible] For 4 boilers: [illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]
CO				EPA 42 Table 1.4-1	84	0.082	4.19 E-01	1.83 E+00
NO_x				EPA 42 Table 1.4-1	100	0.098	4.94 E-01	2.16 E+00
SO_2				EPA 42 Table 1.4-2	0.60	0.00059	2.96 E-03	1.30 E-02
PM10				EPA 42 Table 1.4-2	7.60	0.0075	3.76 E-02	1.64 E-01
PM				EPA 42 Table 1.4-2	7.60	0.0075	3.76 E-02	1.64 E-01
Pb				EPA 42 Table 1.4-2	0.0005	4.90 E-07	2.47 E-03	1.08 E-02
VOC				EPA 42 Table 1.4-2	5.50	0.005	2.72 E-02	1.19 E-01
TOC				EPA 42 Table 1.4-2	11.00	0.011	5.44 E-02	2.38 E-01
3-Methylchloranthrene				EPA 42 Table 1.4-3	2.4 E-05	2.35 E-08	1.19 E-07	5.18 E-07
7-Methylbenzanthracene				EPA 42 Table 1.4-3	1.8 E-05	1.76 E-08	8.89 E-08	3.89 E-07
7,12-Dimethylbenz(a)anthracene				EPA 42 Table 1.4-3	1.6 E-05	1.57 E-08	7.91 E-08	3.46 E-07
Acenaphthene				EPA 42 Table 1.4-3	1.8 E-05	1.76 E-08	8.89 E-08	3.89 E-07
Acenaphthylene				EPA 42 Table 1.4-3	1.8 E-05	1.76 E-08	8.89 E-08	3.89 E-07
Anthracene				EPA 42 Table 1.4-3	2.4 E-05	2.35 E-08	1.19 E-07	5.18 E-07
Arsenic				EPA 42 Table 1.4-4	2.0 E-04	1.96 E-07	9.89 E-07	4.33 E-06
Barium				EPA 42 Table 1.4-4	4.4 E-04	4.31 E-07	2.17 E-06	9.52 E-06
Benz(a)anthracene				EPA 42 Table 1.4-3	1.8 E-05	1.76 E-08	8.89 E-08	3.89 E-07
Benzene				EPA 42 Table 1.4-3	2.1 E-03	2.06 E-06	1.04 E-05	4.54 E-05
Benzo(b)pyrene				EPA 42 Table 1.4-3	1.2 E-05	1.18 E-08	5.93 E-08	2.60 E-07
Benzo(b)fluoranthene				EPA 42 Table 1.4-3	1.8 E-05	1.76 E-08	8.89 E-08	3.89 E-07
Benzo(g,h,i)perylene				EPA 42 Table 1.4-3	1.2 E-05	1.18 E-08	5.93 E-08	2.60 E-07
Benzo(k)fluoranthene				EPA 42 Table 1.4-3	1.8 E-05	1.76 E-08	8.89 E-08	3.89 E-07
Beryllium				EPA 42 Table 1.4-4	1.2 E-05	1.18 E-08	5.93 E-08	2.60 E-07
Butane				EPA 42 Table 1.4-3	2.1 E+00	2.06 E-03	1.04 E-02	4.54 E-02
Cadmium				EPA 42 Table 1.4-4	1.1 E-03	1.08 E-06	5.44 E-06	2.38 E-05
Chromium				EPA 42 Table 1.4-4	1.4 E-03	1.37 E-06	6.92 E-06	3.03 E-05
Chrysene				EPA 42 Table 1.4-3	1.8 E-05	1.76 E-08	8.89 E-08	3.89 E-07
Cobalt				EPA 42 Table 1.4-4	8.4 E-05	8.24 E-08	4.15 E-07	1.82 E-06
Copper				EPA 42 Table 1.4-4	8.5 E-04	8.33 E-07	4.20 E-06	1.84 E-05
Dibenz(a,h)anthracene				EPA 42 Table 1.4-3	1.2 E-05	1.18 E-08	5.93 E-08	2.60 E-07
Dichlorobenzene				EPA 42 Table 1.4-3	1.2 E-03	1.18 E-06	5.93 E-06	2.60 E-05
Ethane				EPA 42 Table 1.4-3	3.1 E+00	3.04 E-03	1.53 E-02	6.71 E-02
Formaldehyde				EPA 42 Table 1.4-3	2.8 E-03	2.94 E-06	1.48 E-05	6.49 E-05
Fluoranthene				EPA 42 Table 1.4-3	2.8 E-05	2.75 E-08	1.38 E-07	6.05 E-07
Fluorene				EPA 42 Table 1.4-3	7.8 E-05	7.65 E-08	3.71 E-06	1.62 E-05
Formaldehyde				EPA 42 Table 1.4-3	1.8 E+00	1.76 E-03	8.89 E-03	3.89 E-02
Hexane				EPA 42 Table 1.4-3	1.8 E-05	1.76 E-08	8.89 E-08	3.89 E-07
Indeno(1,2,3-cd)pyrene				EPA 42 Table 1.4-3	3.3 E-06	3.73 E-07	1.88 E-06	8.23 E-06
Manganese				EPA 42 Table 1.4-4	2.6 E-04	2.55 E-07	1.29 E-06	5.63 E-06
Mercury				EPA 42 Table 1.4-2	2.30	0.00225	1.14 E-02	4.95 E-02
Methane				EPA 42 Table 1.4-4	1.1 E-03	1.08 E-06	5.44 E-06	2.38 E-05
Molybdenum				EPA 42 Table 1.4-3	8.1 E-04	7.94 E-07	3.91 E-06	1.72 E-05
Naphthalene				EPA 42 Table 1.4-4	2.1 E-03	2.06 E-06	1.04 E-05	4.54 E-05
Nickel				EPA 42 Table 1.4-3	2.8 E+00	2.75 E-03	1.38 E-02	6.05 E-02
Pentane				EPA 42 Table 1.4-3	1.7 E-05	1.67 E-08	8.40 E-08	3.68 E-07
Phenanthrene				EPA 42 Table 1.4-3	1.6 E+00	1.57 E-03	7.91 E-03	3.46 E-02
Propane				EPA 42 Table 1.4-3	5.0 E-05	4.90 E-08	2.47 E-07	1.08 E-07
Pyrene				EPA 42 Table 1.4-4	3.4 E-05	3.34 E-08	1.70 E-07	6.10 E-07
Selenium				EPA 42 Table 1.4-3	3.4 E-05	3.33 E-08	1.68 E-06	7.35 E-06
Toluene				EPA 42 Table 1.4-4	2.3 E-03	2.26 E-06	1.14 E-05	4.98 E-05
Vanadium				EPA 42 Table 1.4-4	2.6 E-02	2.54 E-05	1.43 E-04	6.29 E-04
Zinc								

Notes:

1. Emission factor for "Small Boilers" and "Uncontrolled".
2. Potential hours of operation of boiler (annual) = [illegible]
3. Actual hours of operation of boiler (winter: Sept 1 to May 31) = 273 days/year x 24 hours/day = [illegible]
4. Boilers used during winter for heating.
5. Identifier #013.

Abbreviations used:

- [illegible] Million gal
- hr Hours
- yr Years
- lb Pounds of emissions
- tons Tons of emissions

Emissions 1(b) Small Equip 4/24/2006
013 1 of 1 @2:37PM
Syed

Item #14: Boilers

Emission Estimates

Date: 01-Jul-04

(Listed as item #14 on the "Campus Inventory" list).

Location: Holt Arena Building #60

	Fuel	Maximum Equipment Capacity		Emission Factors from EPA 42: Reference Table		Following calculations based on Emission Factors:	
	Gas	Total of 2 boilers; each boiler with an output of 2.570 MMBtu/hr; and at a firing rate of 90% =90%x2.57=1.458 For 2 boilers =(1.458 MMBtu/hr =2.916 MMBtu/hr	MMBtu/hr 2.916				
CO				EPA 42 Table 1.4-1	84	0.000	2.30 E-01	1.06 E+00
NO_x				EPA 42 Table 1.4-1	100	0.000	2.74 E-01	1.20 E+00
SO_2				EPA 42 Table 1.4-2	0.60	0.000000	1.64 E-03	7.20 E-03
PM10				EPA 42 Table 1.4-2	7.60	0.0076	2.14 E-02	9.37 E-02
PM				EPA 42 Table 1.4-2	7.60	0.0076	2.14 E-02	9.37 E-02
Pb				EPA 42 Table 1.4-2	0.0005	4.90 E-07	1.41 E-03	6.16 E-03
VOC				EPA 42 Table 1.4-2	5.50	0.005	1.55 E-02	6.76 E-02
TOC				EPA 42 Table 1.4-2	11.00	0.011	3.10 E-02	1.36 E-01
3-Methylchloranthrene				EPA 42 Table 1.4-3	2.4 E-06	2.36 E-09	6.75 E-09	2.96 E-07
7-Methylchloranthrene				EPA 42 Table 1.4-3	1.8 E-06	1.76 E-09	5.06 E-09	2.22 E-07
7,12-Dimethylbenz(a)anthracene				EPA 42 Table 1.4-3	1.6 E-06	1.57 E-09	4.50 E-09	1.97 E-07
Acenaphthene				EPA 42 Table 1.4-3	1.8 E-06	1.76 E-09	5.06 E-09	2.22 E-07
Acenaphthylene				EPA 42 Table 1.4-3	1.8 E-06	1.76 E-09	5.06 E-09	2.22 E-07
Anthracene				EPA 42 Table 1.4-3	2.4 E-06	2.36 E-09	6.75 E-09	2.96 E-07
Arsenic				EPA 42 Table 1.4-4	2.0 E-04	1.96 E-07	5.62 E-07	2.46 E-05
Barium				EPA 42 Table 1.4-4	4.4 E-03	4.31 E-06	1.24 E-05	5.42 E-04
Benz(a)anthracene				EPA 42 Table 1.4-3	1.2 E-06	1.18 E-09	3.38 E-09	1.48 E-07
Benzene				EPA 42 Table 1.4-3	2.1 E-03	2.06 E-06	5.91 E-06	2.59 E-04
Benzo(a)pyrene				EPA 42 Table 1.4-3	1.2 E-06	1.18 E-09	3.38 E-09	1.48 E-07
Benzo(b)chrysene				EPA 42 Table 1.4-3	1.8 E-06	1.76 E-09	5.06 E-09	2.22 E-07
Benzo(g,h,i)perylene				EPA 42 Table 1.4-3	1.2 E-06	1.18 E-09	3.38 E-09	1.48 E-07
Benzo(k)fluoranthene				EPA 42 Table 1.4-3	1.8 E-06	1.76 E-09	5.06 E-09	2.22 E-07
Beryllium				EPA 42 Table 1.4-4	1.2 E-05	1.18 E-08	3.38 E-08	1.48 E-06
Butane				EPA 42 Table 1.4-2	2.1 E+00	2.06 E-03	5.91 E-03	2.59 E-02
Cadmium				EPA 42 Table 1.4-4	1.1 E-03	1.08 E-06	3.10 E-06	1.36 E-05
Chromium				EPA 42 Table 1.4-4	1.4 E-03	1.37 E-06	3.94 E-06	1.73 E-05
Chrysene				EPA 42 Table 1.4-3	1.8 E-06	1.76 E-09	5.06 E-09	2.22 E-07
Cobalt				EPA 42 Table 1.4-4	8.4 E-05	8.24 E-08	2.36 E-07	1.04 E-06
Copper				EPA 42 Table 1.4-4	8.5 E-05	8.33 E-08	2.39 E-07	1.05 E-06
Dibenz(a,h)anthracene				EPA 42 Table 1.4-3	1.2 E-06	1.18 E-09	3.38 E-09	1.48 E-07
Dichlorobenzene				EPA 42 Table 1.4-3	1.2 E-05	1.18 E-08	3.38 E-08	1.48 E-06
Ethane				EPA 42 Table 1.4-2	3.1 E+00	3.04 E-03	8.72 E-03	3.82 E-02
Fluoranthene				EPA 42 Table 1.4-3	3.0 E-06	2.94 E-09	8.44 E-09	3.70 E-07
Fluorene				EPA 42 Table 1.4-3	2.8 E-06	2.75 E-09	7.88 E-09	3.45 E-07
Formaldehyde				EPA 42 Table 1.4-3	7.5 E-02	7.35 E-05	2.11 E-04	9.24 E-04
Hexane				EPA 42 Table 1.4-2	1.8 E+00	1.76 E-03	5.06 E-03	2.22 E-02
Indeno(1,2,3-cd)pyrene				EPA 42 Table 1.4-3	1.8 E-06	1.76 E-09	5.06 E-09	2.22 E-07
Manganese				EPA 42 Table 1.4-4	3.8 E-04	3.73 E-07	1.07 E-06	4.68 E-06
Mercury				EPA 42 Table 1.4-4	2.6 E-04	2.55 E-07	7.32 E-07	3.20 E-06
Methane				EPA 42 Table 1.4-2	2.30	0.00226	6.47 E-03	2.83 E-02
Molybdenum				EPA 42 Table 1.4-4	1.1 E-03	1.08 E-06	3.10 E-06	1.36 E-05
Naphthalene				EPA 42 Table 1.4-3	6.1 E-04	5.98 E-07	1.72 E-06	7.52 E-06
Nickel				EPA 42 Table 1.4-4	2.1 E-03	2.06 E-06	5.91 E-06	2.59 E-05
Pentane				EPA 42 Table 1.4-2	2.6 E+00	2.55 E-03	7.32 E-03	3.20 E-02
Phenanthrene				EPA 42 Table 1.4-3	1.7 E-06	1.67 E-09	4.79 E-09	2.10 E-07
Propane				EPA 42 Table 1.4-2	1.6 E+00	1.57 E-03	4.50 E-03	1.97 E-02
Pyrene				EPA 42 Table 1.4-3	5.0 E-06	4.90 E-09	1.41 E-08	6.16 E-07
Selenium				EPA 42 Table 1.4-4	2.4 E-05	2.35 E-08	6.75 E-08	2.96 E-06
Toluene				EPA 42 Table 1.4-3	3.4 E-03	3.33 E-06	9.57 E-06	4.19 E-05
Vanadium				EPA 42 Table 1.4-4	2.3 E-04	2.25 E-07	6.47 E-07	2.83 E-06
Zinc				EPA 42 Table 1.4-4	2.9 E-02	2.84 E-05	8.16 E-05	3.57 E-04

Notes:

1. Emission factor for "Small Boilers" and "Uncontrolled".
2. Potential hours of operation of boiler (annual) = 8,760 hours/year
3. Actual hours of operation of boilers (all year) = 365 days/year x 14 hours/day = 5,110 hours/year
4. Boilers used all year for domestic hot water.
5. Identifier #814.

Abbreviations used:

MMBtu: Million Btu
hr: Hours
yr: Years
lb: Pounds of emissions
ton: Tons of emissions

Emissions 1Gal Small Equip 6/24/2003
814 1 of 1 @2:57PM
Dyed

Item #15: Boilers

Emission Estimates

Date: 01-Jul-04

(Listed as Item #15 on the "Campus Inventory" list).

Location: Red Hill Building #49

	Fuel	Maximum Equipment Capacity		Emission Factors from EPA 42			Following estimates based on Emission Factors	
				Reference Table		Calculated	Calculated	Calculated
	Gas		5.109					
CO				EPA 42 Table 1.4-1	84	0.086	9.26 E-03	4.05 E-01
NO_x				EPA 42 Table 1.4-1	100	0.098	1.10 E-01	4.83 E-01
SO_2				EPA 42 Table 1.4-2	0.60	0.00588	6.62 E-04	2.89 E-03
PM10				EPA 42 Table 1.4-2	7.60	0.0745	8.38 E-03	3.67 E-02
PM				EPA 42 Table 1.4-2	7.60	0.0745	8.38 E-03	3.67 E-02
Pb				EPA 42 Table 1.4-2	0.0005	4.90 E-07	5.51 E-07	2.42 E-06
VOC				EPA 42 Table 1.4-2	5.50	0.054	6.07 E-03	2.66 E-02
TOC				EPA 42 Table 1.4-2	11.00	0.011	1.21 E-02	5.31 E-02
2-Methylnaphthalene				EPA 42 Table 1.4-3	2.4 E-08	2.35 E-08	2.64 E-08	1.16 E-07
3-Methylchloranthrene				EPA 42 Table 1.4-3	1.8 E-09	1.76 E-09	1.98 E-09	8.70 E-09
7,12-Dimethylbenz(a)anthracene				EPA 42 Table 1.4-3	1.6 E-08	1.57 E-08	1.76 E-08	7.73 E-08
Acenaphthene				EPA 42 Table 1.4-3	1.8 E-09	1.76 E-09	1.98 E-09	8.70 E-09
Acenaphthylene				EPA 42 Table 1.4-3	1.8 E-09	1.76 E-09	1.98 E-09	8.70 E-09
Anthracene				EPA 42 Table 1.4-3	2.4 E-09	2.35 E-09	2.64 E-09	1.16 E-08
Arsenic				EPA 42 Table 1.4-4	2.0 E-04	1.96 E-07	2.21 E-07	9.68 E-07
Barium				EPA 42 Table 1.4-4	4.4 E-03	4.31 E-06	4.85 E-06	2.13 E-05
Benzo(a)anthracene				EPA 42 Table 1.4-3	1.8 E-09	1.76 E-09	1.98 E-09	8.70 E-09
Benzene				EPA 42 Table 1.4-3	2.1 E-06	2.06 E-06	2.31 E-06	1.01 E-05
Benzo(a)pyrene				EPA 42 Table 1.4-3	1.2 E-09	1.18 E-09	1.32 E-09	5.80 E-09
Benzo(b)fluoranthene				EPA 42 Table 1.4-3	1.8 E-09	1.76 E-09	1.98 E-09	8.70 E-09
Benzo(g,h,i)perylene				EPA 42 Table 1.4-3	1.2 E-09	1.18 E-09	1.32 E-09	5.80 E-09
Benzo(k)fluoranthene				EPA 42 Table 1.4-3	1.8 E-09	1.76 E-09	1.98 E-09	8.70 E-09
Beryllium				EPA 42 Table 1.4-4	1.2 E-05	1.18 E-08	1.32 E-08	5.80 E-08
Butane				EPA 42 Table 1.4-2	2.1 E+00	2.06 E-03	2.32 E-03	1.01 E-02
Cadmium				EPA 42 Table 1.4-4	1.1 E-03	1.08 E-06	1.21 E-06	5.31 E-06
Chromium				EPA 42 Table 1.4-4	1.4 E-03	1.37 E-06	1.54 E-06	6.76 E-06
Chrysene				EPA 42 Table 1.4-3	1.8 E-09	1.76 E-09	1.98 E-09	8.70 E-09
Cobalt				EPA 42 Table 1.4-4	8.4 E-05	8.24 E-08	9.26 E-08	4.06 E-07
Copper				EPA 42 Table 1.4-4	8.5 E-04	8.33 E-07	9.36 E-07	4.11 E-06
Dibenz(a,h)anthracene				EPA 42 Table 1.4-3	1.2 E-09	1.18 E-09	1.32 E-09	5.80 E-09
Dichlorobenzene				EPA 42 Table 1.4-3	1.2 E-09	1.18 E-09	1.32 E-09	5.80 E-09
Ethane				EPA 42 Table 1.4-2	3.1 E+00	3.04 E-03	3.42 E-03	1.50 E-02
Fluoranthene				EPA 42 Table 1.4-3	3.0 E-09	2.94 E-09	3.31 E-09	1.45 E-08
Fluorene				EPA 42 Table 1.4-3	2.8 E-09	2.75 E-09	3.09 E-09	1.36 E-08
Formaldehyde				EPA 42 Table 1.4-3	7.5 E-02	7.36 E-05	8.27 E-05	3.62 E-04
Hexane				EPA 42 Table 1.4-3	1.8 E+00	1.76 E-03	1.98 E-03	8.70 E-03
Indeno(1,2,3-cd)pyrene				EPA 42 Table 1.4-3	1.8 E-09	1.76 E-09	1.98 E-09	8.70 E-09
Manganese				EPA 42 Table 1.4-4	3.8 E-04	3.73 E-07	4.19 E-07	1.84 E-06
Mercury				EPA 42 Table 1.4-4	2.6 E-04	2.55 E-07	2.87 E-07	1.26 E-06
Methane				EPA 42 Table 1.4-2	2.30	0.00226	2.54 E-03	1.11 E-02
Molybdenum				EPA 42 Table 1.4-4	1.1 E-03	1.08 E-06	1.21 E-06	5.31 E-06
Naphthalene				EPA 42 Table 1.4-3	6.1 E-09	5.98 E-09	6.73 E-09	2.95 E-08
Nickel				EPA 42 Table 1.4-4	2.1 E-03	2.06 E-06	2.32 E-06	1.01 E-05
Pentane				EPA 42 Table 1.4-2	2.6 E+00	2.55 E-03	2.87 E-03	1.26 E-02
Phenanthrene				EPA 42 Table 1.4-3	1.7 E-09	1.67 E-09	1.88 E-09	8.21 E-09
Propane				EPA 42 Table 1.4-2	1.6 E+00	1.57 E-03	1.76 E-03	7.73 E-03
Pyrene				EPA 42 Table 1.4-3	5.0 E-09	4.90 E-09	5.51 E-09	2.42 E-08
Selenium				EPA 42 Table 1.4-4	2.4 E-05	2.35 E-08	2.64 E-08	1.16 E-07
Toluene				EPA 42 Table 1.4-3	3.4 E-03	3.33 E-06	3.75 E-06	1.64 E-05
Vanadium				EPA 42 Table 1.4-4	2.3 E-03	2.25 E-06	2.54 E-06	1.11 E-05
Zinc				EPA 42 Table 1.4-4	2.9 E-03	2.84 E-06	3.20 E-06	1.40 E-05

Notes:
1. Emission factor for "Small Boilers" and "Uncontrolled".
2. Potential hours of operation of boiler (year-all) = [illegible]
3. Actual hours of operation of boiler (winter: Sept 1 to May 31) = 273 days/year x 24 hours/day = [illegible] hours/year
4. Boiler used during winter for steam purposes.
5. Identifier #815.

Abbreviations used:
- MMBtu Million Btu
- hr Hours
- yr Years
- lb Pounds of emissions
- ton Tons of emissions

Emissions ISU Small Boiler 6/24/2003
S10 1 of 1 @2:07PM
Syed

Item #16: Boiler

Emission Estimates

Date: 04-Jul-04

(Listed on item #16 on the "Campus Inventory" list).

Location: Chemistry - Building 003

Pollutant	Fuel	Maximum Equipment Capacity		Emission Factors from EPA 42: Reference Table			Following estimates based on Emission Factors	
	Gas		1.100					
CO				EPA 42 Table 1.4-1	84	0.092	9.30 E-02	4.10 E-01
NO_x				EPA 42 Table 1.4-1	100	0.110	1.13 E-01	4.95 E-01
SO_2				EPA 42 Table 1.4-2	0.60	0.00066	6.70 E-04	2.97 E-03
PM10				EPA 42 Table 1.4-2	7.60	0.0076	8.50 E-03	3.76 E-02
PM				EPA 42 Table 1.4-2	7.60	0.0076	8.50 E-03	3.76 E-02
PM				EPA 42 Table 1.4-2	0.0055	4.00 E-07	6.00 E-07	2.48 E-06
VOC				EPA 42 Table 1.4-2	0.30	0.0003	4.22 E-03	2.73 E-02
TOC				EPA 42 Table 1.4-2	11.00	0.011	1.24 E-02	5.46 E-02
2-Methylnaphthalene				EPA 42 Table 1.4-3	2.4 E-05	2.36 E-08	2.71 E-09	1.19 E-07
3-Methylchloranthrene				EPA 42 Table 1.4-3	1.8 E-05	1.76 E-08	2.03 E-09	8.91 E-08
7,12-Dimethylbenz(a)anthracene				EPA 42 Table 1.4-3	1.6 E-05	1.57 E-08	1.81 E-09	7.92 E-08
Acenaphthene				EPA 42 Table 1.4-3	1.8 E-05	1.76 E-08	2.03 E-09	8.91 E-08
Acenaphthylene				EPA 42 Table 1.4-3	1.8 E-05	1.76 E-08	2.03 E-09	8.91 E-08
Anthracene				EPA 42 Table 1.4-3	2.4 E-05	2.36 E-08	2.71 E-09	1.19 E-07
Arsenic				EPA 42 Table 1.4-4	2.0 E-04	1.96 E-07	2.30 E-07	9.90 E-07
Barium				EPA 42 Table 1.4-4	4.4 E-04	4.31 E-07	4.97 E-07	2.18 E-06
Benz(a)anthracene				EPA 42 Table 1.4-3	1.8 E-05	1.76 E-08	2.03 E-09	8.91 E-08
Benzene				EPA 42 Table 1.4-3	2.1 E-03	2.06 E-06	2.37 E-07	1.04 E-06
Benzo(b)pyrene				EPA 42 Table 1.4-3	1.2 E-05	1.18 E-08	1.35 E-09	5.94 E-08
Benzo(g,h,i)perylene				EPA 42 Table 1.4-3	1.8 E-05	1.76 E-08	2.03 E-09	8.91 E-08
Benzo(k)fluoranthene				EPA 42 Table 1.4-3	1.2 E-05	1.18 E-08	1.35 E-09	5.94 E-08
Beryllium				EPA 42 Table 1.4-3	1.8 E-05	1.76 E-08	2.03 E-09	8.91 E-08
Boron				EPA 42 Table 1.4-4	1.2 E-05	1.18 E-08	1.35 E-09	5.94 E-08
Cadmium				EPA 42 Table 1.4-3	2.1 E+00	2.06 E-03	2.37 E-04	1.04 E-02
Chromium				EPA 42 Table 1.4-4	1.1 E-03	1.08 E-06	1.24 E-07	5.45 E-06
Chrysene				EPA 42 Table 1.4-4	1.4 E-05	1.37 E-08	1.58 E-09	6.93 E-08
Cobalt				EPA 42 Table 1.4-3	1.8 E-05	1.76 E-08	2.03 E-09	8.91 E-08
Copper				EPA 42 Table 1.4-4	8.4 E-05	8.24 E-08	9.50 E-09	4.18 E-07
Dibenzo(a,h)anthracene				EPA 42 Table 1.4-4	8.5 E-04	8.33 E-07	9.61 E-07	4.21 E-06
Dichlorobenzene				EPA 42 Table 1.4-3	1.2 E-05	1.18 E-08	1.35 E-09	5.94 E-08
Fluoranthene				EPA 42 Table 1.4-3	1.2 E-05	1.18 E-08	1.35 E-09	5.94 E-08
Fluorene				EPA 42 Table 1.4-3	3.1 E-05	3.04 E-08	3.50 E-09	1.53 E-07
Formaldehyde				EPA 42 Table 1.4-3	2.6 E-05	2.54 E-08	2.93 E-09	1.28 E-07
Hexane				EPA 42 Table 1.4-3	2.8 E-05	2.75 E-08	3.17 E-09	1.39 E-07
Indeno(1,2,3-cd)pyrene				EPA 42 Table 1.4-3	7.5 E-05	7.35 E-08	8.46 E-09	3.71 E-07
Manganese				EPA 42 Table 1.4-3	1.8 E+00	1.76 E-03	2.03 E-04	8.91 E-03
Mercury				EPA 42 Table 1.4-3	1.8 E-05	1.76 E-08	2.03 E-09	8.91 E-08
Methane				EPA 42 Table 1.4-4	3.8 E-04	3.73 E-07	4.30 E-07	1.88 E-06
Molybdenum				EPA 42 Table 1.4-4	2.9 E-04	2.85 E-07	2.94 E-07	1.29 E-06
Naphthalene				EPA 42 Table 1.4-4	2.30	0.00226	2.60 E-05	1.14 E-02
Nickel				EPA 42 Table 1.4-4	1.1 E-03	1.08 E-06	1.24 E-07	5.45 E-06
Pentane				EPA 42 Table 1.4-4	6.1 E-04	5.99 E-07	6.89 E-07	3.02 E-06
Phenanthrene				EPA 42 Table 1.4-4	2.1 E-05	2.06 E-08	2.37 E-09	1.04 E-08
Propane				EPA 42 Table 1.4-3	2.6 E+00	2.55 E-03	2.94 E-04	1.29 E-02
Pyrene				EPA 42 Table 1.4-3	1.7 E-05	1.67 E-08	1.92 E-09	8.42 E-08
Selenium				EPA 42 Table 1.4-3	1.8 E+00	1.67 E-03	1.92 E-03	7.92 E-03
Toluene				EPA 42 Table 1.4-3	5.0 E-05	4.90 E-08	5.65 E-09	2.48 E-08
Vanadium				EPA 42 Table 1.4-4	2.4 E-05	2.36 E-08	2.71 E-09	1.19 E-07
Zinc				EPA 42 Table 1.4-3	3.4 E-05	3.33 E-08	3.84 E-09	1.68 E-08
				EPA 42 Table 1.4-4	2.3 E-03	2.25 E-06	2.60 E-07	1.14 E-06
				EPA 42 Table 1.4-4	2.0 E-03	2.04 E-06	3.20 E-06	1.41 E-04

Notes:

1. Emission factor for "Small Boilers" and "Uncontrolled".
2. Potential hours of operation of boiler (annual) = [redacted]
3. Actual hours of operation of boiler (summer: June 1 to August 31) = 92 days/year x 24 hours/day = 2,208 hours/year
4. Boiler used during summer for heating.
5. Monitor 9010.

Abbreviations used:

MMBtu Million Btu
hr Hours
yr Years
lb Pounds of emissions
ton Tons of emissions

Emissions Idle Small Equip 6/14/2004
SHEET 1 of 1 @2:57PM
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Item #17: Boilers

Emission Estimates

Date: 01-Jul-04

(Listed as item #17 on the "Campus Inventory" list).

Location: Armory Building #73

Emissions	Fuel	Maximum Equipment Capacity		Emission Factors from EPA 42: Reference Table	lb/10^6 scf	lb/MMBtu	Following estimates based on Emission Factors: lb/hr	tons/yr
	Gas							
CO				EPA 42 Table 1.4-1	84	0.080	5.25 E-02	2.34 E-01
NO_x				EPA 42 Table 1.4-1	100	0.098	6.37 E-02	2.79 E-01
SO_2				EPA 42 Table 1.4-2	0.60	0.000588	3.82 E-04	1.67 E-03
PM10				EPA 42 Table 1.4-2	7.60	0.0075	4.84 E-03	2.12 E-02
PM				EPA 42 Table 1.4-2	7.60	0.0075	4.84 E-03	2.12 E-02
Pb				EPA 42 Table 1.4-2	0.0008	4.90 E-07	3.18 E-07	1.40 E-06
VOC				EPA 42 Table 1.4-2	5.50	0.005	3.50 E-03	1.54 E-02
TOC				EPA 42 Table 1.4-2	11.00	0.011	7.01 E-03	3.07 E-02
2-Methylnaphthalene				EPA 42 Table 1.4-3	2.4 E-05	2.36 E-08	1.53 E-08	6.70 E-08
3-Methylchloranthrene				EPA 42 Table 1.4-3	1.8 E-05	1.76 E-08	1.15 E-08	5.03 E-08
7,12-Dimethylbenz(a)anthracene				EPA 42 Table 1.4-3	1.6 E-05	1.57 E-08	1.02 E-08	4.47 E-08
Acenaphthene				EPA 42 Table 1.4-3	1.8 E-05	1.76 E-08	1.15 E-08	5.02 E-08
Acenaphthylene				EPA 42 Table 1.4-3	1.8 E-05	1.76 E-08	1.15 E-08	5.02 E-08
Anthracene				EPA 42 Table 1.4-3	2.4 E-05	2.36 E-08	1.53 E-08	6.70 E-08
Arsenic				EPA 42 Table 1.4-4	2.0 E-04	1.96 E-07	1.27 E-07	5.59 E-07
Barium				EPA 42 Table 1.4-4	4.4 E-03	4.31 E-06	2.80 E-06	1.23 E-05
Benz(a)anthracene				EPA 42 Table 1.4-3	1.8 E-05	1.76 E-08	1.15 E-08	5.02 E-08
Benzene				EPA 42 Table 1.4-3	2.1 E-03	2.06 E-06	1.34 E-06	5.88 E-06
Benzo(b)pyrene				EPA 42 Table 1.4-3	1.2 E-05	1.18 E-08	7.65 E-10	3.35 E-09
Benzo(g)chrysene				EPA 42 Table 1.4-3	1.8 E-05	1.76 E-08	1.15 E-08	5.02 E-08
Benzo(j,k)fluoranthene				EPA 42 Table 1.4-3	1.2 E-05	1.18 E-08	7.65 E-10	3.35 E-09
Benzo(k)fluoranthene				EPA 42 Table 1.4-3	1.8 E-05	1.76 E-08	1.15 E-08	5.02 E-08
Beryllium				EPA 42 Table 1.4-4	1.2 E-05	1.18 E-08	7.65 E-09	3.35 E-08
Boron				EPA 42 Table 1.4-3	2.1 E+00	2.06 E-03	1.34 E-03	5.88 E-03
Cadmium				EPA 42 Table 1.4-4	1.1 E-03	1.08 E-06	7.01 E-07	3.07 E-06
Chromium				EPA 42 Table 1.4-4	1.4 E-03	1.37 E-06	8.92 E-07	3.91 E-06
Chrysene				EPA 42 Table 1.4-3	1.8 E-05	1.76 E-08	1.15 E-08	5.02 E-08
Cobalt				EPA 42 Table 1.4-4	8.4 E-05	8.24 E-08	5.36 E-08	2.34 E-07
Copper				EPA 42 Table 1.4-4	8.5 E-05	8.33 E-08	5.42 E-08	2.37 E-07
Dibenz(a,h)anthracene				EPA 42 Table 1.4-3	1.2 E-05	1.18 E-08	7.65 E-10	3.35 E-09
Dichlorobenzene				EPA 42 Table 1.4-3	1.2 E-05	1.18 E-08	7.65 E-07	3.35 E-06
Ethane				EPA 42 Table 1.4-3	3.1 E+00	3.04 E-03	1.98 E-03	8.68 E-03
Fluoranthene				EPA 42 Table 1.4-3	3.0 E-05	2.94 E-08	1.91 E-08	8.37 E-08
Fluorene				EPA 42 Table 1.4-3	2.8 E-05	2.75 E-08	1.79 E-08	7.82 E-08
Formaldehyde				EPA 42 Table 1.4-3	7.5 E-02	7.35 E-05	4.78 E-05	2.09 E-04
Hexane				EPA 42 Table 1.4-3	1.8 E+00	1.76 E-03	1.15 E-03	5.02 E-03
Indeno(1,2,3-cd)pyrene				EPA 42 Table 1.4-3	1.8 E-05	1.76 E-08	1.15 E-08	5.02 E-08
Manganese				EPA 42 Table 1.4-4	3.8 E-04	3.73 E-07	2.43 E-07	1.06 E-06
Mercury				EPA 42 Table 1.4-4	2.6 E-04	2.55 E-07	1.66 E-07	7.26 E-07
Methane				EPA 42 Table 1.4-2	2.30	0.002254	1.47 E-03	6.42 E-03
Molybdenum				EPA 42 Table 1.4-4	1.1 E-03	1.08 E-06	7.01 E-07	3.07 E-06
Naphthalene				EPA 42 Table 1.4-3	6.1 E-04	4.59 E-07	2.99 E-07	1.31 E-06
Nickel				EPA 42 Table 1.4-4	2.1 E-03	2.06 E-06	1.34 E-06	5.88 E-06
Pentane				EPA 42 Table 1.4-3	2.6 E+00	2.55 E-03	1.66 E-03	7.26 E-03
Phenanthrene				EPA 42 Table 1.4-3	1.7 E-05	1.67 E-08	1.08 E-08	4.75 E-08
Propane				EPA 42 Table 1.4-3	1.6 E+00	1.57 E-03	1.02 E-03	4.47 E-03
Pyrene				EPA 42 Table 1.4-3	5.0 E-05	4.90 E-08	3.19 E-08	1.40 E-07
Selenium				EPA 42 Table 1.4-4	2.4 E-05	2.35 E-08	1.53 E-08	6.70 E-08
Toluene				EPA 42 Table 1.4-3	3.4 E-03	3.33 E-06	2.17 E-06	9.49 E-06
Vanadium				EPA 42 Table 1.4-4	2.3 E-03	2.25 E-06	1.47 E-06	6.42 E-06
Zinc				EPA 42 Table 1.4-4	2.9 E-03	2.84 E-06	1.85 E-06	8.09 E-06

Notes:
1. Emission factor for "Small Boilers" and "Uncontrolled".
2. Potential hours of operation of boiler (annual) = [illegible]
3. Actual hours of operation of boiler (winter: Sept 1 to May 31) = 273 days/year x 24 hours/day = [illegible] hours/year
4. Boilers used during winter for heating.
5. Identifier #017.

Abbreviations used:
- Million Million Btu
- hr Hours
- yr Years
- lb Pounds of emissions
- ton Tons of emissions

Emissions YEU Small Equip 6/24/2003
017 1 of 1 @2:37PM
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Item #18: Boilers

Emission Estimates

Date: 01-Jul-04

(Listed on line #18 on the "Campus Inventory" list).

Location: Dowling Building #71

[illegible]	Fuel	Maximum Equipment Capacity	[illegible]	Emission Factors from EPA 42s			Following estimates based on Emission Factors	
				Reference Table	[illegible]	[illegible]	[illegible]	[illegible]
	Gas		[illegible]		lb/10⁶ scf	lb/[illegible]	lb/hr	lbs/yr
CO				EPA 42 Table 1.4-1	84	[illegible]	4.00 E-02	2.10 E-01
NO_x				EPA 42 Table 1.4-1	100	[illegible]	5.00 E-02	2.63 E-01
SO_2				EPA 42 Table 1.4-2	0.60	[illegible]	3.00 E-04	1.58 E-03
PM10				EPA 42 Table 1.4-2	7.60	[illegible]	4.40 E-03	1.94 E-02
PM				EPA 42 Table 1.4-2	7.60	[illegible]	4.40 E-03	1.94 E-02
Pb				EPA 42 Table 1.4-3	[illegible]	4.00 E-07	2.00 E-07	1.20 E-06
VOC				EPA 42 Table 1.4-2	5.50	[illegible]	3.21 E-03	1.41 E-02
TOC				EPA 42 Table 1.4-2	11.00	0.011	6.42 E-03	2.81 E-02
3-Methylchlorofluoranthene				EPA 42 Table 1.4-3	2.4 E-06	2.30 E-06	1.40 E-06	6.13 E-06
2-Methylchlorofluoranthene				EPA 42 Table 1.4-3	1.8 E-06	1.70 E-06	1.00 E-06	4.60 E-06
7,12-Dimethylbenz(a)anthracene				EPA 42 Table 1.4-3	1.6 E-05	1.57 E-06	9.20 E-06	4.00 E-06
Acenaphthene				EPA 42 Table 1.4-3	1.8 E-06	1.70 E-06	1.00 E-06	4.60 E-06
Acenaphthylene				EPA 42 Table 1.4-3	1.8 E-06	1.70 E-06	1.00 E-06	4.60 E-06
Anthracene				EPA 42 Table 1.4-3	2.4 E-06	2.30 E-06	1.40 E-06	6.13 E-06
Amonia				EPA 42 Table 1.4-4	2.9 E-04	1.60 E-07	1.17 E-07	5.11 E-07
Barium				EPA 42 Table 1.4-4	4.4 E-04	4.31 E-06	2.67 E-06	1.12 E-05
Benz(a)anthracene				EPA 42 Table 1.4-3	1.8 E-06	1.70 E-06	1.00 E-06	4.60 E-06
Benzene				EPA 42 Table 1.4-3	2.1 E-03	2.00 E-06	1.23 E-06	5.37 E-06
Benz(a)pyrene				EPA 42 Table 1.4-3	1.2 E-06	1.10 E-06	7.00 E-10	3.07 E-06
Benz(b)fluoranthene				EPA 42 Table 1.4-3	1.8 E-06	1.70 E-06	1.00 E-06	4.60 E-06
Benz(g,h,i)perylene				EPA 42 Table 1.4-3	1.2 E-06	1.10 E-06	7.00 E-10	3.07 E-06
Benz(k)fluoranthene				EPA 42 Table 1.4-3	1.8 E-06	1.70 E-06	1.00 E-06	4.60 E-06
Beryllium				EPA 42 Table 1.4-4	1.2 E-05	1.10 E-06	7.00 E-09	3.07 E-05
Boron				EPA 42 Table 1.4-3	2.1 E-03	2.00 E-06	1.23 E-03	5.37 E-03
Cadmium				EPA 42 Table 1.4-4	1.1 E-03	1.00 E-06	6.42 E-07	2.81 E-06
Chromium				EPA 42 Table 1.4-4	1.4 E-03	1.37 E-06	8.17 E-07	3.58 E-06
Chrysene				EPA 42 Table 1.4-3	1.8 E-06	1.70 E-06	1.00 E-06	4.60 E-06
Cobalt				EPA 42 Table 1.4-4	8.4 E-05	8.24 E-06	4.90 E-06	2.16 E-05
Copper				EPA 42 Table 1.4-4	8.5 E-04	8.33 E-07	4.96 E-07	2.17 E-06
Dibenz(a,h)anthracene				EPA 42 Table 1.4-3	1.2 E-06	1.10 E-06	7.00 E-10	3.07 E-06
Dichlorobenzene				EPA 42 Table 1.4-3	1.2 E-03	1.10 E-06	7.00 E-07	3.07 E-06
Ethane				EPA 42 Table 1.4-3	3.1 E+00	2.94 E-03	1.81 E-03	7.92 E-03
Fluoranthene				EPA 42 Table 1.4-3	3.0 E-06	2.94 E-06	1.75 E-06	7.67 E-06
Fluorene				EPA 42 Table 1.4-3	2.8 E-06	2.70 E-06	1.65 E-06	7.18 E-06
Formaldehyde				EPA 42 Table 1.4-4	7.5 E-02	7.36 E-05	4.39 E-05	1.92 E-04
Hexane				EPA 42 Table 1.4-3	1.8 E+00	1.70 E-03	1.00 E-03	4.60 E-03
Indeno(1,2,3-cd)pyrene				EPA 42 Table 1.4-3	1.8 E-06	1.70 E-06	1.00 E-06	4.60 E-06
Manganese				EPA 42 Table 1.4-4	3.8 E-04	3.73 E-07	2.22 E-07	9.71 E-07
Mercury				EPA 42 Table 1.4-4	2.6 E-04	2.55 E-07	1.52 E-07	6.64 E-07
Methane				EPA 42 Table 1.4-2	2.30	0.00230	1.34 E-03	5.89 E-03
Molybdenum				EPA 42 Table 1.4-4	1.1 E-03	1.08 E-06	6.42 E-07	2.81 E-06
Naphthalene				EPA 42 Table 1.4-6	6.1 E-04	5.98 E-07	3.56 E-07	1.56 E-06
Nickel				EPA 42 Table 1.4-4	2.1 E-03	2.06 E-06	1.23 E-06	5.37 E-06
Pentane				EPA 42 Table 1.4-6	2.6 E+00	2.55 E-03	1.52 E-03	6.64 E-03
Phenanthrene				EPA 42 Table 1.4-3	1.7 E-05	1.67 E-06	9.92 E-07	4.34 E-06
Propane				EPA 42 Table 1.4-3	1.8 E+00	1.67 E-03	9.92 E-04	4.34 E-03
Pyrene				EPA 42 Table 1.4-3	5.0 E-06	4.90 E-06	2.92 E-06	1.28 E-05
Selenium				EPA 42 Table 1.4-4	2.4 E-05	2.35 E-06	1.40 E-06	6.13 E-06
Toluene				EPA 42 Table 1.4-3	3.4 E-03	3.33 E-06	1.98 E-06	8.68 E-06
Vanadium				EPA 42 Table 1.4-4	2.3 E-05	2.25 E-06	1.34 E-06	5.89 E-06
Zinc				EPA 42 Table 1.4-4	2.9 E-02	2.84 E-05	1.69 E-05	7.44 E-05

Notes:

1. Emission factor for "Small Boilers" and "Uncontrolled".
2. Potential hours of operation of boiler (annual) = [illegible] hours/year
3. Actual hours of operation of boiler (winter: Sept 1 to May 31) = 275 days/year x 24 hours/day = [illegible] hours/year
4. Boilers used during winter for heating.
5. Manual 4010.

Abbreviations used:

- MMBtu Million Btu
- hr Hours
- yr Years
- lbs Pounds of emissions
- tons Tons of emissions

Emissions 1GU Small Equip 6/24/2003
Sheet 1 of 1 @2:07PM
Eqmt

Item #19: Boilers

Emission Estimates

Date: 01-Jul-04

(Listed as item #10 on the "Campus Inventory" list).

Location: Alumni House Building #29

Pollutant	Fuel	Maximum Equipment Capacity		Emission Factors from EPA AP-42: Reference Table			Following estimates based on Emission Factors:	
					lb/10^6 scf	lb/MMBtu	lb/hr	ton/yr
	Gas		0.135					
CO				EPA 42 Table 1.4-1	84	0.082	8.49 E-03	4.33 E-02
NO_x				EPA 42 Table 1.4-1	100	0.098	1.10 E-02	5.16 E-02
SO_2				EPA 42 Table 1.4-2	0.60	0.00059	7.05 E-05	3.08 E-04
PM10				EPA 42 Table 1.4-2	7.60	0.0075	8.94 E-04	3.92 E-03
PM				EPA 42 Table 1.4-2	7.60	0.0075	8.94 E-04	3.92 E-03
Pb				EPA 42 Table 1.4-2	0.0005	4.90 E-07	5.88 E-08	2.58 E-07
VOC				EPA 42 Table 1.4-2	5.50	0.0054	6.47 E-04	2.83 E-03
TOC				EPA 42 Table 1.4-2	11.00	0.011	1.29 E-03	5.67 E-03
3-Methylnaphthalene				EPA 42 Table 1.4-3	2.4 E-05	2.35 E-08	2.82 E-09	1.24 E-08
2-Methylnaphthalene				EPA 42 Table 1.4-3	1.8 E-05	1.76 E-08	2.12 E-10	9.28 E-10
7,12-Dimethylbenz(a)anthracene				EPA 42 Table 1.4-3	1.6 E-05	1.57 E-08	1.88 E-09	8.24 E-09
Acenaphthene				EPA 42 Table 1.4-3	1.8 E-05	1.76 E-08	2.12 E-10	9.28 E-10
Acenaphthylene				EPA 42 Table 1.4-3	1.8 E-05	1.76 E-08	2.12 E-10	9.28 E-10
Anthracene				EPA 42 Table 1.4-3	2.4 E-05	2.35 E-08	2.82 E-10	1.24 E-09
Arsenic				EPA 42 Table 1.4-4	2.0 E-04	1.96 E-07	2.35 E-08	1.03 E-07
Barium				EPA 42 Table 1.4-4	4.4 E-04	4.31 E-07	5.18 E-07	2.27 E-06
Benz(a)anthracene				EPA 42 Table 1.4-3	1.8 E-05	1.76 E-08	2.12 E-10	9.28 E-10
Benzene				EPA 42 Table 1.4-3	2.1 E-03	2.06 E-06	2.47 E-07	1.08 E-06
Benzo(a)pyrene				EPA 42 Table 1.4-3	1.2 E-05	1.18 E-08	1.41 E-10	6.18 E-10
Benzo(b)fluoranthene				EPA 42 Table 1.4-3	1.8 E-05	1.76 E-08	2.12 E-10	9.28 E-10
Benzo(g,h,i)perylene				EPA 42 Table 1.4-3	1.2 E-05	1.18 E-08	1.41 E-10	6.18 E-10
Benzo(k)fluoranthene				EPA 42 Table 1.4-3	1.8 E-05	1.76 E-08	2.12 E-10	9.28 E-10
Beryllium				EPA 42 Table 1.4-4	1.2 E-05	1.18 E-08	1.41 E-08	6.18 E-08
Boron				EPA 42 Table 1.4-3	2.1 E+00	2.06 E-03	2.47 E-04	1.08 E-03
Cadmium				EPA 42 Table 1.4-4	1.1 E-04	1.08 E-07	1.29 E-07	5.67 E-07
Chromium				EPA 42 Table 1.4-4	1.4 E-03	1.37 E-06	1.65 E-07	7.21 E-07
Chrysene				EPA 42 Table 1.4-3	1.8 E-05	1.76 E-08	2.12 E-10	9.28 E-10
Cobalt				EPA 42 Table 1.4-4	8.4 E-05	8.24 E-08	9.88 E-09	4.33 E-08
Copper				EPA 42 Table 1.4-4	8.5 E-04	8.33 E-07	1.00 E-07	4.38 E-07
Dibenzo(a,h)anthracene				EPA 42 Table 1.4-3	1.2 E-05	1.18 E-08	1.41 E-10	6.18 E-10
Dichlorobenzene				EPA 42 Table 1.4-3	1.2 E-03	1.18 E-06	1.41 E-07	6.18 E-07
Ethane				EPA 42 Table 1.4-3	3.1 E+00	3.04 E-03	3.65 E-04	1.60 E-03
Fluoranthene				EPA 42 Table 1.4-3	3.0 E-05	2.94 E-08	3.53 E-10	1.55 E-09
Fluorene				EPA 42 Table 1.4-3	2.8 E-05	2.75 E-08	3.29 E-10	1.44 E-09
Formaldehyde				EPA 42 Table 1.4-3	7.6 E-02	7.45 E-05	8.92 E-08	3.91 E-05
Hexane				EPA 42 Table 1.4-3	1.8 E+00	1.76 E-03	2.12 E-04	9.28 E-04
Indeno(1,2,3-cd)pyrene				EPA 42 Table 1.4-3	1.8 E-05	1.76 E-08	2.12 E-10	9.28 E-10
Manganese				EPA 42 Table 1.4-4	3.8 E-04	3.73 E-07	4.47 E-08	1.96 E-07
Mercury				EPA 42 Table 1.4-4	2.6 E-04	2.55 E-07	3.06 E-08	1.34 E-07
Methane				EPA 42 Table 1.4-2	2.30	0.00225	2.71 E-04	1.19 E-03
Methylchrysene				EPA 42 Table 1.4-3	1.1 E-05	1.08 E-08	1.29 E-09	5.67 E-09
Naphthalene				EPA 42 Table 1.4-3	6.1 E-04	5.98 E-07	7.18 E-08	3.14 E-07
Nickel				EPA 42 Table 1.4-4	2.1 E-03	2.06 E-06	2.47 E-07	1.08 E-06
Pentane				EPA 42 Table 1.4-3	2.6 E+00	2.55 E-03	3.06 E-04	1.34 E-03
Phenanthrene				EPA 42 Table 1.4-3	1.7 E-05	1.67 E-08	2.00 E-09	8.76 E-09
Propane				EPA 42 Table 1.4-3	1.6 E+00	1.57 E-03	1.88 E-04	8.24 E-04
Pyrene				EPA 42 Table 1.4-3	5.0 E-05	4.90 E-08	5.88 E-10	2.58 E-09
Selenium				EPA 42 Table 1.4-4	2.4 E-05	2.35 E-08	2.82 E-09	1.24 E-08
Toluene				EPA 42 Table 1.4-3	3.4 E-03	3.33 E-06	4.00 E-07	1.75 E-06
Vanadium				EPA 42 Table 1.4-4	2.3 E-05	2.25 E-08	2.71 E-09	1.18 E-08
Zinc				EPA 42 Table 1.4-4	2.0 E-02	2.04 E-05	2.41 E-06	1.06 E-05

Notes:

1. Emission factor for "Small Boilers" and "Uncontrolled".
2. Potential hours of operation of boiler (annual) = 8,760 hours/year
3. Actual hours of operation of boiler (winter: Sept 1 to May 31) = 275 days/year x 24 hours/day = 6,600 hours/year
4. Boiler used during winter for heating.
5. Identifier #B10.

Abbreviations used:

MMBtu Million Btu
hr Hours
yr Years
lb Pounds of emissions
ton Tons of emissions

Emissions IGU Small Boiler 6/24/2003
B10 1 of 1 @2:07PM
Syed

Item #20: Boilers

Emission Estimates

Date: 01-JA-04

(Listed as item #20 on the "Compact Inventory" tab).

Location: BPC Building #40

[redacted]	Fuel	Maximum Equipment Capacity		Emission Factors from EPA 42: Reference Table			Following estimates based on Emission Factors:	
	Gas		1.000					
CO				EPA 42 Table 1.4-1	84	0.080	1.24 E-01	5.41 E-01
NO_x				EPA 42 Table 1.4-1	100	0.100	1.47 E-01	6.44 E-01
SO_2				EPA 42 Table 1.4-2	0.06	0.00006	8.82 E-04	3.86 E-03
PM10				EPA 42 Table 1.4-2	7.60	0.0076	1.12 E-02	4.89 E-02
PM				EPA 42 Table 1.4-2	7.60	0.0076	1.12 E-02	4.89 E-02
Pb				EPA 42 Table 1.4-3	0.0005	4.90 E-07	7.35 E-07	3.22 E-06
VOC				EPA 42 Table 1.4-2	5.50	0.0055	8.09 E-02	3.54 E-02
TOC				EPA 42 Table 1.4-2	11.00	0.011	1.62 E-02	7.09 E-02
2-Methylnaphthalene				EPA 42 Table 1.4-3	2.4 E-05	2.35 E-08	3.53 E-08	1.55 E-07
3-Methylchloranthrene				EPA 42 Table 1.4-3	1.8 E-06	1.76 E-09	2.65 E-09	1.16 E-08
7,12-Dimethylbenz(a)anthracene				EPA 42 Table 1.4-3	1.6 E-05	1.57 E-08	2.35 E-08	1.03 E-07
Acenaphthene				EPA 42 Table 1.4-3	1.8 E-06	1.76 E-09	2.65 E-09	1.16 E-08
Acenaphthylene				EPA 42 Table 1.4-3	1.8 E-06	1.76 E-09	2.65 E-09	1.16 E-08
Anthracene				EPA 42 Table 1.4-3	2.4 E-06	2.35 E-09	3.53 E-09	1.55 E-08
Arsenic				EPA 42 Table 1.4-3	2.0 E-04	1.96 E-07	2.94 E-07	1.29 E-06
Barium				EPA 42 Table 1.4-4	4.4 E-03	4.31 E-06	6.47 E-06	2.83 E-05
Benz(a)anthracene				EPA 42 Table 1.4-3	1.8 E-06	1.76 E-09	2.65 E-09	1.16 E-08
Benzene				EPA 42 Table 1.4-3	2.1 E-03	2.06 E-06	3.09 E-06	1.35 E-05
Benzo(b)pyrene				EPA 42 Table 1.4-3	1.2 E-06	1.18 E-09	1.76 E-09	7.73 E-09
Benzo(g,h,i)perylene				EPA 42 Table 1.4-3	1.8 E-06	1.76 E-09	2.65 E-09	1.16 E-08
Benzo(k)fluoranthene				EPA 42 Table 1.4-3	1.2 E-06	1.18 E-09	1.76 E-09	7.73 E-09
Benzo(j)fluoranthene				EPA 42 Table 1.4-3	1.8 E-06	1.76 E-09	2.65 E-09	1.16 E-08
Beryllium				EPA 42 Table 1.4-3	1.2 E-06	1.18 E-09	1.76 E-09	7.73 E-09
Boron				EPA 42 Table 1.4-3	2.1 E+00	2.06 E-03	3.09 E-03	1.35 E-02
Cadmium				EPA 42 Table 1.4-4	1.1 E-03	1.08 E-06	1.62 E-06	7.09 E-06
Chromium				EPA 42 Table 1.4-4	1.4 E-03	1.37 E-06	2.06 E-06	8.02 E-06
Chrysene				EPA 42 Table 1.4-3	1.8 E-06	1.76 E-09	2.65 E-09	1.16 E-08
Cobalt				EPA 42 Table 1.4-4	8.4 E-05	8.24 E-08	1.24 E-07	5.41 E-07
Copper				EPA 42 Table 1.4-4	8.5 E-04	8.33 E-07	1.25 E-06	5.45 E-06
Dibenz(a,h)anthracene				EPA 42 Table 1.4-3	1.2 E-06	1.18 E-09	1.76 E-09	7.73 E-09
Dichlorobenzene				EPA 42 Table 1.4-3	1.2 E-06	1.18 E-09	1.76 E-09	7.73 E-09
Ethane				EPA 42 Table 1.4-3	3.1 E+00	3.04 E-03	4.56 E-03	2.00 E-02
Formaldehyde				EPA 42 Table 1.4-3	3.0 E-05	2.94 E-08	4.41 E-08	1.93 E-07
Fluoranthene				EPA 42 Table 1.4-3	2.8 E-06	2.75 E-09	4.12 E-09	1.80 E-08
Fluorene				EPA 42 Table 1.4-3	7.5 E-06	7.35 E-09	1.10 E-08	4.82 E-08
Formaldehyde				EPA 42 Table 1.4-3	1.9 E+00	1.86 E-03	2.79 E-03	1.22 E-02
Hexane				EPA 42 Table 1.4-3	1.8 E-06	1.76 E-09	2.65 E-09	1.16 E-08
Indeno(1,2,3-cd)pyrene				EPA 42 Table 1.4-3	3.0 E-01	2.75 E-07	4.12 E-07	1.80 E-06
Naphthalene				EPA 42 Table 1.4-4	2.0 E-01	2.06 E-07	3.09 E-07	1.35 E-06
Mercury				EPA 42 Table 1.4-2	2.30	0.00230	3.39 E-03	1.48 E-02
Methane				EPA 42 Table 1.4-3	1.1 E-03	1.08 E-06	1.62 E-06	7.09 E-06
Molybdenum				EPA 42 Table 1.4-3	6.1 E-01	6.00 E-07	8.97 E-07	3.93 E-06
Naphthalene				EPA 42 Table 1.4-4	2.1 E-03	2.06 E-06	3.09 E-06	1.35 E-05
Nickel				EPA 42 Table 1.4-3	2.6 E+00	2.55 E-03	3.82 E-03	1.67 E-02
Pentane				EPA 42 Table 1.4-3	1.7 E-05	1.67 E-08	2.50 E-08	1.10 E-07
Phenanthrene				EPA 42 Table 1.4-3	1.0 E+00	1.37 E-03	2.06 E-03	9.02 E-03
Propane				EPA 42 Table 1.4-3	8.8 E-02	4.02 E-05	7.24 E-05	3.22 E-04
Pyrene				EPA 42 Table 1.4-4	2.4 E-05	2.35 E-08	3.53 E-08	1.55 E-07
Selenium				EPA 42 Table 1.4-3	3.4 E-05	3.33 E-08	5.00 E-08	2.19 E-07
Toluene				EPA 42 Table 1.4-4	3.3 E-03	3.29 E-06	3.29 E-06	1.45 E-05
Vanadium				EPA 42 Table 1.4-4	2.9 E-02	2.84 E-05	4.26 E-05	1.87 E-04
Zinc								

Notes:

1. Emission factor for "Small Boilers" and "Uncontrolled".
2. Potential hours of operation of boiler (annual) = [redacted]
3. Actual hours of operation of boiler (winter: Sept 1 to May 31) = 273 days/year x 24 hours/day = [redacted]
4. Boilers used during winter for heating.
5. Manifest #930.

Abbreviations used:

[redacted] Million Btu
hr Hours
yr Years
lb_m Pounds of emissions
$Mmlb_m$ Tons of emissions

Emissions ISU Small Equip 1/24/2004
Page 1 of 1 02:37PM
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Item #21: Boilers

Emission Estimates

Date: 01-Jul-04

(Listed as item 021 on the "Campus Inventory" list).

Location: President's Home Building #30

		Maximum Equipment Capacity		Emission Factors from EPA 42:			Following estimates based on Emission Factors	
EMISSIONS	Fuel			Reference Table		calculated	calculated	calculated
	Gas		6.300					
CO				EPA 42 Table 1.4-1	84	0.000	1.77 E-00	7.04 E-00
NO_x				EPA 42 Table 1.4-1	100	0.000	2.09 E-00	8.37 E-00
SO_2				EPA 42 Table 1.4-2	0.60	0.00000	1.26 E-04	5.30 E-04
PM10				EPA 42 Table 1.4-2	7.60	0.0071	1.60 E-00	6.69 E-00
PM				EPA 42 Table 1.4-2	7.60	0.0071	1.60 E-00	6.69 E-00
Pb				EPA 42 Table 1.4-2	0.0005	4.69 E-07	1.00 E-07	4.40 E-07
VOC				EPA 42 Table 1.4-2	5.50	0.000	1.13 E-00	4.94 E-00
TOC				EPA 42 Table 1.4-2	11.00	0.011	2.26 E-00	9.87 E-00
2-Methylnaphthalene				EPA 42 Table 1.4-3	2.4 E-05	2.26 E-00	4.92 E-10	2.16 E-00
3-Methylchloranthrene				EPA 42 Table 1.4-3	1.8 E-05	1.70 E-00	3.69 E-10	1.62 E-00
7,12-Dimethylbenzanthracene				EPA 42 Table 1.4-3	1.6 E-05	1.57 E-00	3.28 E-10	1.44 E-00
Acenaphthene				EPA 42 Table 1.4-3	1.8 E-05	1.70 E-00	3.69 E-10	1.62 E-00
Acenaphthylene				EPA 42 Table 1.4-3	1.8 E-05	1.70 E-00	3.69 E-10	1.62 E-00
Anthracene				EPA 42 Table 1.4-3	2.4 E-05	2.26 E-00	4.92 E-10	2.16 E-00
Arsenic				EPA 42 Table 1.4-4	2.0 E-04	1.88 E-07	4.10 E-09	1.79 E-07
Barium				EPA 42 Table 1.4-4	4.4 E-03	4.31 E-00	9.02 E-07	3.95 E-00
Benzo(a)anthracene				EPA 42 Table 1.4-3	1.8 E-05	1.70 E-00	3.69 E-10	1.62 E-00
Benzene				EPA 42 Table 1.4-3	2.1 E-03	2.00 E-00	4.30 E-07	1.88 E-00
Benzo(a)pyrene				EPA 42 Table 1.4-3	1.2 E-05	1.13 E-00	2.46 E-10	1.08 E-00
Benzo(b)fluoranthene				EPA 42 Table 1.4-3	1.8 E-05	1.70 E-00	3.69 E-10	1.62 E-00
Benzo(k,l,j)perylene				EPA 42 Table 1.4-3	1.2 E-05	1.13 E-00	2.46 E-10	1.08 E-00
Benzo(g)fluoranthene				EPA 42 Table 1.4-3	1.8 E-05	1.70 E-00	3.69 E-10	1.62 E-00
Beryllium				EPA 42 Table 1.4-4	1.2 E-05	1.13 E-00	2.46 E-09	1.08 E-00
Boron				EPA 42 Table 1.4-5	2.1 E+00	2.00 E-00	4.30 E-04	1.88 E-00
Cadmium				EPA 42 Table 1.4-4	1.1 E-05	1.05 E-00	2.26 E-07	9.87 E-07
Chromium				EPA 42 Table 1.4-4	1.4 E-03	1.37 E-00	2.87 E-07	1.26 E-00
Chrysene				EPA 42 Table 1.4-3	1.8 E-05	1.70 E-00	3.69 E-10	1.62 E-00
Cobalt				EPA 42 Table 1.4-4	8.4 E-05	8.24 E-00	1.72 E-08	7.54 E-00
Copper				EPA 42 Table 1.4-4	8.5 E-04	8.33 E-07	1.74 E-07	7.63 E-07
Dibenzo(a,h)anthracene				EPA 42 Table 1.4-3	1.2 E-05	1.13 E-00	2.46 E-10	1.08 E-00
Dichlorobenzene				EPA 42 Table 1.4-3	1.2 E-03	1.13 E-00	2.46 E-07	1.08 E-00
Silicon				EPA 42 Table 1.4-5	3.1 E+00	3.04 E-00	6.35 E-04	2.78 E-00
Fluoranthene				EPA 42 Table 1.4-3	3.0 E-05	2.94 E-00	6.15 E-10	2.69 E-00
Fluorene				EPA 42 Table 1.4-3	2.8 E-05	2.75 E-00	5.74 E-10	2.51 E-00
Formaldehyde				EPA 42 Table 1.4-5	7.5 E-02	7.35 E-00	1.54 E-05	6.73 E-00
Hexane				EPA 42 Table 1.4-5	1.8 E+00	1.76 E-00	3.69 E-04	1.62 E-00
Indeno(1,2,3-cd)pyrene				EPA 42 Table 1.4-3	1.8 E-05	1.70 E-00	3.69 E-10	1.62 E-00
Manganese				EPA 42 Table 1.4-4	3.8 E-04	3.73 E-07	7.79 E-08	3.41 E-07
Mercury				EPA 42 Table 1.4-4	2.6 E-04	2.55 E-07	5.33 E-08	2.33 E-07
Methane				EPA 42 Table 1.4-5	2.30	0.00225	4.71 E-04	2.06 E-00
Molybdenum				EPA 42 Table 1.4-4	1.1 E-03	1.08 E-00	2.26 E-07	9.87 E-07
Naphthalene				EPA 42 Table 1.4-3	6.1 E-04	5.98 E-07	1.25 E-07	5.47 E-07
Nickel				EPA 42 Table 1.4-4	2.1 E-03	2.06 E-00	4.30 E-07	1.88 E-00
Pentane				EPA 42 Table 1.4-5	2.6 E+00	2.55 E-00	5.33 E-04	2.33 E-00
Phenanthrene				EPA 42 Table 1.4-3	1.7 E-05	1.67 E-00	3.49 E-10	1.53 E-00
Propane				EPA 42 Table 1.4-5	1.6 E+00	1.57 E-00	3.28 E-04	1.44 E-00
Pyrene				EPA 42 Table 1.4-3	5.0 E-05	4.90 E-00	1.02 E-09	4.49 E-00
Selenium				EPA 42 Table 1.4-4	2.4 E-05	2.35 E-00	4.92 E-09	2.16 E-00
Toluene				EPA 42 Table 1.4-3	3.4 E-03	3.33 E-00	6.97 E-07	3.05 E-00
Vanadium				EPA 42 Table 1.4-4	2.3 E-03	2.25 E-00	4.71 E-07	2.06 E-00
Zinc				EPA 42 Table 1.4-4	2.9 E-02	2.84 E-00	5.94 E-09	2.60 E-00

Notes:

1. Emission factor for "Small Boilers" and "Uncontrolled".
2. Potential hours of operation of boiler (annual) = 8,760 hours/year
3. Actual hours of operation of boiler (winter: Sept 1 to May 31) = 273 days/year x 24 hours/day = 6,552 hours/year
4. Boilers used during winter for heating.
5. Identifier 4001.

Abbreviations used:

MMBtu Million Btu
hr Hours
yr Years
lbs Pounds of emissions
tons Tons of emissions

Emissions 10U Small Equip 6/24/2003
021 1 of 1 @2:57PM
Sysd

Item #22: Boilers

Emission Estimates

Date: [illegible]

(Listed on line 438 on the "Campus Inventory" list).

Location: President's Home Building #30

	Fuel	Maximum Equipment Capacity		Emission Factors from EPA 42			Following calculations based on Emission Factors	
				Referencing Table		calculated	calculated	calculated
	Gas		[illegible]		$lb/10^6$ scf	lb/MMBtu	lb/hr	tons/yr
CO				EPA 42 Table 1.4-1	84	0.082	4.10 E-02	1.80 E-01
NO_x				EPA 42 Table 1.4-1	100	0.098	4.88 E-02	2.14 E-01
SO_2				EPA 42 Table 1.4-2	0.60	5.88E-04	2.94 E-04	1.31 E-03
PM10				EPA 42 Table 1.4-2	7.60	0.0075	3.73 E-03	1.63 E-02
PM				EPA 42 Table 1.4-2	7.60	0.0075	3.73 E-03	1.63 E-02
Pb				EPA 42 Table 1.4-2	0.0005	4.90 E-07	2.40 E-07	1.05 E-06
VOC				EPA 42 Table 1.4-2	5.50	0.005	2.71 E-03	1.19 E-02
TOC				EPA 42 Table 1.4-2	11.00	0.011	5.43 E-03	2.38 E-02
2-Methylnaphthalene				EPA 42 Table 1.4-3	2.4 E-08	2.35 E-08	1.17 E-08	5.14 E-08
1-Methylchrysene				EPA 42 Table 1.4-3	1.8 E-08	1.76 E-08	8.80 E-10	3.85 E-09
7,12-Dimethylbenz(a)anthracene				EPA 42 Table 1.4-3	1.6 E-05	1.57 E-05	7.87 E-09	3.45 E-08
Acenaphthene				EPA 42 Table 1.4-3	1.8 E-08	1.76 E-08	8.80 E-10	3.85 E-09
Acenaphthylene				EPA 42 Table 1.4-3	1.8 E-08	1.76 E-08	8.80 E-10	3.85 E-09
Anthracene				EPA 42 Table 1.4-3	2.4 E-08	2.35 E-08	1.17 E-08	5.14 E-08
Arsenic				EPA 42 Table 1.4-4	2.0 E-04	1.96 E-07	9.80 E-08	4.29 E-07
Barium				EPA 42 Table 1.4-4	4.4 E-03	4.31 E-06	2.15 E-05	9.42 E-05
Benz(a)anthracene				EPA 42 Table 1.4-3	1.8 E-08	1.76 E-08	8.80 E-10	3.85 E-09
Benzene				EPA 42 Table 1.4-3	2.1 E-06	2.06 E-06	1.03 E-08	4.50 E-08
Benzo(a)pyrene				EPA 42 Table 1.4-3	1.2 E-08	1.18 E-08	5.88 E-10	2.57 E-09
Benzo(b)fluoranthene				EPA 42 Table 1.4-3	1.8 E-08	1.76 E-08	8.80 E-10	3.85 E-09
Benzo(g,h,i)perylene				EPA 42 Table 1.4-3	1.2 E-08	1.18 E-08	5.88 E-10	2.57 E-09
Benzo(k)fluoranthene				EPA 42 Table 1.4-3	1.8 E-08	1.76 E-08	8.80 E-10	3.85 E-09
Beryllium				EPA 42 Table 1.4-4	1.2 E-05	1.18 E-08	5.88 E-09	2.57 E-08
Boron				EPA 42 Table 1.4-3	2.1 E+00	2.06 E-03	1.03 E-06	4.50 E-03
Cadmium				EPA 42 Table 1.4-4	1.1 E-03	1.08 E-06	5.40 E-07	2.36 E-06
Chromium				EPA 42 Table 1.4-4	1.4 E-03	1.37 E-06	6.87 E-07	3.00 E-06
Chrysene				EPA 42 Table 1.4-3	1.8 E-08	1.76 E-08	8.80 E-10	3.85 E-09
Cobalt				EPA 42 Table 1.4-4	8.4 E-05	8.24 E-08	4.12 E-08	1.80 E-07
Copper				EPA 42 Table 1.4-4	8.5 E-04	8.33 E-07	4.23 E-07	1.85 E-06
Dibenz(a,h)anthracene				EPA 42 Table 1.4-3	1.2 E-08	1.18 E-08	5.88 E-10	2.57 E-09
Dichlorobenzene				EPA 42 Table 1.4-3	1.2 E-08	1.18 E-08	5.88 E-07	2.57 E-06
Ethane				EPA 42 Table 1.4-3	3.1 E+00	3.04 E-03	1.54 E-06	6.75 E-03
Fluoranthene				EPA 42 Table 1.4-3	3.0 E-08	2.94 E-08	1.47 E-09	6.44 E-09
Fluorene				EPA 42 Table 1.4-3	2.8 E-08	2.75 E-08	1.38 E-09	6.11 E-09
Formaldehyde				EPA 42 Table 1.4-3	7.6 E-02	7.35 E-05	3.74 E-05	1.64 E-04
Hexane				EPA 42 Table 1.4-3	1.8 E+00	1.76 E-03	8.80 E-04	3.85 E-03
Indeno(1,2,3-cd)pyrene				EPA 42 Table 1.4-3	1.8 E-08	1.76 E-08	8.80 E-10	3.85 E-09
Manganese				EPA 42 Table 1.4-4	3.8 E-04	3.73 E-07	1.86 E-07	8.20 E-07
Mercury				EPA 42 Table 1.4-4	2.6 E-04	2.55 E-07	1.28 E-07	5.67 E-07
Methane				EPA 42 Table 1.4-2	2.30	0.00226	1.13 E-03	4.92 E-03
Molybdenum				EPA 42 Table 1.4-4	1.1 E-03	1.08 E-06	5.40 E-07	2.36 E-06
Naphthalene				EPA 42 Table 1.4-3	6.1 E-04	5.98 E-07	2.94 E-07	1.28 E-06
Nickel				EPA 42 Table 1.4-4	2.1 E-03	2.06 E-06	1.03 E-06	4.50 E-06
Pentane				EPA 42 Table 1.4-3	2.6 E+00	2.55 E-03	1.29 E-06	5.67 E-03
Phenanthrene				EPA 42 Table 1.4-3	1.7 E-08	1.67 E-08	8.47 E-10	3.71 E-09
Propane				EPA 42 Table 1.4-3	1.6 E+00	1.57 E-03	7.87 E-04	3.45 E-03
Pyrene				EPA 42 Table 1.4-3	4.9 E-08	4.80 E-08	2.40 E-09	1.05 E-08
Selenium				EPA 42 Table 1.4-4	2.4 E-05	2.35 E-08	1.18 E-08	5.14 E-08
Toluene				EPA 42 Table 1.4-3	3.4 E-03	3.33 E-06	1.66 E-06	7.28 E-06
Vanadium				EPA 42 Table 1.4-4	2.3 E-03	2.25 E-06	1.13 E-06	4.92 E-06
Zinc				EPA 42 Table 1.4-4	2.9 E-03	2.84 E-06	1.44 E-06	6.32 E-06

Notes:

1. Emission factor for "Small Boilers" and "Uncontrolled".
2. Potential hours of operation of boiler (annual) = [illegible] hours/year
3. Actual hours of operation of boiler (winter: Sept 1 to May 31) = 273 days/year x 24 hours/day = 6,552 hours/year
4. Boilers used during winter for heating.
5. Identifier #622.

Abbreviations used:

- MMBtu Million Btu
- hr Hours
- yr Years
- lb Pounds of emissions
- tons Tons of emissions

Emissions IBU Small Study 10/4/2006
622 1 of 1 @2:07PM
Syed

Item #23: Kiln

Emission Estimates

Date: 01-Jul-04

(Listed as Item #23 on the "Campus Inventory" list).

Location: Vasvik Building #46

[illegible]	Fuel	Maximum Equipment Capacity	[illegible]	Emission Factors from EPA 42: Reference Table	[illegible]	[illegible]	Following estimates based on Emission Factors: [illegible]	[illegible]
	Gas	Total of 9 kilns; typically 8 kilns used at 9 times, and each kiln with an input of [illegible] therefore equal to [illegible]	[illegible]					
CO				EPA 42 Table 1.4-1	84	[illegible]	1.15 E-05	5.16 E-05
NO_x				EPA 42 Table 1.4-1	100	[illegible]	1.40 E-05	6.14 E-05
SO_2				EPA 42 Table 1.4-2	0.60	[illegible]	8.41 E-06	3.68 E-05
PM10				EPA 42 Table 1.4-2	7.60	0.0076	1.07 E-04	4.67 E-04
PM				EPA 42 Table 1.4-2	7.60	0.0076	1.07 E-04	4.67 E-04
Pb				EPA 42 Table 1.4-2	0.0005	4.00 E-07	7.01 E-09	3.07 E-08
VOC				EPA 42 Table 1.4-2	5.50	[illegible]	7.71 E-08	3.36 E-04
TOC				EPA 42 Table 1.4-2	11.00	0.011	1.54 E-04	6.71 E-04
[illegible]				EPA 42 Table 1.4-3	2.4 E-05	2.36 E-08	3.36 E-10	1.47 E-09
[illegible]				EPA 42 Table 1.4-3	1.9 E-05	1.79 E-08	2.52 E-11	1.10 E-10
[illegible]				EPA 42 Table 1.4-3	1.6 E-05	1.57 E-08	2.24 E-10	9.80 E-10
[illegible]				EPA 42 Table 1.4-3	1.9 E-05	1.79 E-08	2.52 E-11	1.10 E-10
[illegible]				EPA 42 Table 1.4-3	1.9 E-05	1.79 E-08	2.52 E-11	1.10 E-10
[illegible]				EPA 42 Table 1.4-3	2.4 E-05	2.36 E-08	3.36 E-11	1.47 E-10
[illegible]				EPA 42 Table 1.4-4	2.9 E-04	1.88 E-07	2.59 E-09	1.29 E-08
[illegible]				EPA 42 Table 1.4-4	4.4 E-05	4.31 E-08	6.17 E-09	2.70 E-07
[illegible]				EPA 42 Table 1.4-3	1.9 E-05	1.79 E-08	2.52 E-11	1.10 E-10
[illegible]				EPA 42 Table 1.4-3	2.1 E-05	2.08 E-08	2.94 E-09	1.29 E-07
[illegible]				EPA 42 Table 1.4-3	1.2 E-05	1.18 E-08	1.68 E-11	7.37 E-11
[illegible]				EPA 42 Table 1.4-3	1.9 E-05	1.79 E-08	2.52 E-11	1.10 E-10
[illegible]				EPA 42 Table 1.4-3	1.2 E-05	1.18 E-08	1.68 E-11	7.37 E-11
[illegible]				EPA 42 Table 1.4-3	1.9 E-05	1.79 E-08	2.52 E-11	1.10 E-10
[illegible]				EPA 42 Table 1.4-4	1.2 E-05	1.18 E-08	1.68 E-10	7.37 E-10
[illegible]				EPA 42 Table 1.4-3	2.1 E+00	2.08 E-05	2.94 E-08	1.29 E-04
[illegible]				EPA 42 Table 1.4-4	1.1 E-03	1.08 E-06	1.54 E-09	6.75 E-09
[illegible]				EPA 42 Table 1.4-4	1.4 E-05	1.37 E-08	1.95 E-09	8.58 E-08
[illegible]				EPA 42 Table 1.4-3	1.9 E-05	1.79 E-08	2.52 E-11	1.10 E-10
[illegible]				EPA 42 Table 1.4-4	8.4 E-05	8.24 E-08	1.18 E-09	5.16 E-08
[illegible]				EPA 42 Table 1.4-4	6.6 E-04	6.23 E-07	1.78 E-09	6.22 E-08
[illegible]				EPA 42 Table 1.4-3	1.2 E-05	1.18 E-08	1.68 E-11	7.37 E-11
[illegible]				EPA 42 Table 1.4-3	1.2 E-05	1.18 E-08	1.68 E-08	7.37 E-08
[illegible]				EPA 42 Table 1.4-3	3.1 E+00	3.04 E-05	4.34 E-08	1.90 E-04
[illegible]				EPA 42 Table 1.4-4	3.0 E-05	2.94 E-08	4.20 E-11	1.84 E-10
[illegible]				EPA 42 Table 1.4-4	2.8 E-05	2.78 E-08	3.92 E-11	1.72 E-10
[illegible]				EPA 42 Table 1.4-3	7.6 E-05	7.35 E-08	1.05 E-05	4.60 E-05
[illegible]				EPA 42 Table 1.4-3	1.9 E+00	1.79 E-05	2.52 E-08	1.10 E-04
[illegible]				EPA 42 Table 1.4-3	1.9 E-05	1.79 E-08	2.52 E-11	1.10 E-10
[illegible]				EPA 42 Table 1.4-4	3.8 E-04	3.78 E-07	5.32 E-09	2.32 E-08
[illegible]				EPA 42 Table 1.4-4	2.9 E-04	2.89 E-07	3.84 E-09	1.68 E-08
[illegible]				EPA 42 Table 1.4-3	2.30	0.00224	3.22 E-05	1.41 E-04
[illegible]				EPA 42 Table 1.4-4	1.1 E-03	1.08 E-06	1.54 E-09	6.75 E-09
[illegible]				EPA 42 Table 1.4-3	6.1 E-04	6.00 E-07	8.56 E-09	3.74 E-08
[illegible]				EPA 42 Table 1.4-4	2.1 E-05	2.08 E-08	2.94 E-08	1.29 E-07
[illegible]				EPA 42 Table 1.4-3	2.0 E+00	2.00 E-05	3.64 E-08	1.68 E-04
[illegible]				EPA 42 Table 1.4-3	1.7 E-05	1.67 E-08	2.38 E-10	1.04 E-09
[illegible]				EPA 42 Table 1.4-3	1.0 E+00	1.57 E-05	2.24 E-08	9.85 E-05
[illegible]				EPA 42 Table 1.4-3	5.0 E-05	4.90 E-08	7.84 E-11	3.07 E-10
[illegible]				EPA 42 Table 1.4-4	2.4 E-05	2.36 E-08	3.36 E-10	1.47 E-09
[illegible]				EPA 42 Table 1.4-3	3.4 E-05	3.35 E-08	4.77 E-08	2.08 E-07
[illegible]				EPA 42 Table 1.4-4	2.3 E-05	2.26 E-08	3.22 E-08	1.41 E-07
Zinc				EPA 42 Table 1.4-4	2.0 E-05	2.04 E-08	4.08 E-07	1.79 E-06

Notes:

1. Emission factor for "Small Boilers" and "Uncontrolled".
2. Potential hours of operation (previously #
3. Actual hours of operation = 24 hours/day x 9 days/wk x 2 weeks/yr x 8 months/yr x 5 kilns =
4. Kiln used for pottery and sculpting classes.
5. Identified in #23.

[illegible] hours/year
[illegible] hours/year

Abbreviations used:

- MMBtu: Million Btu
- hr: Hours
- yr: Years
- lbs: Pounds of emissions
- tons: Tons of emissions

Emissions Kiln Small Equip 6/24/2004
#23 1 of 1 @ 2:31PM
Byrd

Item #24: Kiln

Emission Estimates

Date: 01-Jul-04

[redacted]

Location: Art & Museum Building #38

[redacted]	Fuel	Maximum Equipment Capacity	[redacted]	[redacted] Emission Factors from EPA AP-42			Following estimates based on Emission Factors	
				Referenced Table	[redacted]	[redacted]	[redacted]	[redacted]
	Gas		[redacted]		lb/mm³ out	lb/[illegible]	lb/hr	tons/yr
CO				EPA 42 Table 1.4-1	84	[illegible]	[illegible]	[illegible]
NO_x				EPA 42 Table 1.4-1	100	[illegible]	[illegible]	[illegible]
SO_2				EPA 42 Table 1.4-2	0.60	[illegible]	[illegible]	[illegible]
TSP10				EPA 42 Table 1.4-2	7.60	[illegible]	7.40 E-04	[illegible]
PM				EPA 42 Table 1.4-2	7.60	[illegible]	7.40 E-04	[illegible]
Pb				EPA 42 Table 1.4-2	[illegible]	4.90 E-07	4.80 E-09	2.13 E-07
VOC				EPA 42 Table 1.4-2	5.50	[illegible]	5.36 E-04	2.36 E-03
TOC				EPA 42 Table 1.4-2	11.00	0.011	1.08 E-03	4.72 E-03
1-Methylnaphthalene				EPA 42 Table 1.4-4	2.4 E-05	2.35 E-08	2.35 E-09	1.05 E-08
2-Methylnaphthalene				EPA 42 Table 1.4-4	1.8 E-05	1.76 E-08	1.76 E-10	7.73 E-10
7,12-Dimethylbenz[a]anthracene				EPA 42 Table 1.4-4	1.9 E-05	1.87 E-08	1.87 E-09	8.07 E-09
Acenaphthene				EPA 42 Table 1.4-4	1.8 E-05	1.76 E-08	1.76 E-10	7.73 E-10
Acenaphthylene				EPA 42 Table 1.4-4	1.8 E-05	1.76 E-08	1.76 E-10	7.73 E-10
Anthracene				EPA 42 Table 1.4-4	2.4 E-05	2.35 E-08	2.35 E-10	1.03 E-09
Arsenic				EPA 42 Table 1.4-4	2.0 E-04	1.96 E-07	1.96 E-09	8.59 E-09
Barium				EPA 42 Table 1.4-4	4.4 E-05	4.31 E-08	4.31 E-07	1.89 E-06
Benzo[a]anthracene				EPA 42 Table 1.4-4	1.8 E-05	1.76 E-08	1.76 E-10	7.73 E-10
Benzene				EPA 42 Table 1.4-4	2.1 E-03	2.06 E-06	2.06 E-07	9.02 E-07
Benzo[b]pyrene				EPA 42 Table 1.4-4	1.2 E-05	1.18 E-08	1.18 E-10	5.15 E-10
Benzo[g,h,i]fluoranthene				EPA 42 Table 1.4-4	1.8 E-05	1.76 E-08	1.76 E-10	7.73 E-10
Benzo[g,h,i]perylene				EPA 42 Table 1.4-4	1.2 E-05	1.18 E-08	1.18 E-10	5.15 E-10
Benzo[k]fluoranthene				EPA 42 Table 1.4-4	1.8 E-05	1.76 E-08	1.76 E-10	7.73 E-10
Beryllium				EPA 42 Table 1.4-4	1.2 E-05	1.18 E-08	1.18 E-10	5.15 E-10
Butane				EPA 42 Table 1.4-4	2.1 E+00	2.06 E-03	2.06 E-04	9.02 E-04
Cadmium				EPA 42 Table 1.4-4	1.1 E-05	1.08 E-08	1.08 E-07	4.72 E-07
Chloride				EPA 42 Table 1.4-4	1.4 E-05	1.37 E-08	1.37 E-07	5.94 E-07
Chrysene				EPA 42 Table 1.4-4	1.8 E-05	1.76 E-08	1.76 E-10	7.73 E-10
Cobalt				EPA 42 Table 1.4-4	8.4 E-05	8.24 E-08	8.24 E-09	3.61 E-08
Copper				EPA 42 Table 1.4-4	8.5 E-04	8.33 E-07	8.33 E-08	3.65 E-07
Dibenzo[a,h]anthracene				EPA 42 Table 1.4-4	1.2 E-05	1.18 E-08	1.18 E-10	5.15 E-10
Dichlorobenzene				EPA 42 Table 1.4-4	1.2 E-05	1.18 E-08	1.18 E-07	5.15 E-07
Ethane				EPA 42 Table 1.4-4	3.1 E+00	3.04 E-03	3.04 E-04	1.33 E-03
Fluoranthene				EPA 42 Table 1.4-4	3.0 E-05	2.94 E-08	2.94 E-10	1.29 E-09
Fluorene				EPA 42 Table 1.4-4	2.8 E-05	2.75 E-08	2.75 E-10	1.20 E-09
Formaldehyde				EPA 42 Table 1.4-4	7.6 E-02	7.45 E-05	7.45 E-06	3.22 E-05
Arsenic				EPA 42 Table 1.4-4	1.8 E+00	1.76 E-03	1.76 E-04	7.73 E-04
Indeno(1,2,3-cd)pyrene				EPA 42 Table 1.4-4	1.8 E-05	1.76 E-08	1.76 E-10	7.73 E-10
Manganese				EPA 42 Table 1.4-4	3.8 E-04	3.73 E-07	3.73 E-08	1.63 E-07
Mercury				EPA 42 Table 1.4-4	2.6 E-04	2.55 E-07	2.55 E-08	1.12 E-07
Methane				EPA 42 Table 1.4-2	2.30	0.00225	2.25 E-04	9.85 E-04
Naphthalene				EPA 42 Table 1.4-4	1.1 E-03	1.08 E-06	1.08 E-07	4.72 E-07
Naphthalene				EPA 42 Table 1.4-2	6.1 E-04	5.98 E-07	5.98 E-08	2.62 E-07
Nickel				EPA 42 Table 1.4-4	2.1 E-03	2.06 E-06	2.06 E-07	9.02 E-07
Pentane				EPA 42 Table 1.4-3	2.6 E+00	2.55 E-03	2.55 E-04	1.12 E-03
Phenanthrene				EPA 42 Table 1.4-4	1.7 E-05	1.67 E-08	1.67 E-09	7.30 E-09
Propane				EPA 42 Table 1.4-3	1.6 E+00	1.57 E-03	1.57 E-04	6.87 E-04
Pyrene				EPA 42 Table 1.4-3	5.0 E-05	4.90 E-08	4.90 E-10	2.15 E-09
Selenium				EPA 42 Table 1.4-4	2.4 E-05	2.35 E-08	2.35 E-09	1.03 E-08
Toluene				EPA 42 Table 1.4-3	3.4 E-03	3.33 E-06	3.33 E-07	1.46 E-06
Vanadium				EPA 42 Table 1.4-4	2.3 E-04	2.25 E-07	2.25 E-08	9.85 E-07
Zinc				EPA 42 Table 1.4-4	2.9 E-02	2.84 E-05	2.84 E-06	1.25 E-05

Notes:

1. Emission factor for "Small Boiler" and "Uncontrolled".
2. Potential hours of operation (annual) = [redacted] 8760 hours/year
3. Actual hours of operation =
4. Kiln used for quality classes.
5. Identity #434.

Abbreviations used:

MMBtu: Million Btu
hr: Hours
yr: Years
lb: Pounds of emissions
ton: Tons of emissions

Emissions IDU Small Equip. 06/10/2004
K34 1 of 1 @2:37PM
Syed

Item #26: Burnoff Furnace

Emission Estimates

Date: 01-Jul-04

Listed as item #26 on the "Campus Inventory" tab.

Location: Art & Museum Building #28

Emissions	Fuel	Maximum Equipment Capacity		Emission Factors from EPA 42			Following emissions based on Emission Factors	
				Referencing Table			calculated	calculated
	Gas				$lb_x/10^6$ scf	lb_x/million	lb_x/hr	lb_x/yr
CO				EPA 42 Table 1.4-1	84	0.080	1.06 E-02	7.21 E-02
NO_x				EPA 42 Table 1.4-1	100	0.095	1.26 E-02	8.58 E-02
SO_2				EPA 42 Table 1.4-2	0.60	0.00057	1.10 E-04	5.15 E-04
PM10				EPA 42 Table 1.4-2	7.60	0.0075	1.40 E-03	6.53 E-03
TSP				EPA 42 Table 1.4-2	7.60	0.0075	1.40 E-03	6.53 E-03
Pb				EPA 42 Table 1.4-2	0.0005	4.90 E-07	9.00 E-08	4.29 E-07
VOC				EPA 42 Table 1.4-2	5.50	0.005	1.00 E-03	4.72 E-03
TOC				EPA 42 Table 1.4-2	11.00	0.011	2.10 E-03	9.46 E-03
2-Methylnaphthalene				EPA 42 Table 1.4-3	2.4 E-05	2.35 E-08	4.71 E-09	2.06 E-08
2-Methylphenanthrene				EPA 42 Table 1.4-3	1.0 E-05	1.70 E-08	3.53 E-10	1.55 E-08
7,12-Dimethylbenz(a)anthracene				EPA 42 Table 1.4-3	1.0 E-05	1.17 E-08	3.14 E-09	1.37 E-08
Acenaphthene				EPA 42 Table 1.4-3	1.0 E-05	1.70 E-08	3.53 E-10	1.55 E-08
Acenaphthylene				EPA 42 Table 1.4-3	1.0 E-05	1.70 E-08	3.53 E-10	1.55 E-08
Anthracene				EPA 42 Table 1.4-3	2.4 E-05	2.35 E-08	4.71 E-10	2.06 E-08
Arsenic				EPA 42 Table 1.4-4	2.0 E-01	1.96 E-07	3.92 E-09	1.72 E-07
Barium				EPA 42 Table 1.4-4	4.4 E-01	4.31 E-07	8.63 E-07	3.78 E-06
Benz(a)anthracene				EPA 42 Table 1.4-3	1.8 E-05	1.76 E-08	3.53 E-10	1.55 E-08
Benzene				EPA 42 Table 1.4-3	2.1 E-03	2.06 E-06	4.12 E-07	1.80 E-06
Benz(a)pyrene				EPA 42 Table 1.4-3	1.2 E-05	1.18 E-08	2.35 E-10	1.03 E-08
Benzo(b)fluoranthene				EPA 42 Table 1.4-3	1.8 E-05	1.76 E-08	3.53 E-10	1.55 E-08
Benzo(g,h,i)perylene				EPA 42 Table 1.4-3	1.2 E-05	1.18 E-08	2.35 E-10	1.03 E-08
Benzo(k)fluoranthene				EPA 42 Table 1.4-3	1.8 E-05	1.76 E-08	3.53 E-10	1.55 E-08
Beryllium				EPA 42 Table 1.4-4	1.2 E-01	1.18 E-07	2.35 E-09	1.03 E-07
Boron				EPA 42 Table 1.4-3	2.1 E-03	2.06 E-06	4.12 E-04	1.80 E-03
Cadmium				EPA 42 Table 1.4-4	1.1 E-01	1.08 E-07	2.16 E-07	9.46 E-07
Chromium				EPA 42 Table 1.4-4	1.4 E-01	1.37 E-07	2.75 E-07	1.20 E-06
Chrysene				EPA 42 Table 1.4-3	1.8 E-05	1.76 E-08	3.53 E-10	1.55 E-08
Cobalt				EPA 42 Table 1.4-4	8.4 E-05	8.24 E-08	1.65 E-08	7.21 E-08
Copper				EPA 42 Table 1.4-4	8.5 E-01	8.33 E-07	1.67 E-07	7.30 E-07
Dibenz(a,h)anthracene				EPA 42 Table 1.4-3	1.2 E-05	1.18 E-08	2.35 E-10	1.03 E-08
Dichlorobenzene				EPA 42 Table 1.4-3	1.2 E-05	1.18 E-08	2.35 E-07	1.03 E-06
Ethane				EPA 42 Table 1.4-3	3.1 E+00	3.04 E-05	6.08 E-04	2.66 E-03
Fluoranthene				EPA 42 Table 1.4-3	3.0 E-05	2.94 E-08	5.88 E-10	2.58 E-08
Fluorene				EPA 42 Table 1.4-3	2.8 E-05	2.75 E-08	5.49 E-10	2.40 E-08
Formaldehyde				EPA 42 Table 1.4-3	7.5 E-02	7.35 E-05	1.47 E-05	6.44 E-05
Hexane				EPA 42 Table 1.4-3	1.8 E+00	1.76 E-03	3.53 E-04	1.55 E-03
Indeno(1,2,3-cd)pyrene				EPA 42 Table 1.4-3	1.8 E-05	1.76 E-08	3.53 E-10	1.55 E-08
Manganese				EPA 42 Table 1.4-4	3.8 E-01	3.73 E-07	7.45 E-09	3.26 E-07
Mercury				EPA 42 Table 1.4-4	2.6 E-01	2.55 E-07	5.10 E-09	2.23 E-07
Methane				EPA 42 Table 1.4-2	2.30	0.00226	4.51 E-04	1.98 E-03
Molybdenum				EPA 42 Table 1.4-4	1.1 E-01	1.08 E-07	2.16 E-07	9.46 E-07
Naphthalene				EPA 42 Table 1.4-3	6.1 E-04	6.00 E-07	1.20 E-07	5.26 E-07
Nickel				EPA 42 Table 1.4-4	2.1 E-01	2.06 E-07	4.12 E-07	1.80 E-06
Pentane				EPA 42 Table 1.4-3	2.6 E+00	2.55 E-03	5.10 E-04	2.23 E-03
Phenanthrene				EPA 42 Table 1.4-3	1.7 E-05	1.67 E-08	3.33 E-09	1.46 E-08
Propane				EPA 42 Table 1.4-3	1.6 E+00	1.57 E-03	3.14 E-04	1.37 E-03
Pyrene				EPA 42 Table 1.4-3	5.0 E-05	4.90 E-08	9.80 E-10	4.29 E-08
Selenium				EPA 42 Table 1.4-4	2.4 E-01	2.35 E-07	4.71 E-09	2.06 E-08
Toluene				EPA 42 Table 1.4-3	3.4 E-03	3.33 E-06	6.67 E-07	2.92 E-06
Vanadium				EPA 42 Table 1.4-4	2.3 E-01	2.25 E-07	4.51 E-07	1.98 E-06
Zinc				EPA 42 Table 1.4-4	2.5 E-01	2.45 E-07	5.00 E-09	2.19 E-08

Notes:

1. Emission factor for "Small Boilers" and "Uncontrolled".
2. Potential hours of operation (annual) = 8,760 hours/year
3. Actual hours of operation = 200 hours/year
4. Furnace used for foundry classes.
5. Identifier #F26.

Abbreviations used:

MMBtu Million Btu
hr Hours
yr Years
lb_x Pounds of emissions
ton_x Tons of emissions

Emissions IBU Small Equip 6/24/2004
F26 1 of 1 @7:57PM
Syed

Item #20: Melting furnace

Emission Estimates

Date: 01-Jul-04

(Listed as item #30 on the "Campus Inventory" list).

Location: Art & Museum Building #30

Pollutant	Fuel	Maximum Equipment Capacity		Emission Factors from EPA 42			Following estimates based on Emission Factors	
				Reference Table	lb/10[illegible] cuf	lb/[illegible]	lb/yr	lb/yr
	Gas		[illegible]					
[illegible]				EPA 42 Table 1.4-1	94	[illegible]	[illegible]	[illegible]
[illegible]				EPA 42 Table 1.4-1	160	[illegible]	[illegible]	[illegible]
[illegible]				EPA 42 Table 1.4-2	0.60	[illegible]	[illegible]	[illegible]
[illegible]				EPA 42 Table 1.4-3	7.60	[illegible]	7.44 E-04	[illegible]
[illegible]				EPA 42 Table 1.4-2	7.60	[illegible]	7.44 E-04	[illegible]
[illegible]				EPA 42 Table 1.4-3	[illegible]	4.98 E-07	4.98 E-09	[illegible]
[illegible]				EPA 42 Table 1.4-2	5.60	[illegible]	5.30 E-04	[illegible]
[illegible]				EPA 42 Table 1.4-2	11.00	[illegible]	1.08 E-03	4.73 E-06
2-Methylnaphthalene				EPA 42 Table 1.4-3	2.4 E-05	[illegible]	[illegible]	[illegible]
3-Methylchloranthrene				EPA 42 Table 1.4-3	1.8 E-09	1.70 E-09	1.70 E-10	7.73 E-10
7,12-Dimethylbenz(a)anthracene				EPA 42 Table 1.4-3	1.8 E-09	1.87 E-09	1.87 E-09	[illegible]
Acenaphthene				EPA 42 Table 1.4-3	1.8 E-09	1.70 E-09	1.70 E-10	7.73 E-10
Acenaphthylene				EPA 42 Table 1.4-3	1.8 E-09	1.70 E-09	1.70 E-10	7.73 E-10
Anthracene				EPA 42 Table 1.4-3	2.4 E-09	[illegible]	[illegible]	[illegible]
Arsenic				EPA 42 Table 1.4-4	2.0 E-04	1.89 E-07	1.89 E-08	[illegible]
Barium				EPA 42 Table 1.4-4	4.4 E-09	4.31 E-09	4.31 E-07	[illegible]
Benzo(a)anthracene				EPA 42 Table 1.4-3	1.8 E-09	1.70 E-09	1.70 E-10	7.73 E-10
Benzene				EPA 42 Table 1.4-3	2.1 E-03	[illegible]	[illegible]	[illegible]
Benzo(a)pyrene				EPA 42 Table 1.4-3	1.2 E-09	1.18 E-09	1.18 E-10	5.16 E-10
Benzo(b)fluoranthene				EPA 42 Table 1.4-3	1.8 E-09	1.70 E-09	1.70 E-10	7.73 E-10
Benzo(g,h,i)perylene				EPA 42 Table 1.4-3	1.2 E-09	1.18 E-09	1.18 E-10	5.16 E-10
Benzo(k)fluoranthene				EPA 42 Table 1.4-3	1.8 E-09	1.70 E-09	1.70 E-10	7.73 E-10
Beryllium				EPA 42 Table 1.4-4	1.2 E-09	1.18 E-09	1.18 E-09	5.16 E-09
Boron				EPA 42 Table 1.4-3	2.1 E+00	2.00 E-03	2.00 E-04	[illegible]
Cadmium				EPA 42 Table 1.4-4	1.1 E-03	1.08 E-06	1.08 E-07	4.73 E-07
Chromium				EPA 42 Table 1.4-4	1.4 E-09	1.37 E-09	1.37 E-07	[illegible]
Chrysene				EPA 42 Table 1.4-3	1.8 E-09	1.70 E-09	1.70 E-10	7.73 E-10
Cobalt				EPA 42 Table 1.4-4	8.4 E-09	8.24 E-09	8.24 E-09	[illegible]
Copper				EPA 42 Table 1.4-4	8.6 E-04	8.33 E-07	8.33 E-08	[illegible]
Dibenzo(a,h)anthracene				EPA 42 Table 1.4-3	1.2 E-09	1.18 E-09	1.18 E-10	5.16 E-10
Dibenzofuran				EPA 42 Table 1.4-3	1.2 E-09	1.18 E-09	1.18 E-07	5.16 E-09
Dioxin				EPA 42 Table 1.4-3	3.1 E+00	3.04 E-03	3.04 E-04	[illegible]
Fluoranthene				EPA 42 Table 1.4-3	1.9 E-09	2.94 E-09	2.94 E-10	[illegible]
Fluorene				EPA 42 Table 1.4-3	2.8 E-09	2.75 E-09	2.75 E-10	[illegible]
Formaldehyde				EPA 42 Table 1.4-3	7.6 E-02	7.36 E-05	7.36 E-06	[illegible]
Hexane				EPA 42 Table 1.4-3	1.8 E+00	1.76 E-03	1.76 E-04	7.73 E-04
Indeno(1,2,3-cd)pyrene				EPA 42 Table 1.4-3	1.8 E-09	1.70 E-09	1.70 E-10	7.73 E-10
Manganese				EPA 42 Table 1.4-4	3.8 E-04	3.73 E-07	3.73 E-08	1.63 E-07
Mercury				EPA 42 Table 1.4-4	2.6 E-04	2.55 E-07	2.55 E-08	1.12 E-07
Methane				EPA 42 Table 1.4-2	2.30	[illegible]	2.26 E-04	[illegible]
Molybdenum				EPA 42 Table 1.4-4	1.1 E-03	1.08 E-06	1.08 E-07	4.73 E-07
Naphthalene				EPA 42 Table 1.4-3	6.1 E-04	5.98 E-07	5.98 E-08	2.62 E-07
Nickel				EPA 42 Table 1.4-4	2.1 E-03	2.06 E-06	2.06 E-07	9.02 E-07
Pentane				EPA 42 Table 1.4-3	2.6 E+00	2.55 E-03	2.55 E-04	1.12 E-03
Phenanthrene				EPA 42 Table 1.4-3	1.7 E-09	1.67 E-09	1.67 E-10	7.30 E-10
Propane				EPA 42 Table 1.4-3	1.6 E+00	1.57 E-03	1.57 E-04	6.87 E-04
Pyrene				EPA 42 Table 1.4-3	4.6 E-09	4.51 E-09	4.51 E-10	2.15 E-09
Selenium				EPA 42 Table 1.4-4	2.4 E-03	2.35 E-07	2.35 E-08	1.03 E-07
Toluene				EPA 42 Table 1.4-3	3.4 E-03	3.33 E-06	3.33 E-07	1.46 E-06
Vanadium				EPA 42 Table 1.4-4	2.3 E-03	2.25 E-06	2.25 E-07	9.87 E-07
Zinc				EPA 42 Table 1.4-4	2.9 E-03	2.84 E-06	2.84 E-07	1.25 E-06

Notes:
1 Emission factor for "Small Boilers" and "Uncontrolled".
2 Potential hours of operation (annual) =
3 Actual hours of operation =
4 Furnace used for foundry classes.
5 Identifier #F20.

[illegible] hours/year
100 hours/year

Abbreviations used:
MMBtu Million Btu
hr Hours
yr Years
lbs Pounds of emissions
tons Tons of emissions

Emissions 100 Small Equip 02/12/05
F20 1 of 1 @3:57 PM
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Item #27: Boiler

Emission Estimates

Date: 01-Jul-04

(Listed as Item #27 on the "Campus Inventory" list.)

Location: West Campus - Building 972

[illegible]	Fuel	Maximum Equipment Capacity	[illegible]	Emission Factors from EPA 42: Referenced Table	[illegible]	[illegible]	Indicating estimated Annual vs Emission Factors calculated	[illegible]
	Gas		[illegible]		[illegible]		[illegible]	[illegible]
CO				EPA 42 Table 1.4-1	[illegible]	[illegible]	7.21 E-01	3.16 E-01
NO_x				EPA 42 Table 1.4-1	[illegible]	[illegible]	[illegible]	[illegible]
SO_2				EPA 42 Table 1.4-2	[illegible]	[illegible]	[illegible]	[illegible]
PM10				EPA 42 Table 1.4-2	[illegible]	[illegible]	[illegible]	[illegible]
PM				EPA 42 Table 1.4-2	[illegible]	[illegible]	[illegible]	[illegible]
Pb				EPA 42 Table 1.4-2	[illegible]	[illegible]	[illegible]	[illegible]
VOC				EPA 42 Table 1.4-2	[illegible]	[illegible]	4.72 E-01	[illegible]
TOC				EPA 42 Table 1.4-2	[illegible]	[illegible]	[illegible]	[illegible]
2-Methylnaphthalene				EPA 42 Table 1.4-3	[illegible]	[illegible]	[illegible]	[illegible]
3-Methylchloranthrene				EPA 42 Table 1.4-3	[illegible]	[illegible]	[illegible]	[illegible]
7,12-Dimethylbenzanthracene				EPA 42 Table 1.4-3	[illegible]	[illegible]	[illegible]	[illegible]
Acenaphthene				EPA 42 Table 1.4-3	[illegible]	[illegible]	[illegible]	[illegible]
Acenaphthylene				EPA 42 Table 1.4-3	[illegible]	[illegible]	[illegible]	[illegible]
Anthracene				EPA 42 Table 1.4-3	[illegible]	[illegible]	[illegible]	[illegible]
Arsenic				EPA 42 Table 1.4-4	[illegible]	[illegible]	1.72 E-07	[illegible]
Barium				EPA 42 Table 1.4-4	[illegible]	[illegible]	[illegible]	[illegible]
Benzo(a)anthracene				EPA 42 Table 1.4-3	[illegible]	[illegible]	[illegible]	[illegible]
Benzene				EPA 42 Table 1.4-3	[illegible]	[illegible]	[illegible]	[illegible]
Benzo(a)pyrene				EPA 42 Table 1.4-3	[illegible]	[illegible]	[illegible]	[illegible]
Benzo(b)fluoranthene				EPA 42 Table 1.4-3	[illegible]	[illegible]	[illegible]	[illegible]
Benzo(g,h,i)perylene				EPA 42 Table 1.4-3	[illegible]	[illegible]	[illegible]	[illegible]
Benzo(k)fluoranthene				EPA 42 Table 1.4-3	[illegible]	[illegible]	[illegible]	[illegible]
Beryllium				EPA 42 Table 1.4-3	[illegible]	[illegible]	[illegible]	[illegible]
Boron				EPA 42 Table 1.4-3	[illegible]	[illegible]	[illegible]	[illegible]
Cadmium				EPA 42 Table 1.4-4	[illegible]	[illegible]	[illegible]	[illegible]
Chromium				EPA 42 Table 1.4-4	[illegible]	[illegible]	[illegible]	[illegible]
Chrysene				EPA 42 Table 1.4-3	[illegible]	[illegible]	[illegible]	[illegible]
Cobalt				EPA 42 Table 1.4-4	[illegible]	[illegible]	[illegible]	[illegible]
Copper				EPA 42 Table 1.4-4	[illegible]	[illegible]	[illegible]	[illegible]
Dibenzo(a,h)anthracene				EPA 42 Table 1.4-3	[illegible]	[illegible]	[illegible]	[illegible]
Dichlorobenzene				EPA 42 Table 1.4-3	[illegible]	[illegible]	[illegible]	[illegible]
Fluoranthene				EPA 42 Table 1.4-3	[illegible]	[illegible]	[illegible]	[illegible]
Fluorene				EPA 42 Table 1.4-3	[illegible]	[illegible]	[illegible]	[illegible]
Formaldehyde				EPA 42 Table 1.4-3	[illegible]	[illegible]	[illegible]	[illegible]
Hexane				EPA 42 Table 1.4-2	[illegible]	[illegible]	[illegible]	[illegible]
Indeno(1,2,3-cd)pyrene				EPA 42 Table 1.4-3	[illegible]	[illegible]	[illegible]	[illegible]
Manganese				EPA 42 Table 1.4-3	[illegible]	[illegible]	[illegible]	[illegible]
Mercury				EPA 42 Table 1.4-4	[illegible]	[illegible]	[illegible]	[illegible]
Methane				EPA 42 Table 1.4-4	[illegible]	[illegible]	[illegible]	[illegible]
Molybdenum				EPA 42 Table 1.4-2	[illegible]	[illegible]	[illegible]	[illegible]
Naphthalene				EPA 42 Table 1.4-3	[illegible]	[illegible]	[illegible]	[illegible]
Nickel				EPA 42 Table 1.4-4	[illegible]	[illegible]	[illegible]	[illegible]
Pentane				EPA 42 Table 1.4-4	[illegible]	[illegible]	[illegible]	[illegible]
Phenanthrene				EPA 42 Table 1.4-3	[illegible]	[illegible]	[illegible]	[illegible]
Propane				EPA 42 Table 1.4-3	[illegible]	[illegible]	[illegible]	[illegible]
Pyrene				EPA 42 Table 1.4-5	[illegible]	[illegible]	[illegible]	[illegible]
Selenium				EPA 42 Table 1.4-3	[illegible]	[illegible]	[illegible]	[illegible]
Toluene				EPA 42 Table 1.4-4	[illegible]	[illegible]	[illegible]	[illegible]
Vanadium				EPA 42 Table 1.4-3	[illegible]	[illegible]	[illegible]	[illegible]
Zinc				EPA 42 Table 1.4-4	[illegible]	[illegible]	[illegible]	[illegible]

Notes:

1. Emission factor for "Small Boilers" and "Uncontrolled".
2. Potential hours of operation of boiler (annual) =
3. Actual hours of operation of boiler (used only on a backup basis) =
4. Boiler has not been used in the last two years.
5. Boiler used for hot water.
6. Identifier not27.

[illegible] hours/year

10 hours/year

Abbreviations used:

[illegible] Million Btu

hr Hours

yr Years

lb_m Pounds of emissions

ton_m Tons of emissions

Emissions IQU Small Equip 6/24/2003
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Item #28: Boiler

Emission Estimates

Date: [illegible]

(Listed as Item [illegible] on the "Campus Inventory" list.)

Location: 5th Street Apartments - Building #70

Pollutant	Fuel	Maximum Equipment Capacity		Emission Factors from EPA 42: Emission Factor Table			Annual emissions based on Emission Factors: calculated	
	Gas		[illegible]					
CO				EPA 42 Table 1.4-1	84	[illegible]	3.46 E-03	1.51 E-01
NO_x				EPA 42 Table 1.4-1	100	[illegible]	4.12 E-03	1.80 E-01
SO_2				EPA 42 Table 1.4-2	[illegible]	[illegible]	2.47 E-04	1.08 E-02
$PM10$				EPA 42 Table 1.4-2	7.60	[illegible]	3.13 E-03	1.37 E-02
PM				EPA 42 Table 1.4-2	7.60	[illegible]	3.13 E-03	1.37 E-02
Pb				EPA 42 Table 1.4-2	[illegible]	[illegible]	2.03 E-07	[illegible]
VOC				EPA 42 Table 1.4-2	5.50	[illegible]	2.26 E-03	[illegible]
TOC				EPA 42 Table 1.4-2	11.00	0.011	4.53 E-03	1.98 E-02
3-Methylchloranthrene				EPA 42 Table 1.4-3	2.4 E-05	[illegible]	[illegible]	[illegible]
7-Methylbenzanthrene				EPA 42 Table 1.4-3	1.8 E-05	[illegible]	7.41 E-10	[illegible]
7,12-Dimethylbenz(a)anthracene				EPA 42 Table 1.4-3	1.6 E-05	[illegible]	[illegible]	[illegible]
Acenaphthene				EPA 42 Table 1.4-3	1.8 E-05	[illegible]	7.41 E-10	[illegible]
Acenaphthylene				EPA 42 Table 1.4-3	1.8 E-05	[illegible]	7.41 E-10	[illegible]
Anthracene				EPA 42 Table 1.4-3	2.4 E-05	[illegible]	[illegible]	[illegible]
Arsenic				EPA 42 Table 1.4-4	2.0 E-04	[illegible]	[illegible]	[illegible]
Barium				EPA 42 Table 1.4-4	4.4 E-03	[illegible]	[illegible]	[illegible]
Benz(a)anthracene				EPA 42 Table 1.4-3	1.8 E-05	[illegible]	7.41 E-10	[illegible]
Benzene				EPA 42 Table 1.4-3	2.1 E-03	[illegible]	[illegible]	[illegible]
Benzo(a)pyrene				EPA 42 Table 1.4-3	1.2 E-05	[illegible]	4.94 E-10	[illegible]
Benzo(b)fluoranthene				EPA 42 Table 1.4-3	1.8 E-05	[illegible]	7.41 E-10	[illegible]
Benzo(g,h,i)perylene				EPA 42 Table 1.4-3	1.2 E-05	[illegible]	4.94 E-10	[illegible]
Benzo(k)fluoranthene				EPA 42 Table 1.4-3	1.8 E-05	[illegible]	7.41 E-10	[illegible]
Beryllium				EPA 42 Table 1.4-4	1.2 E-05	[illegible]	4.94 E-09	[illegible]
Butane				EPA 42 Table 1.4-2	2.1 E+00	[illegible]	[illegible]	[illegible]
Cadmium				EPA 42 Table 1.4-4	1.1 E-03	[illegible]	4.53 E-07	[illegible]
Chromium				EPA 42 Table 1.4-4	1.4 E-03	[illegible]	5.76 E-07	[illegible]
Chrysene				EPA 42 Table 1.4-3	1.8 E-05	[illegible]	7.41 E-10	[illegible]
Cobalt				EPA 42 Table 1.4-4	8.4 E-05	[illegible]	[illegible]	[illegible]
Copper				EPA 42 Table 1.4-4	8.5 E-04	[illegible]	[illegible]	[illegible]
Dibenz(a,h)anthracene				EPA 42 Table 1.4-3	1.2 E-05	[illegible]	4.94 E-10	[illegible]
Dichlorobenzene				EPA 42 Table 1.4-3	1.2 E-03	[illegible]	4.94 E-07	[illegible]
Ethane				EPA 42 Table 1.4-2	3.1 E+00	[illegible]	[illegible]	[illegible]
Fluoranthene				EPA 42 Table 1.4-3	3.0 E-05	[illegible]	1.24 E-09	[illegible]
Fluorene				EPA 42 Table 1.4-3	2.8 E-05	[illegible]	[illegible]	[illegible]
Formaldehyde				EPA 42 Table 1.4-3	7.5 E-02	[illegible]	[illegible]	[illegible]
Hexane				EPA 42 Table 1.4-3	1.8 E+00	[illegible]	7.41 E-04	[illegible]
Indeno(1,2,3-cd)pyrene				EPA 42 Table 1.4-3	1.8 E-05	[illegible]	7.41 E-10	[illegible]
Manganese				EPA 42 Table 1.4-4	3.8 E-04	[illegible]	[illegible]	[illegible]
Mercury				EPA 42 Table 1.4-4	2.6 E-04	[illegible]	1.07 E-07	[illegible]
Methane				EPA 42 Table 1.4-2	2.20	[illegible]	9.47 E-04	[illegible]
Molybdenum				EPA 42 Table 1.4-4	1.1 E-03	[illegible]	[illegible]	[illegible]
Naphthalene				EPA 42 Table 1.4-3	6.1 E-04	[illegible]	2.51 E-07	[illegible]
Nickel				EPA 42 Table 1.4-4	2.1 E-03	[illegible]	[illegible]	[illegible]
Pentane				EPA 42 Table 1.4-2	2.6 E+00	[illegible]	1.07 E-03	[illegible]
Phenanthrene				EPA 42 Table 1.4-3	1.7 E-05	[illegible]	7.00 E-10	[illegible]
Propane				EPA 42 Table 1.4-2	1.6 E+00	[illegible]	[illegible]	[illegible]
Pyrene				EPA 42 Table 1.4-3	5.0 E-05	[illegible]	[illegible]	[illegible]
Selenium				EPA 42 Table 1.4-4	2.4 E-05	[illegible]	[illegible]	[illegible]
Toluene				EPA 42 Table 1.4-3	3.4 E-03	[illegible]	[illegible]	[illegible]
Vanadium				EPA 42 Table 1.4-4	2.3 E-03	[illegible]	9.47 E-07	[illegible]
Zinc				EPA 42 Table 1.4-4	2.9 E-02	[illegible]	1.19 E-05	[illegible]

Notes:

1. Emission factor for "Small Boiler" and "Uncontrolled".
2. Potential hours of operation of boiler (annual) = [illegible] hours/year
3. Actual hours of operation of boiler (winter: Sept 1 to May 31) = 273 days/year x 24 hours/day = [illegible] hours/year
4. Boiler used during winter for hot water.
5. Identifier #[illegible].

Abbreviations used:

MMBtu Million Btu
hr Hours
yr Years
lb Pounds of emissions
ton Tons of emissions

Emissions BIU Small Equip 6/24/2003
[illegible] 1 of 1 [illegible]
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Item #29: Boiler

Emission Estimates

Date: 01-Jul-04

(Listed as Item #29 in the "Campus Inventory" list.)

Location: Schubert - Building #56

[illegible]	Fuel	Maximum Equipment Capacity		Emission Factors from EPA 42: Reference Table		Following estimates based on Emission Factors:	
					calculated	calculated	calculated
	Gas		[illegible] 0.405				
					$lb_m/10^6$ scf	$lb_m/MMBtu$	lb_m/hr	ton_m/yr
CO				EPA 42 Table 1.4-1	84	0.082	3.29 E-02	1.44 E-01
NO_x				EPA 42 Table 1.4-1	100	0.098	3.92 E-02	1.72 E-01
SO_2				EPA 42 Table 1.4-2	0.60	4.00000	3.36 E-04	1.03 E-03
PM10				EPA 42 Table 1.4-2	7.60	0.0076	2.98 E-02	1.31 E-02
PM				EPA 42 Table 1.4-2	7.60	0.0076	2.98 E-02	1.31 E-02
Pb				EPA 42 Table 1.4-2	0.0005	4.90 E-07	1.92 E-07	8.42 E-07
VOC				EPA 42 Table 1.4-2	5.50	0.005	2.16 E-02	9.46 E-02
TOC				EPA 42 Table 1.4-2	11.00	0.011	4.31 E-02	1.89 E-01
3-Methylchloranthrene				EPA 42 Table 1.4-3	2.4 E-08	2.36 E-09	9.41 E-09	4.12 E-08
3-Methylcholanthrene				EPA 42 Table 1.4-3	1.8 E-08	1.76 E-09	7.06 E-10	3.09 E-09
7,12-Dimethylbenz(a)anthracene				EPA 42 Table 1.4-3	1.6 E-08	1.57 E-09	6.27 E-10	2.75 E-09
Acenaphthene				EPA 42 Table 1.4-3	1.8 E-08	1.76 E-09	7.06 E-10	3.09 E-09
Acenaphthylene				EPA 42 Table 1.4-3	1.8 E-08	1.76 E-09	7.06 E-10	3.09 E-09
Anthracene				EPA 42 Table 1.4-3	2.4 E-08	2.36 E-09	9.41 E-10	4.12 E-09
Arsenic				EPA 42 Table 1.4-4	2.0 E-04	1.96 E-07	7.84 E-08	3.44 E-07
Barium				EPA 42 Table 1.4-4	4.4 E-03	4.31 E-06	1.73 E-06	7.58 E-06
Benz(a)anthracene				EPA 42 Table 1.4-3	1.8 E-08	1.76 E-09	7.06 E-10	3.09 E-09
Benzene				EPA 42 Table 1.4-3	2.1 E-06	2.06 E-07	8.24 E-09	3.61 E-08
Benzo(a)pyrene				EPA 42 Table 1.4-3	1.2 E-08	1.18 E-09	4.71 E-10	2.06 E-09
Benzo(b)fluoranthene				EPA 42 Table 1.4-3	1.8 E-08	1.76 E-09	7.06 E-10	3.09 E-09
Benzo(g,h,i)perylene				EPA 42 Table 1.4-3	1.2 E-08	1.18 E-09	4.71 E-10	2.06 E-09
Benzo(k)fluoranthene				EPA 42 Table 1.4-3	1.8 E-08	1.76 E-09	7.06 E-10	3.09 E-09
Beryllium				EPA 42 Table 1.4-4	1.2 E-05	1.18 E-08	4.71 E-09	2.06 E-08
Boron				EPA 42 Table 1.4-3	2.1 E+00	2.06 E-03	8.24 E-04	3.61 E-03
Cadmium				EPA 42 Table 1.4-4	1.1 E-03	1.08 E-06	4.31 E-07	1.89 E-06
Chromium				EPA 42 Table 1.4-4	1.4 E-03	1.37 E-06	5.49 E-07	2.40 E-06
Chrysene				EPA 42 Table 1.4-3	1.8 E-08	1.76 E-09	7.06 E-10	3.09 E-09
Cobalt				EPA 42 Table 1.4-4	8.4 E-05	8.24 E-08	3.29 E-08	1.44 E-07
Copper				EPA 42 Table 1.4-4	8.5 E-04	8.33 E-07	3.33 E-07	1.46 E-06
Dibenz(a,h)anthracene				EPA 42 Table 1.4-3	1.2 E-08	1.18 E-09	4.71 E-10	2.06 E-09
Dichlorobenzene				EPA 42 Table 1.4-3	1.2 E-08	1.18 E-09	4.71 E-10	2.06 E-09
Ethane				EPA 42 Table 1.4-3	3.1 E+00	3.04 E-03	1.22 E-03	5.32 E-03
Fluoranthene				EPA 42 Table 1.4-3	3.0 E-08	2.94 E-09	1.18 E-09	5.15 E-09
Fluorene				EPA 42 Table 1.4-3	2.8 E-08	2.75 E-09	1.10 E-09	4.81 E-09
Formaldehyde				EPA 42 Table 1.4-3	7.5 E-02	7.35 E-05	2.94 E-05	1.29 E-04
Hexane				EPA 42 Table 1.4-3	1.8 E+00	1.76 E-03	7.06 E-04	3.09 E-03
Indeno(1,2,3-cd)pyrene				EPA 42 Table 1.4-3	1.8 E-08	1.76 E-09	7.06 E-10	3.09 E-09
Manganese				EPA 42 Table 1.4-4	3.8 E-04	3.73 E-07	1.49 E-07	6.53 E-07
Mercury				EPA 42 Table 1.4-4	2.6 E-04	2.55 E-07	1.02 E-07	4.47 E-07
Methane				EPA 42 Table 1.4-2	2.30	0.00230	9.20 E-04	3.92 E-03
Molybdenum				EPA 42 Table 1.4-4	1.1 E-03	1.08 E-06	4.31 E-07	1.89 E-06
Naphthalene				EPA 42 Table 1.4-3	6.1 E-04	5.98 E-07	2.39 E-07	1.05 E-06
Nickel				EPA 42 Table 1.4-4	2.1 E-03	2.06 E-06	8.24 E-07	3.61 E-06
Pentane				EPA 42 Table 1.4-3	2.6 E+00	2.55 E-03	1.02 E-03	4.47 E-03
Phenanthrene				EPA 42 Table 1.4-3	1.7 E-08	1.67 E-09	6.67 E-10	2.92 E-09
Propane				EPA 42 Table 1.4-3	1.6 E+00	1.57 E-03	6.27 E-04	2.75 E-03
Pyrene				EPA 42 Table 1.4-3	5.0 E-08	4.90 E-09	1.96 E-09	8.58 E-09
Selenium				EPA 42 Table 1.4-4	2.4 E-05	2.35 E-08	9.41 E-09	4.12 E-08
Toluene				EPA 42 Table 1.4-3	3.4 E-06	3.33 E-07	1.33 E-07	5.84 E-06
Vanadium				EPA 42 Table 1.4-4	2.3 E-03	2.25 E-06	9.02 E-07	3.95 E-06
Zinc				EPA 42 Table 1.4-4	2.9 E-03	2.84 E-06	1.14 E-06	4.98 E-06

Notes:

1. Emission factor for "Small Boilers" and "Uncontrolled".
2. Actual hours of operation of boiler (all year) = 365 days/year x 24 hours/day = [illegible] hours/year
3. Boiler used for heating.
4. Identifier [illegible].

Abbreviations used:

MMBtu Million Btu
hr Hours
yr Years
lb_m Pounds of emissions
ton_m Tons of emissions

Emissions IDU Small Equip 6/24/2004
Sheet 1 of 1 @2:07PM
Syed

Item #30: Boiler

Emission Estimates

Date: 01-Jul-04

(Listed as Item #30 on the "Campus Inventory" list.)

Location: Schubert - Building #56

		Maximum Equipment Capacity		Emission Factors from EPA 42:			Annualized estimates based on Emission Factors	
	Fuel			Reference Table				
	Gas		0.400		lb/10^6 scf	lb/MMBtu	lb/hr	tons/yr
CO				EPA 42 Table 1.4-1	84	0.082	3.29 E-02	1.44 E-01
NO_x				EPA 42 Table 1.4-1	100	0.098	3.92 E-02	1.72 E-01
SO_2				EPA 42 Table 1.4-2	0.60	0.00059	2.36 E-04	1.03 E-03
PM10				EPA 42 Table 1.4-2	7.60	0.0076	2.98 E-03	1.31 E-02
PM				EPA 42 Table 1.4-2	7.60	0.0076	2.98 E-03	1.31 E-02
Pb				EPA 42 Table 1.4-2	0.0005	4.90 E-07	1.96 E-07	8.59 E-07
VOC				EPA 42 Table 1.4-2	5.50	0.005	2.16 E-03	9.46 E-03
TOC				EPA 42 Table 1.4-2	11.00	0.011	4.31 E-03	1.89 E-02
2-Methylnaphthalene				EPA 42 Table 1.4-3	2.4 E-05	2.35 E-08	9.41 E-09	4.12 E-08
3-Methylchloranthrene				EPA 42 Table 1.4-3	1.8 E-06	1.76 E-09	7.06 E-10	3.09 E-09
7,12-Dimethylbenz(a)anthracene				EPA 42 Table 1.4-3	1.6 E-05	1.57 E-08	6.27 E-09	2.75 E-08
Acenaphthene				EPA 42 Table 1.4-3	1.8 E-06	1.76 E-09	7.06 E-10	3.09 E-09
Acenaphthylene				EPA 42 Table 1.4-3	1.8 E-06	1.76 E-09	7.06 E-10	3.09 E-09
Anthracene				EPA 42 Table 1.4-3	2.4 E-06	2.35 E-09	9.41 E-10	4.12 E-09
Arsenic				EPA 42 Table 1.4-4	2.0 E-04	1.96 E-07	7.84 E-08	3.44 E-07
Barium				EPA 42 Table 1.4-4	4.4 E-03	4.31 E-06	1.72 E-06	7.55 E-06
Benzo(a)anthracene				EPA 42 Table 1.4-3	1.8 E-06	1.76 E-09	7.06 E-10	3.09 E-09
Benzene				EPA 42 Table 1.4-3	2.1 E-03	2.06 E-06	8.24 E-07	3.61 E-06
Benzo(b)pyrene				EPA 42 Table 1.4-3	1.2 E-06	1.18 E-09	4.71 E-10	2.06 E-09
Benzo(b)fluoranthene				EPA 42 Table 1.4-3	1.8 E-06	1.76 E-09	7.06 E-10	3.09 E-09
Benzo(k,l,m)pyrene				EPA 42 Table 1.4-3	1.2 E-06	1.18 E-09	4.71 E-10	2.06 E-09
Benzo(g,h,i)perylene				EPA 42 Table 1.4-3	1.8 E-06	1.76 E-09	7.06 E-10	3.09 E-09
Beryllium				EPA 42 Table 1.4-4	1.2 E-05	1.18 E-08	4.71 E-09	2.06 E-08
Boron				EPA 42 Table 1.4-4	2.1 E+00	2.06 E-03	8.24 E-04	3.61 E-03
Cadmium				EPA 42 Table 1.4-4	1.1 E-03	1.08 E-06	4.31 E-07	1.89 E-06
Chromium				EPA 42 Table 1.4-4	1.4 E-03	1.37 E-06	5.49 E-07	2.40 E-06
Chrysene				EPA 42 Table 1.4-3	1.8 E-06	1.76 E-09	7.06 E-10	3.09 E-09
Cobalt				EPA 42 Table 1.4-4	8.4 E-05	8.24 E-08	3.29 E-08	1.44 E-07
Copper				EPA 42 Table 1.4-4	8.5 E-04	8.33 E-07	3.33 E-07	1.46 E-06
Dibenz(a,h)anthracene				EPA 42 Table 1.4-3	1.2 E-06	1.18 E-09	4.71 E-10	2.06 E-09
Dichlorobenzene				EPA 42 Table 1.4-3	1.2 E-03	1.18 E-06	4.71 E-07	2.06 E-06
Manganese				EPA 42 Table 1.4-4	3.1 E+00	3.04 E-03	1.22 E-03	5.32 E-03
Fluoranthene				EPA 42 Table 1.4-3	3.0 E-06	2.94 E-09	1.18 E-09	5.15 E-09
Fluorene				EPA 42 Table 1.4-3	2.8 E-06	2.75 E-09	1.10 E-09	4.81 E-09
Formaldehyde				EPA 42 Table 1.4-3	7.5 E-02	7.35 E-05	2.94 E-05	1.29 E-04
Mercury				EPA 42 Table 1.4-4	1.8 E+00	1.76 E-03	7.06 E-04	3.09 E-03
Indeno(1,2,3-cd)pyrene				EPA 42 Table 1.4-3	1.8 E-06	1.76 E-09	7.06 E-10	3.09 E-09
Naphthalene				EPA 42 Table 1.4-3	6.0 E-04	5.73 E-07	1.49 E-07	6.55 E-07
Nickel				EPA 42 Table 1.4-4	2.6 E-03	2.55 E-06	1.02 E-06	4.47 E-06
Nitrate				EPA 42 Table 1.4-2	2.30	0.00230	9.02 E-04	3.95 E-03
Phenanthrene				EPA 42 Table 1.4-3	1.1 E-05	1.08 E-08	4.31 E-09	1.89 E-08
Phosphorus				EPA 42 Table 1.4-4	6.1 E-04	5.98 E-07	2.39 E-07	1.05 E-06
Propane				EPA 42 Table 1.4-4	2.1 E-03	2.06 E-06	8.24 E-07	3.61 E-06
Pyrene				EPA 42 Table 1.4-3	2.6 E+00	2.55 E-03	1.02 E-03	4.47 E-03
Selenium				EPA 42 Table 1.4-3	1.7 E-05	1.67 E-08	6.67 E-09	2.92 E-08
Toluene				EPA 42 Table 1.4-3	1.6 E+00	1.57 E-03	6.27 E-04	2.75 E-03
Vanadium				EPA 42 Table 1.4-4	5.0 E-03	4.90 E-06	1.96 E-06	8.59 E-06
Zinc				EPA 42 Table 1.4-4	2.4 E-03	2.35 E-06	9.41 E-07	4.12 E-06
				EPA 42 Table 1.4-4	3.4 E-03	3.33 E-06	1.33 E-06	5.84 E-06
				EPA 42 Table 1.4-4	2.3 E-03	2.25 E-06	8.82 E-07	3.86 E-06
				EPA 42 Table 1.4-4	2.9 E-03	2.84 E-06	1.14 E-06	4.99 E-06

Notes:

1. Emission factor for "Small Boilers" and "Uncontrolled".
2. Actual hours of operation of boiler (so year) = 365 days/year x 24 hours/day = 8,760 hours/year
3. Boiler used for heating.
4. Identifier #930

Abbreviations used:

MMBtu Million Btu
hr Hours
yr Years
lb, Pounds of emissions
tons, Tons of emissions

Emissions 4BJ Small Ex.xls 1/24/2005
930 1 of 1 @2:37PM
Syed

Item #31: Boiler

Emission Estimates

Date: 01-Jul-04

(Listed as item 501 on the "Campus Inventory" list.)

Location: RFC Ph. II - Building #48

Pollutant	Fuel	Maximum Equipment Capacity	[illegible]	Emission Factors from EPA 42: Reference Table	[illegible]	[illegible]	Following calculations based on Emission Factors: [illegible]	[illegible]
	Gas		[illegible] 0.100		lb/10^6 scf	lb/[illegible]	lb/hr	tons/yr
CO				EPA 42 Table 1.4-1	84	0.0839	1.30 E-02	6.10 E-02
NO_x				EPA 42 Table 1.4-1	100	0.098	1.55 E-02	7.28 E-02
SO_2				EPA 42 Table 1.4-2	0.60	0.00588	9.14 E-05	4.28 E-04
Pb				EPA 42 Table 1.4-2	7.60	0.0074	1.16 E-03	5.42 E-03
PM				EPA 42 Table 1.4-2	7.60	0.0074	1.16 E-03	5.42 E-03
VOC				EPA 42 Table 1.4-2	0.0055	4.80 E-07	7.46 E-09	3.50 E-07
TOC				EPA 42 Table 1.4-2	5.50	0.0054	8.11 E-04	3.80 E-03
2-Methylnaphthalene				EPA 42 Table 1.4-3	11.00	0.011	1.62 E-03	7.59 E-03
3-Methylchloranthrene				EPA 42 Table 1.4-3	2.4 E-08	2.36 E-09	3.66 E-09	1.74 E-08
7,12-Dimethylbenz(a)anthracene				EPA 42 Table 1.4-3	1.6 E-05	1.76 E-06	2.66 E-10	1.31 E-09
Acenaphthene				EPA 42 Table 1.4-3	1.8 E-06	1.57 E-06	2.35 E-09	1.10 E-08
Acenaphthylene				EPA 42 Table 1.4-3	1.8 E-06	1.76 E-06	2.66 E-10	1.31 E-09
Anthracene				EPA 42 Table 1.4-3	1.8 E-06	1.76 E-06	2.66 E-10	1.31 E-09
Arsenic				EPA 42 Table 1.4-3	2.4 E-06	2.36 E-06	3.66 E-10	1.74 E-09
Barium				EPA 42 Table 1.4-4	2.0 E-04	1.96 E-07	3.31 E-09	1.46 E-07
Benzo(a)anthracene				EPA 42 Table 1.4-4	4.4 E-03	4.31 E-06	7.26 E-07	3.18 E-06
Benzene				EPA 42 Table 1.4-3	1.8 E-06	1.76 E-06	2.66 E-10	1.31 E-09
Benzo(a)pyrene				EPA 42 Table 1.4-3	2.1 E-03	2.06 E-06	3.46 E-07	1.52 E-06
Benzo(b)fluoranthene				EPA 42 Table 1.4-3	1.2 E-06	1.18 E-06	1.99 E-10	8.71 E-10
Benzo(g,h,i)perylene				EPA 42 Table 1.4-3	1.8 E-06	1.76 E-06	2.66 E-10	1.31 E-09
Benzo(k)fluoranthene				EPA 42 Table 1.4-3	1.2 E-06	1.18 E-06	1.99 E-10	8.71 E-10
Beryllium				EPA 42 Table 1.4-3	1.8 E-06	1.76 E-06	2.66 E-10	1.31 E-09
Butane				EPA 42 Table 1.4-4	1.2 E-03	1.18 E-06	1.99 E-09	8.71 E-09
Cadmium				EPA 42 Table 1.4-3	2.1 E+00	2.06 E-03	3.46 E-04	1.52 E-03
Chromium				EPA 42 Table 1.4-4	1.1 E-03	1.08 E-06	1.82 E-07	7.98 E-07
Chrysene				EPA 42 Table 1.4-4	1.4 E-03	1.37 E-06	2.32 E-07	1.02 E-06
Cobalt				EPA 42 Table 1.4-3	1.8 E-06	1.76 E-06	2.66 E-10	1.31 E-09
Copper				EPA 42 Table 1.4-4	8.4 E-05	8.24 E-08	1.39 E-08	6.16 E-08
Dibenzo(a,h)anthracene				EPA 42 Table 1.4-4	6.5 E-04	6.37 E-07	1.07 E-07	4.67 E-07
Dichlorobenzene				EPA 42 Table 1.4-3	1.2 E-06	1.18 E-06	1.99 E-10	8.71 E-10
Ethane				EPA 42 Table 1.4-3	1.2 E-03	1.18 E-06	1.99 E-07	8.71 E-07
Fluoranthene				EPA 42 Table 1.4-3	3.1 E+00	3.04 E-03	5.14 E-04	2.26 E-03
Fluorene				EPA 42 Table 1.4-3	3.0 E-06	2.94 E-06	4.97 E-10	2.18 E-09
Formaldehyde				EPA 42 Table 1.4-3	2.8 E-06	2.75 E-06	4.64 E-10	2.03 E-09
Hexane				EPA 42 Table 1.4-3	7.5 E-06	7.36 E-06	1.24 E-09	5.44 E-09
Indeno(1,2,3-cd)pyrene				EPA 42 Table 1.4-3	1.8 E+00	1.76 E-03	2.98 E-04	1.31 E-03
Manganese				EPA 42 Table 1.4-3	1.8 E-06	1.76 E-06	2.98 E-10	1.31 E-09
Mercury				EPA 42 Table 1.4-4	3.0 E-04	2.73 E-07	4.30 E-08	2.76 E-07
Methane				EPA 42 Table 1.4-4	2.6 E-04	2.50 E-07	4.31 E-08	1.89 E-07
Molybdenum				EPA 42 Table 1.4-2	2.30	0.00230	3.91 E-04	1.67 E-03
Naphthalene				EPA 42 Table 1.4-4	1.1 E-03	1.08 E-06	1.82 E-07	7.98 E-07
Nickel				EPA 42 Table 1.4-3	8.1 E-04	5.98 E-07	1.01 E-07	4.43 E-07
Pentane				EPA 42 Table 1.4-4	2.1 E-03	2.06 E-06	3.46 E-07	1.52 E-06
Phenanthrene				EPA 42 Table 1.4-3	2.6 E+00	2.55 E-03	4.32 E-04	1.89 E-03
Propane				EPA 42 Table 1.4-3	1.7 E-06	1.67 E-06	2.82 E-10	1.23 E-09
Pyrene				EPA 42 Table 1.4-3	1.6 E+00	1.57 E-03	2.66 E-04	1.16 E-03
Selenium				EPA 42 Table 1.4-3	6.0 E-06	4.90 E-06	8.28 E-10	3.63 E-09
Toluene				EPA 42 Table 1.4-4	3.4 E-06	3.35 E-09	5.66 E-09	1.74 E-08
Vanadium				EPA 42 Table 1.4-3	3.4 E-06	3.33 E-06	5.63 E-07	2.47 E-06
Zinc				EPA 42 Table 1.4-3	2.3 E-03	2.26 E-06	3.81 E-07	1.67 E-06
				EPA 42 Table 1.4-4	2.0 E-03	2.04 E-06	4.00 E-08	2.10 E-08

Notes:

1. Emission factor for "Small Boilers" and "Uncontrolled".
2. Potential hours of operation of boiler (annual) = [illegible] hours/year
3. Actual hours of operation of boiler (11 months) = 335 days/year x 24 hours/day = 8,040 hours/year
4. Boiler used for hot water for cosmetology department.
5. Identifier #501.

Abbreviations used:

MMBtu Million Btu
hr Hours
yr Years
lb Pounds of emissions
ton Tons of emissions

Emissions 480 Small Equip 6/24/2003
501 1 of 1 @2:57PM
Syed

Item #32: Boiler

Emission Estimates

Date: 01-Jul-06

(Listed as item #32 on the "Campus Inventory" list.)

Location: R/C Pt. III - Building #40

Pollutant	Fuel	Maximum Equipment Capacity		Emission Factors from EPA 42			Following estimates based on Emission Factors	
				Reference Table				
	Gas	[illegible]	[illegible]					
CO		[illegible]		EPA 42 Table 1.4-1	[illegible]	[illegible]	[illegible]	[illegible]
NO_x				EPA 42 Table 1.4-1	100	[illegible]	[illegible]	[illegible]
SO_2				EPA 42 Table 1.4-2	[illegible]	[illegible]	[illegible]	[illegible]
PM10				EPA 42 Table 1.4-2	7.60	[illegible]	[illegible]	[illegible]
PM				EPA 42 Table 1.4-2	7.60	[illegible]	[illegible]	[illegible]
VOC				EPA 42 Table 1.4-2	[illegible]	[illegible]	[illegible]	[illegible]
TOC				EPA 42 Table 1.4-2	11.00	[illegible]	[illegible]	[illegible]
1-Methylnaphthalene				EPA 42 Table 1.4-3	[illegible]	[illegible]	[illegible]	[illegible]
2-Methylnaphthalene				EPA 42 Table 1.4-3	[illegible]	[illegible]	[illegible]	[illegible]
1,10-Dimethylbenzo[a]anthracene				EPA 42 Table 1.4-3	[illegible]	[illegible]	[illegible]	[illegible]
Acenaphthene				EPA 42 Table 1.4-3	[illegible]	[illegible]	[illegible]	[illegible]
Acenaphthylene				EPA 42 Table 1.4-3	[illegible]	[illegible]	[illegible]	[illegible]
Anthracene				EPA 42 Table 1.4-3	[illegible]	[illegible]	[illegible]	[illegible]
Arsenic				EPA 42 Table 1.4-4	[illegible]	[illegible]	[illegible]	[illegible]
Barium				EPA 42 Table 1.4-4	[illegible]	[illegible]	[illegible]	[illegible]
Benzo[a]anthracene				EPA 42 Table 1.4-3	[illegible]	[illegible]	[illegible]	[illegible]
Benzene				EPA 42 Table 1.4-3	[illegible]	[illegible]	[illegible]	[illegible]
Benzo[a]pyrene				EPA 42 Table 1.4-3	[illegible]	[illegible]	[illegible]	[illegible]
Benzo[b]fluoranthene				EPA 42 Table 1.4-3	[illegible]	[illegible]	[illegible]	[illegible]
Benzo[k]fluoranthene				EPA 42 Table 1.4-3	[illegible]	[illegible]	[illegible]	[illegible]
Beryllium				EPA 42 Table 1.4-4	[illegible]	[illegible]	[illegible]	[illegible]
Boron				EPA 42 Table 1.4-3	[illegible]	[illegible]	[illegible]	[illegible]
Cadmium				EPA 42 Table 1.4-4	[illegible]	[illegible]	[illegible]	[illegible]
Chromium				EPA 42 Table 1.4-4	[illegible]	[illegible]	[illegible]	[illegible]
Chrysene				EPA 42 Table 1.4-3	[illegible]	[illegible]	[illegible]	[illegible]
Cobalt				EPA 42 Table 1.4-4	[illegible]	[illegible]	[illegible]	[illegible]
Copper				EPA 42 Table 1.4-4	[illegible]	[illegible]	[illegible]	[illegible]
Dibenzo[a,h]anthracene				EPA 42 Table 1.4-3	[illegible]	[illegible]	[illegible]	[illegible]
Dichlorobenzene				EPA 42 Table 1.4-3	[illegible]	[illegible]	[illegible]	[illegible]
Fluoranthene				EPA 42 Table 1.4-3	[illegible]	[illegible]	[illegible]	[illegible]
Fluorene				EPA 42 Table 1.4-3	[illegible]	[illegible]	[illegible]	[illegible]
Formaldehyde				EPA 42 Table 1.4-3	[illegible]	[illegible]	[illegible]	[illegible]
Hexane				EPA 42 Table 1.4-3	[illegible]	[illegible]	[illegible]	[illegible]
Indeno(1,2,3-cd)pyrene				EPA 42 Table 1.4-3	[illegible]	[illegible]	[illegible]	[illegible]
Manganese				EPA 42 Table 1.4-4	[illegible]	[illegible]	[illegible]	[illegible]
Mercury				EPA 42 Table 1.4-4	[illegible]	[illegible]	[illegible]	[illegible]
Methane				EPA 42 Table 1.4-2	[illegible]	[illegible]	[illegible]	[illegible]
Molybdenum				EPA 42 Table 1.4-4	[illegible]	[illegible]	[illegible]	[illegible]
Naphthalene				EPA 42 Table 1.4-3	[illegible]	[illegible]	[illegible]	[illegible]
Nickel				EPA 42 Table 1.4-4	[illegible]	[illegible]	[illegible]	[illegible]
Pentane				EPA 42 Table 1.4-2	[illegible]	[illegible]	[illegible]	[illegible]
Phenanthrene				EPA 42 Table 1.4-3	[illegible]	[illegible]	[illegible]	[illegible]
Propane				EPA 42 Table 1.4-2	[illegible]	[illegible]	[illegible]	[illegible]
Pyrene				EPA 42 Table 1.4-3	[illegible]	[illegible]	[illegible]	[illegible]
Selenium				EPA 42 Table 1.4-4	[illegible]	[illegible]	[illegible]	[illegible]
Toluene				EPA 42 Table 1.4-3	[illegible]	[illegible]	[illegible]	[illegible]
Vanadium				EPA 42 Table 1.4-4	[illegible]	[illegible]	[illegible]	[illegible]
Zinc				EPA 42 Table 1.4-4	[illegible]	[illegible]	[illegible]	[illegible]

Notes:

1. Emission factor for "Small Boilers" and "Uncontrolled".
2. Actual hours of operation of boiler (at year) = [illegible] days/year x 24 hours/day = [illegible]
3. Boiler used for hot water.
4. Modified 2002.

Abbreviations used:

[illegible] Million Btu
hr Hours
yr Years
lb_m Pounds of emissions
ton_m Tons of emissions

Generated via Excel Equip. [illegible]
[illegible] 1 of 1 @[illegible]
[illegible]

Item #33: Boilers

Emission Estimates

Date: 01-Jul-04

(Listed as item #66 on the "Campus Inventory" list.)

Location: Performing Arts Center Building #98

Pollutant	Fuel	Maximum Equipment Capacity	Multiplier	Emission Factors from EPA 42: Reference Table			Following estimates based on Emission Factors:	
	Gas	Total of 4 boilers; each boiler with an output of [illegible]; firing rate = 80% =80%x[illegible]=1.24 for 4 boilers! =4x1.24 MMBtu/hr =4.96 MMBtu/hr	4.96		lb/10^6 scf	lb/MMBtu	lb/hr	tons/yr
CO				EPA 42 Table 1.4-1	84	0.082	4.09 E-01	1.79 E-00
NO_x				EPA 42 Table 1.4-1	100	0.098	4.86 E-01	2.13 E+00
SO_2				EPA 42 Table 1.4-2	0.60	0.00059	2.92 E-03	1.28 E-02
PM10				EPA 42 Table 1.4-3	7.60	0.0076	3.70 E-02	1.62 E-01
PM				EPA 42 Table 1.4-2	7.60	0.0076	3.70 E-02	1.62 E-01
Pb				EPA 42 Table 1.4-3	0.0005	4.90 E-07	2.43 E-03	1.06 E-02
VOC				EPA 42 Table 1.4-2	5.50	0.005	2.67 E-02	1.17 E-01
TOC				EPA 42 Table 1.4-2	11.00	0.011	5.35 E-02	2.34 E-01
2-Methylnaphthalene				EPA 42 Table 1.4-3	2.4 E-05	2.36 E-08	1.17 E-07	5.11 E-07
3-Methylchloranthrene				EPA 42 Table 1.4-3	1.8 E-09	1.76 E-12	8.75 E-09	3.83 E-08
7,12-Dimethylbenz(a)anthracene				EPA 42 Table 1.4-3	1.6 E-05	1.57 E-08	7.78 E-05	3.41 E-07
Acenaphthene				EPA 42 Table 1.4-3	1.8 E-09	1.76 E-12	8.75 E-09	3.83 E-08
Acenaphthylene				EPA 42 Table 1.4-3	1.8 E-09	1.76 E-12	8.75 E-09	3.83 E-08
Anthracene				EPA 42 Table 1.4-3	2.4 E-09	2.35 E-12	1.17 E-08	5.11 E-08
Arsenic				EPA 42 Table 1.4-4	2.0 E-04	1.96 E-07	9.73 E-07	4.26 E-06
Benzene				EPA 42 Table 1.4-4	4.4 E-03	4.31 E-06	2.14 E-05	9.37 E-05
Benzo(a)anthracene				EPA 42 Table 1.4-3	1.8 E-09	1.76 E-12	8.75 E-09	3.83 E-08
Benzene				EPA 42 Table 1.4-3	2.1 E-08	2.06 E-11	1.02 E-08	4.47 E-08
Benzo(b)pyrene				EPA 42 Table 1.4-3	1.2 E-08	1.18 E-11	5.84 E-09	2.56 E-08
Benzo(g)fluoranthene				EPA 42 Table 1.4-3	1.8 E-09	1.76 E-12	8.75 E-09	3.83 E-08
Benzo(k)fluoranthene				EPA 42 Table 1.4-3	1.2 E-08	1.18 E-11	5.84 E-09	2.56 E-08
Benzo(j)fluoranthene				EPA 42 Table 1.4-3	1.8 E-09	1.76 E-12	8.75 E-09	3.83 E-08
Beryllium				EPA 42 Table 1.4-4	1.2 E-05	1.18 E-08	5.84 E-08	2.56 E-07
Butane				EPA 42 Table 1.4-3	2.1 E+00	2.06 E-03	1.02 E-02	4.47 E-02
Cadmium				EPA 42 Table 1.4-4	1.1 E-03	1.08 E-06	5.35 E-06	2.34 E-05
Chromium				EPA 42 Table 1.4-4	1.4 E-03	1.37 E-06	6.81 E-06	2.98 E-05
Chrysene				EPA 42 Table 1.4-3	1.8 E-09	1.76 E-12	8.75 E-09	3.83 E-08
Cobalt				EPA 42 Table 1.4-4	8.4 E-05	8.24 E-08	4.08 E-07	1.79 E-06
Copper				EPA 42 Table 1.4-4	8.5 E-04	8.35 E-07	4.13 E-06	1.81 E-05
Dibenzo(a,h)anthracene				EPA 42 Table 1.4-3	1.2 E-08	1.18 E-11	5.84 E-09	2.56 E-08
Dichlorobenzene				EPA 42 Table 1.4-3	1.2 E-08	1.18 E-11	5.84 E-09	2.56 E-08
Ethane				EPA 42 Table 1.4-3	3.1 E+00	3.04 E-03	1.51 E-02	6.60 E-02
Fluoranthene				EPA 42 Table 1.4-3	3.0 E-09	2.94 E-12	1.46 E-08	6.39 E-08
Fluorene				EPA 42 Table 1.4-3	2.8 E-09	2.75 E-12	1.36 E-08	5.96 E-08
Formaldehyde				EPA 42 Table 1.4-3	7.5 E-02	7.35 E-05	3.66 E-04	1.60 E-03
Hexane				EPA 42 Table 1.4-3	1.8 E+00	1.76 E-03	8.75 E-03	3.83 E-02
Indeno(1,2,3-cd)pyrene				EPA 42 Table 1.4-3	1.8 E-09	1.76 E-12	8.75 E-09	3.83 E-08
Manganese				EPA 42 Table 1.4-4	3.8 E-04	3.73 E-07	1.86 E-06	8.09 E-06
Mercury				EPA 42 Table 1.4-4	2.6 E-04	2.55 E-07	1.26 E-06	5.54 E-06
Methane				EPA 42 Table 1.4-2	2.30	0.00230	1.12 E-02	4.90 E-02
Molybdenum				EPA 42 Table 1.4-4	1.1 E-03	1.08 E-06	5.35 E-06	2.34 E-05
Naphthalene				EPA 42 Table 1.4-3	6.1 E-04	6.00 E-07	2.97 E-06	1.30 E-05
Nickel				EPA 42 Table 1.4-4	2.1 E-03	2.06 E-06	1.02 E-05	4.47 E-05
Pentane				EPA 42 Table 1.4-3	2.6 E+00	2.55 E-03	1.26 E-02	5.54 E-02
Phenanthrene				EPA 42 Table 1.4-3	1.7 E-09	1.67 E-12	8.27 E-09	3.62 E-08
Propane				EPA 42 Table 1.4-3	1.6 E+00	1.57 E-03	7.78 E-03	3.41 E-02
Pyrene				EPA 42 Table 1.4-3	5.0 E-09	4.90 E-12	2.43 E-08	1.06 E-07
Selenium				EPA 42 Table 1.4-4	2.4 E-05	2.35 E-08	1.17 E-07	5.11 E-07
Toluene				EPA 42 Table 1.4-3	3.4 E-03	3.33 E-06	1.65 E-05	7.24 E-05
Vanadium				EPA 42 Table 1.4-4	2.3 E-03	2.25 E-06	1.12 E-05	4.90 E-05
Zinc				EPA 42 Table 1.4-4	2.9 E-03	2.84 E-06	1.41 E-05	6.18 E-05

Notes:
1. Emission factor for "Small Boilers" and "Uncontrolled".
2. Potential hours of operation of boiler (annual) = 8,760 hours/year
3. Actual hours of operation of boiler (winter: Sept 1 to May 31) = 273 days/year x 24 hours/day = 6,552 hours/year
4. Boilers used during winter for heating.
5. Kerosene JP8.

Abbreviations used:
- MMBtu: Million Btu
- hr: Hours
- yr: Years
- lb: Pounds of emissions
- ton: Tons of emissions

Emissions ISU Small Equip 10/4/2004
Sheet 1 of 1 @2:57PM
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Item #34: Boiler

Emission Estimates

Date: 01-Jul-04

(Listed as Item 934 on the "Campus Inventory" list.)

Location: Performing Arts Center Building #68

Pollutant	Fuel	Maximum Equipment Capacity	Emission Factors from EPA AP-42: Reference Table			Following estimates based on Emission Factors:	
	Gas						
CO			EPA AP Table 1.4-1	84	0.082	8.18 E-02	3.57 E-01
NOx			EPA AP Table 1.4-1	100	0.098	9.71 E-02	4.25 E-01
SO2			EPA AP Table 1.4-2	0.60	0.00059	5.88 E-04	2.58 E-03
PM10			EPA AP Table 1.4-2	7.60	0.0075	7.39 E-03	3.23 E-02
PM			EPA AP Table 1.4-2	7.60	0.0075	7.39 E-03	3.23 E-02
VOC			EPA AP Table 1.4-2	0.0055	4.90 E-07	4.85 E-07	2.13 E-06
TOC			EPA AP Table 1.4-2	5.60	0.006	5.34 E-03	2.34 E-02
			EPA AP Table 1.4-2	11.00	0.011	1.07 E-02	4.69 E-02
2-Methylnaphthalene			EPA AP Table 1.4-3	2.4 E-05	2.36 E-08	2.38 E-08	1.02 E-07
3-Methylchloranthrene			EPA AP Table 1.4-3	1.8 E-05	1.76 E-08	1.75 E-08	7.66 E-08
7,12-Dimethylbenz(a)anthracene			EPA AP Table 1.4-3	1.6 E-05	1.57 E-08	1.56 E-08	6.84 E-08
Acenaphthene			EPA AP Table 1.4-3	1.8 E-05	1.76 E-08	1.75 E-08	7.66 E-08
Acenaphthylene			EPA AP Table 1.4-3	1.8 E-05	1.76 E-08	1.75 E-08	7.66 E-08
Anthracene			EPA AP Table 1.4-3	2.4 E-05	2.35 E-08	2.33 E-08	1.02 E-07
Arsenic			EPA AP Table 1.4-4	2.0 E-04	1.96 E-07	1.94 E-07	8.50 E-07
Barium			EPA AP Table 1.4-4	4.4 E-03	4.31 E-06	4.27 E-06	1.87 E-05
Benzo(a)anthracene			EPA AP Table 1.4-3	1.8 E-05	1.76 E-08	1.75 E-08	7.66 E-08
Benzene			EPA AP Table 1.4-3	2.1 E-03	2.06 E-06	2.04 E-06	8.93 E-06
Benzo(a)pyrene			EPA AP Table 1.4-3	1.2 E-05	1.18 E-08	1.16 E-08	5.10 E-08
Benzo(b)fluoranthene			EPA AP Table 1.4-3	1.8 E-05	1.76 E-08	1.75 E-08	7.66 E-08
Benzo(g,h,i)perylene			EPA AP Table 1.4-3	1.2 E-05	1.18 E-08	1.16 E-08	5.10 E-08
Benzo(k)fluoranthene			EPA AP Table 1.4-3	1.8 E-05	1.76 E-08	1.75 E-08	7.66 E-08
Beryllium			EPA AP Table 1.4-4	1.2 E-05	1.18 E-08	1.16 E-08	5.10 E-08
Boron			EPA AP Table 1.4-3	2.1 E+00	2.06 E-03	2.04 E-03	8.93 E-03
Cadmium			EPA AP Table 1.4-4	1.1 E-03	1.08 E-06	1.07 E-06	4.68 E-06
Chromium			EPA AP Table 1.4-4	1.4 E-03	1.37 E-06	1.36 E-06	5.95 E-06
Chrysene			EPA AP Table 1.4-3	1.8 E-05	1.76 E-08	1.75 E-08	7.66 E-08
Cobalt			EPA AP Table 1.4-4	8.4 E-05	8.24 E-08	8.16 E-08	3.57 E-07
Copper			EPA AP Table 1.4-4	8.5 E-04	8.33 E-07	8.25 E-07	3.61 E-06
Dibenzo(a,h)anthracene			EPA AP Table 1.4-3	1.2 E-05	1.18 E-08	1.16 E-08	5.10 E-08
Dichlorobenzene			EPA AP Table 1.4-3	1.2 E-03	1.18 E-06	1.16 E-06	5.10 E-06
Dioxins			EPA AP Table 1.4-3	3.1 E+00	3.04 E-03	3.01 E-03	1.32 E-02
Fluoranthene			EPA AP Table 1.4-3	3.0 E-05	2.94 E-08	2.91 E-08	1.28 E-07
Fluorene			EPA AP Table 1.4-3	2.8 E-05	2.75 E-08	2.72 E-08	1.19 E-07
Formaldehyde			EPA AP Table 1.4-3	7.6 E-02	7.35 E-05	7.28 E-05	3.19 E-04
Manganese			EPA AP Table 1.4-3	1.8 E+00	1.76 E-03	1.75 E-03	7.66 E-03
Indeno(1,2,3-cd)pyrene			EPA AP Table 1.4-3	1.8 E-05	1.76 E-08	1.75 E-08	7.66 E-08
Mercury			EPA AP Table 1.4-4	3.8 E-04	3.70 E-07	3.66 E-07	1.60 E-06
Nickel			EPA AP Table 1.4-4	2.8 E-04	2.68 E-07	2.65 E-07	1.11 E-06
Naphthalene			EPA AP Table 1.4-2	3.30	0.00325	3.23 E-03	9.79 E-03
Phenanthrene			EPA AP Table 1.4-4	1.1 E-03	1.08 E-06	1.07 E-06	4.68 E-06
Propane			EPA AP Table 1.4-3	6.1 E-04	5.98 E-07	5.92 E-07	2.59 E-06
Pyrene			EPA AP Table 1.4-4	2.1 E-05	2.05 E-08	2.04 E-08	8.93 E-08
Selenium			EPA AP Table 1.4-4	2.5 E+00	2.50 E-03	2.48 E-03	1.11 E-02
Toluene			EPA AP Table 1.4-3	1.7 E-03	1.67 E-06	1.65 E-06	7.23 E-06
Vanadium			EPA AP Table 1.4-3	1.8 E+00	1.77 E-03	1.75 E-03	6.98 E-03
Zinc			EPA AP Table 1.4-3	5.0 E-05	4.90 E-08	4.86 E-08	2.13 E-07
			EPA AP Table 1.4-4	2.4 E-05	2.35 E-08	2.33 E-08	1.02 E-07
			EPA AP Table 1.4-3	3.4 E-05	3.33 E-08	3.30 E-08	1.45 E-07
			EPA AP Table 1.4-4	2.3 E-03	2.25 E-06	2.23 E-06	9.79 E-06
			EPA AP Table 1.4-4	2.9 E-05	2.84 E-08	2.81 E-08	1.23 E-07

Notes:

1. Emission factor for "Small Boilers" and "Uncontrolled".
2. Actual hours of operation of boiler (all year) = 365 days/year x 24 hours/day = 8,760 hours/year
3. Boiler used all year for domestic hot water.
4. Identifier 0934.

Abbreviations used:

- gal/hr Gallon/hr
- hr Hours
- yr Years
- lb Pounds of emissions
- tons Tons of emissions

Emissions ISU Boiler Equip 6/24/2004
934 1 of 1 @ 8:17PM
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Item #36: Boilers

Emission Estimates

Date: 01-Jul-04

Listed as item 036 on the "Campus Inventory" list.

Location: Holt Arena Building #60

[illegible]	Fuel	Maximum Equipment Capacity	[illegible]	Emission Factors from EPA 42: Reference Table	[illegible]	[illegible]	Intermediate estimates based on Emission Factors [illegible]	[illegible]
	Gas	Total of 2 boilers: Heat input: [illegible] Rating rate of 80% [illegible]	[illegible]		lb/10⁶ scf	lb/[illegible]	lb/hr	tons/yr
CO				EPA 42 Table 1.4-1	84	0.082	1.04 E-02	6.91 E-02
NO_x				EPA 42 Table 1.4-1	100	0.098	2.91 E-02	1.91 E-01
SO_2				EPA 42 Table 1.4-2	0.60	0.00059	1.39 E-04	9.09 E-04
PM10				EPA 42 Table 1.4-2	7.60	0.0075	1.76 E-03	7.79 E-03
PM				EPA 42 Table 1.4-2	7.60	0.0075	1.76 E-03	7.79 E-03
Pb				EPA 42 Table 1.4-3	0.0005	4.90 E-07	1.16 E-07	5.07 E-07
VOC				EPA 42 Table 1.4-2	5.50	0.054	1.27 E-02	5.57 E-02
TOC				EPA 42 Table 1.4-2	11.00	0.011	2.55 E-02	1.11 E-01
1-Methylnaphthalene				EPA 42 Table 1.4-3	2.4 E-08	2.35 E-09	5.56 E-09	2.43 E-08
2-Methylnaphthalene				EPA 42 Table 1.4-3	1.8 E-08	1.76 E-09	4.16 E-10	1.82 E-09
7,12-Dimethylbenz(a)anthracene				EPA 42 Table 1.4-3	1.6 E-08	1.57 E-09	3.70 E-09	1.62 E-08
Acenaphthene				EPA 42 Table 1.4-3	1.8 E-08	1.76 E-09	4.16 E-10	1.82 E-09
Acenaphthylene				EPA 42 Table 1.4-3	1.8 E-08	1.76 E-09	4.16 E-10	1.82 E-09
Anthracene				EPA 42 Table 1.4-3	2.4 E-08	2.35 E-09	5.56 E-10	2.43 E-09
Arsenic				EPA 42 Table 1.4-4	2.0 E-04	1.96 E-07	4.63 E-08	2.03 E-07
Barium				EPA 42 Table 1.4-4	4.4 E-03	4.31 E-06	1.02 E-06	4.46 E-06
Benz(a)anthracene				EPA 42 Table 1.4-3	1.8 E-08	1.76 E-09	4.16 E-10	1.82 E-09
Benzene				EPA 42 Table 1.4-3	2.1 E-03	2.06 E-06	4.86 E-07	2.13 E-06
Benzo(a)pyrene				EPA 42 Table 1.4-3	1.2 E-08	1.18 E-09	2.78 E-10	1.22 E-09
Benzo(b)fluoranthene				EPA 42 Table 1.4-3	1.8 E-08	1.76 E-09	4.16 E-10	1.82 E-09
Benzo(g,h,i)perylene				EPA 42 Table 1.4-3	1.2 E-08	1.18 E-09	2.78 E-10	1.22 E-09
Benzo(k)fluoranthene				EPA 42 Table 1.4-3	1.6 E-08	1.76 E-09	4.16 E-10	1.82 E-09
Beryllium				EPA 42 Table 1.4-4	1.2 E-05	1.18 E-08	2.78 E-09	1.22 E-08
Boron				EPA 42 Table 1.4-3	2.1 E+00	2.06 E-03	4.86 E-04	2.13 E-03
Cadmium				EPA 42 Table 1.4-4	1.1 E-03	1.08 E-06	2.55 E-07	1.11 E-06
Chromium				EPA 42 Table 1.4-4	1.4 E-03	1.37 E-06	3.24 E-07	1.42 E-06
Chrysene				EPA 42 Table 1.4-3	1.8 E-08	1.76 E-09	4.16 E-10	1.82 E-09
Cobalt				EPA 42 Table 1.4-4	8.4 E-05	8.24 E-08	1.94 E-08	8.51 E-08
Copper				EPA 42 Table 1.4-4	8.5 E-04	8.33 E-07	1.97 E-07	8.61 E-07
Dibenz(a,h)anthracene				EPA 42 Table 1.4-3	1.2 E-08	1.18 E-09	2.78 E-10	1.22 E-09
Dichlorobenzene				EPA 42 Table 1.4-3	1.2 E-03	1.18 E-06	2.78 E-07	1.22 E-06
Ethane				EPA 42 Table 1.4-3	3.1 E+00	3.04 E-03	7.17 E-04	3.14 E-03
Fluoranthene				EPA 42 Table 1.4-3	3.0 E-08	2.94 E-09	6.94 E-10	3.04 E-09
Fluorene				EPA 42 Table 1.4-3	2.8 E-08	2.75 E-09	6.48 E-10	2.84 E-09
Formaldehyde				EPA 42 Table 1.4-3	7.5 E-02	7.35 E-05	1.74 E-05	7.60 E-05
Hexane				EPA 42 Table 1.4-3	1.8 E+00	1.76 E-03	4.16 E-04	1.82 E-03
Indeno(1,2,3-cd)pyrene				EPA 42 Table 1.4-3	1.8 E-08	1.76 E-09	4.16 E-10	1.82 E-09
Manganese				EPA 42 Table 1.4-4	3.8 E-04	3.73 E-07	8.79 E-08	3.85 E-07
Mercury				EPA 42 Table 1.4-4	2.6 E-04	2.55 E-07	6.02 E-08	2.63 E-07
Methane				EPA 42 Table 1.4-2	2.30	0.00226	5.32 E-04	2.33 E-03
Molybdenum				EPA 42 Table 1.4-4	1.1 E-03	1.08 E-06	2.55 E-07	1.11 E-06
Naphthalene				EPA 42 Table 1.4-3	6.1 E-04	5.99 E-07	1.41 E-07	6.18 E-07
Nickel				EPA 42 Table 1.4-4	2.1 E-03	2.06 E-06	4.86 E-07	2.13 E-06
Pentane				EPA 42 Table 1.4-3	2.6 E+00	2.55 E-03	6.02 E-04	2.63 E-03
Phenanthrene				EPA 42 Table 1.4-3	1.7 E-08	1.67 E-09	3.93 E-10	1.72 E-09
Propane				EPA 42 Table 1.4-3	1.6 E+00	1.57 E-03	3.70 E-04	1.62 E-03
Pyrene				EPA 42 Table 1.4-3	5.0 E-08	4.90 E-09	1.16 E-09	5.07 E-09
Selenium				EPA 42 Table 1.4-4	2.4 E-05	2.35 E-08	5.56 E-09	2.43 E-08
Toluene				EPA 42 Table 1.4-3	3.4 E-03	3.33 E-06	7.87 E-07	3.44 E-06
Vanadium				EPA 42 Table 1.4-4	2.3 E-03	2.25 E-06	5.32 E-07	2.33 E-06
Zinc				EPA 42 Table 1.4-4	2.9 E-03	2.84 E-06	6.71 E-07	2.94 E-06

Notes:

1. Emission factors for "Small Boilers" and "Uncontrolled".
2. Potential hours of operation at boiler (annual) = [illegible] hours/year
3. Actual hours of operation of boilers (all year) = 365 days/year x 14 hours/day = 5,110 hours/year
4. Boilers used all year for domestic hot water.
5. Identifier [illegible].

Abbreviations used:

- [illegible] Million Btu
- hr Hours
- yr Years
- lb Pounds of emissions
- ton Tons of emissions

Emissions ISU Small Equip 6/24/2003
[illegible] 1 of 1 @2:57PM
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Item #37: Boiler #4 HP4

Emission Estimates

Date: 30-Dec-04

Fuel: Natural Gas

Computer Model Identifier: HP4

Location: Heat Plant - Building #38

Equipment Identification	Fuel	Maximum Equipment Capacity[2]		Emission Factors from EPA AP-42			Following estimates based on Emission Factors	
				Reference Table		calculated	calculated	calculated
Boiler 4	Gas	[illegible]	[illegible]					
CO				EPA AP-42 Table 1.4-1[1]	[illegible]	[illegible]	[illegible]	[illegible]
NO_x				EPA AP-42 Table 1.4-1[1]	[illegible]	[illegible]	[illegible]	[illegible]
SO_2				EPA AP-42 Table 1.4-2	0.00	[illegible]	[illegible]	[illegible]
PM10				EPA AP-42 Table 1.4-2	7.60	[illegible]	[illegible]	[illegible]
PM				EPA AP-42 Table 1.4-2	7.60	[illegible]	[illegible]	[illegible]
VOC				EPA AP-42 Table 1.4-2	[illegible]	[illegible]	[illegible]	[illegible]
TOC				EPA AP-42 Table 1.4-2	[illegible]	[illegible]	[illegible]	[illegible]
2-Methylnaphthalene				EPA AP-42 Table 1.4-3	[illegible]	[illegible]	[illegible]	[illegible]
3-Methylchloranthrene				EPA AP-42 Table 1.4-3	2.4 E-08	2.36 E-08	1.71 E-08	1.01 E-08
7,12-Dimethylbenz(a)anthracene				EPA AP-42 Table 1.4-3	1.6 E-08	1.70 E-08	1.20 E-07	4.21 E-07
Acenaphthene				EPA AP-42 Table 1.4-3	1.6 E-08	1.89 E-08	1.19 E-08	3.74 E-08
Acenaphthylene				EPA AP-42 Table 1.4-3	1.6 E-08	1.70 E-08	1.20 E-07	4.21 E-07
Anthracene				EPA AP-42 Table 1.4-3	1.6 E-08	1.70 E-08	1.20 E-07	4.21 E-07
Benzene				EPA AP-42 Table 1.4-3	2.4 E-08	2.36 E-08	1.71 E-07	5.01 E-07
Benzo(a)anthracene				EPA AP-42 Table 1.4-4	2.0 E-04	1.00 E-07	1.43 E-06	4.00 E-04
Benzo(b)fluoranthene				EPA AP-42 Table 1.4-4	4.4 E-08	4.31 E-08	3.14 E-04	1.00 E-08
Benzo(g,h,i)perylene				EPA AP-42 Table 1.4-3	1.6 E-08	1.70 E-08	1.20 E-07	4.21 E-07
Benzo(k)fluoranthene				EPA AP-42 Table 1.4-3	2.1 E-03	2.00 E-08	1.07 E-04	4.01 E-04
Chrysene				EPA AP-42 Table 1.4-3	1.2 E-08	1.19 E-08	8.57 E-09	2.01 E-07
Dibenz(a,h)anthracene				EPA AP-42 Table 1.4-3	1.6 E-08	1.70 E-08	1.20 E-07	4.21 E-07
Dibenzo(a,e)pyrene				EPA AP-42 Table 1.4-3	1.2 E-08	1.19 E-08	8.57 E-09	2.01 E-07
Dibenzo(a,h)pyrene				EPA AP-42 Table 1.4-3	1.6 E-08	1.70 E-08	1.20 E-07	4.21 E-07
Dibenzo(a,i)pyrene				EPA AP-42 Table 1.4-4	1.2 E-08	1.19 E-08	8.57 E-09	2.01 E-08
Fluoranthene				EPA AP-42 Table 1.4-3	3.1 E-08	2.00 E-08	1.00 E-01	4.04 E-01
Fluorene				EPA AP-42 Table 1.4-4	1.1 E-08	1.00 E-08	7.86 E-09	2.57 E-04
Indeno(1,2,3-cd)pyrene				EPA AP-42 Table 1.4-4	1.4 E-08	1.37 E-08	1.00 E-04	3.28 E-04
Naphthalene				EPA AP-42 Table 1.4-3	1.6 E-08	1.70 E-08	1.20 E-07	4.21 E-07
Phenanthrene				EPA AP-42 Table 1.4-4	8.4 E-08	8.24 E-08	6.00 E-08	1.97 E-08
Pyrene				EPA AP-42 Table 1.4-4	6.4 E-04	6.53 E-07	4.67 E-06	1.00 E-04
Benzene				EPA AP-42 Table 1.4-3	1.2 E-08	1.19 E-08	8.57 E-09	2.01 E-07
Toluene				EPA AP-42 Table 1.4-3	1.2 E-08	1.19 E-08	8.57 E-09	2.01 E-04
Ethylbenzene				EPA AP-42 Table 1.4-3	3.1 E-08	3.04 E-08	2.21 E-01	7.26 E-01
Formaldehyde				EPA AP-42 Table 1.4-3	3.0 E-08	2.94 E-08	2.14 E-07	7.02 E-07
Hexane				EPA AP-42 Table 1.4-3	2.8 E-08	2.78 E-08	2.02 E-07	6.63 E-07
Propanal				EPA AP-42 Table 1.4-3	7.6 E-08	7.38 E-08	5.36 E-08	1.76 E-08
Propane				EPA AP-42 Table 1.4-3	1.6 E-08	1.70 E-08	1.20 E-07	4.21 E-07
Propylene				EPA AP-42 Table 1.4-3	1.6 E-08	1.70 E-08	1.20 E-07	4.21 E-07
Toluene				EPA AP-42 Table 1.4-4	3.0 E-04	3.73 E-07	2.71 E-06	8.89 E-04
Xylene				EPA AP-42 Table 1.4-4	2.8 E-04	2.65 E-07	1.92 E-06	6.02 E-04
Arsenic				EPA AP-42 Table 1.4-2	2.20	0.00000	1.64 E-01	5.38 E-01
Barium				EPA AP-42 Table 1.4-4	1.1 E-08	1.00 E-08	7.86 E-04	2.57 E-04
Beryllium				EPA AP-42 Table 1.4-4	8.1 E-04	8.00 E-07	4.38 E-05	1.43 E-04
Cadmium				EPA AP-42 Table 1.4-4	2.1 E-08	2.06 E-08	1.50 E-04	4.91 E-04
Chromium				EPA AP-42 Table 1.4-3	2.0 E-08	2.00 E-08	1.49 E-01	6.02 E-01
Cobalt				EPA AP-42 Table 1.4-3	1.7 E-08	1.67 E-08	1.21 E-08	3.98 E-08
Copper				EPA AP-42 Table 1.4-3	1.6 E-08	1.57 E-08	1.14 E-01	3.74 E-01
Manganese				EPA AP-42 Table 1.4-3	8.0 E-08	4.88 E-08	2.57 E-07	1.17 E-06
Mercury				EPA AP-42 Table 1.4-4	2.4 E-08	2.36 E-08	1.71 E-08	5.61 E-08
Molybdenum				EPA AP-42 Table 1.4-3	3.4 E-08	3.33 E-08	2.43 E-04	7.98 E-04
Nickel				EPA AP-42 Table 1.4-4	2.3 E-08	2.25 E-08	1.64 E-04	5.38 E-04
Selenium				EPA AP-42 Table 1.4-4	2.6 E-08	2.54 E-08	2.07 E-03	6.79 E-03
Zinc								

Notes

1 Emission factor for "Small Boilers", "Controlled - Low NOx Burners".
2 Hours of operation of boiler (heating season: Sept 1 to May 31) = 273 days/year x 24 hours/day = [illegible]
3 Primary operating fuel = Natural Gas, and secondary (backup) fuel = #2 Oil
From boiler specifications: design heat input = 73.56 MMBtu/hr (gas), and 66.80 MMBtu/hr (oil)
4 Computer Model Identifier: [illegible]
5 Stack Parameters
6 Stack height (ft) = 30.00
7 Stack diameter (ft) = 5.00
8 Gas temperature (F) = 300
9 Gas flowrate (acfm) = 21,000
10 UTM X Coordinate (m) = 359,000
11 UTM Y Coordinate (m) = 4,705,000
12 Stack elevation (m) = 1,355.2

Abbreviations used:

lb Pounds of mass
MMBtu Million Btu
hr Hours
yr Years
lb Pounds of emissions
Mmy Tons of emissions

File name: HP4-Natural Gas
File name: Emissions IQU May2005
Print date: 05/06/05 1:30 PM
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APPENDIX B

Modeling Review

MEMORANDUM

DATE: August 22, 2005

TO: Carole Zundel, Air Quality Division

THROUGH: Kevin Schilling, Stationary Source Modeling Coordinator, Air Quality Division KS

FROM: Dustin Holloway, Modeling Analyst, Air Quality Division DH

PROJECT NUMBER: P-050306

SUBJECT: Modeling Review for the Idaho State University in Pocatello

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1. SUMMARY

Idaho State University (ISU) submitted facility-wide ambient air quality dispersion modeling in support of a permit to construct (PTC) for a 72.84 MMBtu/hr natural gas-fired heating boiler. The analysis includes predicted impacts from all sources at the facility for PM_{10}, NO_x, SO_2, CO, and lead. DEQ did not review the lead analysis because the facility-wide lead emissions rate is less than the applicable modeling thresholds identified in DEQ's air quality modeling guideline. The following table summarizes the key assumptions used in the analysis which should be considered when developing the permit.

Table 1.1 KEY ASSUMPTIONS USED IN MODELING ANALYSIS

Assumption	Explanation
The emergency generator G35 will operate for less than 12 hours per day during routine maintenance and testing.	This assumption was used to demonstrate that the impacts from this facility, when added to the applicable background concentrations, will not cause or significantly contribute to a violation of the PM_{10} NAAQS.

Based on the results of the applicant's and DEQ's analyses, DEQ has determined that the modeling analysis: 1) utilized appropriate methods and models; 2) was conducted using reasonably accurate or conservative model parameters and input data; 3) appropriately adhered to established DEQ guidelines for new source review dispersion modeling; 4) showed that predicted pollutant concentrations at all receptor locations, when appropriately combined with background concentrations, were below stated air quality standards; 5) showed that the increase in toxic air pollutant (TAP) concentrations are within the applicable allowable concentrations in IDAPA 58.01.01.585-586.

2. BACKGROUND INFORMATION

2.1 *Applicable Air Quality Impact Limits*

ISU is located in Pocatello, within the Portneuf Valley in Bannock County. "EPA determined that the Portneuf Valley nonattainment area has attained the National Ambient Air Quality Standards for particulate matter with an aerodynamic diameter of less than or equal to 10 microns by the attainment date of December 31, 1996, as required by the Clean Air Act" (Federal Register, Volume 67, No. 143, July 25, 2002). DEQ submitted the "Portneuf Valley PM-10 Nonattainment Area State Implementation Plan, Maintenance Plan, and Redesignation Request" to EPA on June 30, 2004. On May 20, 2005, EPA proposed the "Approval and Promulgation of Implementation Plans and Designation of Areas for Air Quality Planning Purposes: Portneuf Valley, Idaho, Area" (Federal Register, Volume 70, Number 97, May 20, 2005). However, the area remains designated as a nonattainment area until EPA approves the maintenance plan and proposed redesignation. The area is designated attainment or unclassifiable for all other criteria air pollutants. Table 2.1 provides significant contribution levels (SCL), national ambient air quality standards (NAAQS) for criteria pollutants, and allowable TAP increments. When ambient impacts from project-specific emissions exceed the SCL facility-wide modeling is necessary to demonstrate compliance with NAAQS.

Table 2.1 APPLICABLE REGULATORY LIMITS

Pollutant	Averaging Period	Significant Contribution Levels ($\mu g/m^3$)[a,b]	Regulatory Limit ($\mu g/m^3$)[c]	Modeled Value Used[d]
PM_{10}[e]	Annual	1	50[f]	Maximum 1st highest[g]
	24-hour	5	150[h]	Maximum 6th highest[i] Highest 2nd highest[j]
CO	8-hour	500	10,000[k]	Highest 2nd highest[g]
	1-hour	2000	40,000[k]	Highest 2nd highest[g]
SO_2	Annual	1	80[f]	Maximum 1st highest[g]
	24-hour	5	365[k]	Highest 2nd highest[g]
	3-hour	25	1,300[k]	Highest 2nd highest[g]
NO_2	Annual	1	100[f]	Maximum 1st highest[g]
Arsenic	Annual	N/A	2.3E-04	Maximum 1st highest[g]
Cadmium	Annual	N/A	5.6E-04	Maximum 1st highest[g]
Formaldehyde	Annual	N/A	7.7E-02	Maximum 1st highest[g]
Nickel	Annual	N/A	4.2E-03	Maximum 1st highest[g]

[a] IDAPA 58.01.01.006.91
[b] Micrograms per cubic meter
[c] IDAPA 58.01.01.577 for criteria pollutants, IDAPA 58.01.01.585 for non-carcinogenic toxic air pollutants IDAPA 58.01.01.586 for carcinogenic toxic air pollutants.
[d] The maximum 1st highest modeled value is always used for significant impact analysis and for all toxic air pollutants.
[e] Particulate matter with an aerodynamic diameter less than or equal to a nominal ten micrometers
[f] Never expected to be exceeded in any calendar year.
[g] Concentration at any modeled receptor.
[h] Never expected to be exceeded more than once in any calendar year.
[i] Concentration at any modeled receptor when using five years of meteorological data.
[j] The highest 2nd high is considered to be conservative for five years of meteorological data.
[k] Not to be exceeded more than once per year.

2.2 *Background Concentrations*

DEQ updated the background concentration data for Idaho in the Spring of 2003[1]. Representative background values used in this analysis were based on monitored values for Pocatello's PM_{10}, NO_x, and SO_2 concentrations and default values for urban CO. PM_{10} monitoring data prior to 2001 were not considered in the determination of background concentrations. These data were substantially impacted by emissions from the FMC facility which ceased operation in the year 2000. The applicant submitted an analysis for lead, however DEQ did not review it because the facility-wide lead emissions are below the applicable modeling thresholds. The following table summarizes the background concentrations used in the analysis.

Table 2.2 BACKGROUND CONCENTRATIONS

Pollutant	Averaging Period	Background concentrations ($\mu g/m^3$)[a]
PM10	24-hour	124
	Annual	28
CO	1-hour	15,600
	8-hour	5,200
SO_2	3-hour	280
	24-hour	94
	Annual	21
NO_2	Annual	32

[a] Micrograms per cubic meter.

[1] Hardy, Rick and Schilling, Kevin. *Background Concentrations for Use in New Source Review Dispersion Modeling*. Memorandum to Mary Anderson, March 14, 2003.

3. ASSESSMENT OF MODELING ANALYSIS

3.1 *Modeling Methodology*

ISU performed the ambient impact analysis using the ISCPRIME air quality dispersion model. The following table summarizes the parameters used in the model and DEQ's review and determination of those parameters.

Table 3.1 MODELING PARAMETERS

Parameter	What Facility Submitted	DEQ's Review/Determination
Modeling protocol	DEQ did not review a modeling protocol for this application.	Although no protocol was reviewed, the submitted analysis was performed in accordance with approved methods.
Model Selection	ISCPRIME	ISCPRIME is an appropriate model for this facility because receptors are located within building recirculation cavities.
Meteorological Data	1987-1991 Pocatello surface meteorological data and 1987-1991 Boise upper air meteorological data.	This is the most representative meteorological data available for this area.
Model Options	Regulatory default options were used.	Regulatory default options are appropriate for this facility.
Land Use	Rural	This facility is located within Pocatello city limits. However, the land use around this facility is primarily suburban land to the west and primarily undeveloped land to the east.
Terrain	Terrain effects were calculated.	Receptor elevations were included in the analysis and the model was run to calculated the effects of both simple and complex terrain.
Building Downwash	The PRIME algorithm was used to calculate building downwash.	The PRIME algorithm is appropriate for this analysis because it calculates the effects of both building wakes and recirculation cavities. Modeled receptors are located within building wakes and building recirculation cavities near this facility.
Receptor Network	100 meter course grid; 25 meter fine grid in the locations of the high concentrations.	This receptor network is sufficient to reasonably resolve the maximum concentrations.
Facility Layout	The facility layout included all buildings which could effect downwash. The stacks at this facility with horizontal releases or rain caps were modeled with an exit velocity of 0.001 m/s.	The facility layout was verified by comparing it to the submitted plot plan and aerial photographs of the area.

3.2 *Emission Rates*

The following table summarizes the emissions rates used in the modeling analysis.

Table 3.3 EMISSION RATES

Source ID	Source Description	CO (lb/hr)	NO_x (lb/hr)	SO_2 (lb/hr)	PM_{10} (lb/hr)	Lead (lb/hr)
HP1	Boiler #1	2.64E+00	3.14E+00	1.89E-02	2.39E-01	1.57E-05
HP2	Boiler #2	2.94E-01	3.26E+01	4.77E+01	1.28E-02	2.47E-04
HP3	Boiler #3	2.22E+00	1.32E+00	1.60E-02	2.01E-01	1.32E-05
HOLT1	Emergency Generator No. 1	2.01E+00	1.19E+00	3.17E-04	5.12E-03	2.64E-07
PYS1	Emergency Generator No. 2	1.31E+00	6.09E+00	4.00E-01	4.28E-01	6.76E-07
LFS1	Incinerator	2.00E-02	2.67E-01	7.24E-02	6.93E-02	2.43E-03
PUBSF1	Emergency Generator No. 3	3.29E+00	1.95E+00	5.20E-04	8.40E-03	4.33E-07
G35[a]	Emergency Generator No. 4	3.95E+00	1.83E+01	1.20E+00	1.29E+00	2.04E-06
B8	Boiler No. 8	6.89E-02	8.21E-02	4.92E-04	6.24E-03	4.10E-07
B9	Boiler No. 9	1.10E-01	1.31E-01	7.88E-04	9.98E-03	6.56E-07
B10	Boiler No. 10	6.20E-02	7.38E-02	4.43E-04	5.61E-03	3.69E-07
B11	Boiler No. 11	1.10E-01	1.31E-01	7.88E-04	9.98E-03	6.56E-07
B12	Boiler No. 12	2.21E-01	2.63E-01	1.58E-03	2.00E-02	1.31E-06
B13	Boiler No. 13	4.15E-01	4.94E-01	2.96E-03	3.76E-02	2.47E-06
B14	Boiler No. 14	2.36E-01	2.81E-01	1.69E-03	2.14E-02	1.41E-06
B15	Boiler No. 15	9.26E-02	1.10E-01	6.62E-04	8.38E-03	5.51E-07
B16	Boiler No. 16	9.50E-02	1.13E-01	6.78E-04	8.59E-03	5.65E-07
B17	Boiler No. 17	5.35E-02	6.37E-02	3.82E-04	4.84E-03	3.19E-07
B18	Boiler No. 18	4.90E-02	5.83E-02	3.50E-04	4.43E-03	2.92E-07
B19	Boiler No. 19	9.88E-03	1.18E-02	7.06E-05	8.94E-04	5.88E-08
B20	Boiler No. 20	1.24E-01	1.47E-01	8.82E-04	1.12E-02	7.35E-07
B21	Boiler No. 21	1.72E-02	2.05E-02	1.23E-04	1.56E-03	1.02E-07
B22	Boiler No. 22	4.18E-02	4.98E-02	2.99E-04	3.79E-03	2.49E-07
K23	Kiln K23	1.18E-03	1.40E-03	8.41E-06	1.07E-04	7.01E-09
K24	Kiln K24	8.24E-03	9.80E-03	5.88E-05	7.45E-04	4.90E-08
F25	Furnace F25	1.65E-02	1.96E-02	1.18E-04	1.49E-03	9.80E-08
F26	Melting Furnace F26	8.24E-03	9.80E-03	5.88E-05	7.45E-04	4.90E-08
B27	Boiler No. 27	7.21E-02	8.58E-02	5.15E-04	6.52E-03	4.29E-07
B28	Boiler No. 28	3.46E-02	4.12E-02	2.47E-04	3.13E-03	2.06E-07
B29	Boiler No. 29	3.29E-02	3.92E-02	2.35E-04	2.98E-03	1.96E-07
B30	Boiler No. 30	3.29E-02	3.92E-02	2.35E-04	2.98E-03	1.96E-07
B31	Boiler No. 31	1.39E-02	1.66E-02	9.94E-05	1.26E-03	8.28E-08
B32	Boiler No. 32	4.51E-02	5.37E-02	3.22E-04	4.08E-03	2.69E-07
B33	Boiler No. 33	4.08E-01	4.86E-01	2.92E-03	3.70E-02	2.43E-06
B34	Boiler No. 34	8.15E-02	9.71E-02	5.82E-04	7.38E-03	4.85E-07
B35	Boiler No. 35	1.94E-02	2.31E-02	1.39E-04	1.76E-03	1.16E-07
HP4	Boiler #4	6.00E+00	3.57E+00	4.28E-02	5.43E-01	3.57E-05

[a] Emissions from the generator G35 were assumed to only occur for 12 hours per day.

3.3 *Emission Release Parameters*

The following table summarizes the emission release parameters used in the modeling analysis.

Table 3.3 EMISSION RELEASE PARAMETERS

Source ID	Easting (m)	Northing (m)	Elevation (m)	Stack Height (ft)	Temperature (°F)	Exit Velocity (m/s)*	Stack Diameter (ft)
HP1	383074.0	4745868.0	1364.9	100.0	355.0	2.74	5.50
HP2	383074.0	4745868.0	1364.9	100.0	355.0	2.74	5.50
HP3	383059.0	4745893.0	1365.2	39.0	450.0	2.90	3.00
HOLT1	383443.0	4747165.0	1389.9	4.9	710.3	20.97	0.33
PYS1	382818.1	4746373.5	1369.6	63.0	975.0	50.29	0.67
LFS1	383250.0	4746870.0	1384.1	23.3	1550.0	7.00	1.00
PUBSF1	382980.0	4745852.0	1364.0	4.0	1250.0	48.80	0.30
G35	383990.2	4746180.5	1427.1	3.9	1004.0	34.74	0.32
B8	383029.0	4746085.0	1372.1	36.0	300.0	0.001	1.00
B9	383339.0	4746566.0	1385.9	46.0	450.0	0.001	1.00
B10	383308.0	4746740.0	1385.8	73.0	300.0	0.001	1.00
B11	383301.0	4746783.0	1385.7	73.0	300.0	0.001	1.00
B12	383250.0	4746866.0	1384.1	25.0	300.0	0.001	1.00
B13	383436.0	4747223.0	1389.9	48.0	300.0	0.001	2.00
B14	383313.0	4747108.0	1389.8	48.0	300.0	0.001	2.00
B15	383158.0	4746325.0	1386.5	35.0	450.0	0.001	2.00
B16	382810.0	4746387.0	1369.3	74.0	450.0	0.001	0.75
B17	382689.0	4745572.0	1357.9	33.0	450.0	0.001	1.50
B18	382117.0	4746092.0	1357.2	24.6	450.0	0.001	1.00
B19	382666.3	4746535.0	1366.0	24.6	450.0	0.001	0.66
B20	383164.1	4746729.0	1380.5	50.0	450.0	0.001	2.00
B21	382711.0	4746609.0	1366.1	29.0	300.0	0.001	0.83
B22	382711.0	4746610.0	1366.1	29.0	450.0	0.001	0.83
K23	383217.0	4746615.0	1381.9	16.0	300.0	0.001	0.75
K24	383042.0	4745832.0	1364.0	19.0	300.0	0.001	1.50
F25	383046.0	4745828.0	1364.0	22.0	300.0	0.001	1.50
F26	383049.0	4745831.0	1364.1	18.0	300.0	0.001	1.66
B27	382595.0	4746224.0	1364.5	22.0	450.0	0.001	1.00
B28	382526.6	4746289.0	1363.7	22.0	450.0	0.001	1.00
B29	383445.0	4745966.0	1413.0	37.0	450.0	0.001	1.00
B30	383493.0	4745945.0	1414.4	37.0	450.0	0.001	1.00
B31	383142.0	4746668.0	1379.4	50.0	300.0	0.001	0.83
B32	383161.4	4746727.0	1380.5	50.0	300.0	0.001	2.00
B33	383989.6	4746182.5	1424.8	40.0	300.0	0.001	1.25
B34	383991.4	4746181.5	1424.4	40.0	300.0	0.001	1.25
B35	383435.0	4747106.0	1389.8	48.0	300.0	0.001	2.00
HP4	383056.0	4745897.0	1365.2	39.0	323.0	5.43	5.00

* Stacks with an exit velocity of 0.001 m/s have horizontal releases or rain caps.

3.4 Results

3.4.1 Significant Impact Analysis Results

The impacts from the boiler were analyzed to determine if they exceed the SCLs. The results of the analysis demonstrate that the emissions from the boiler exceed the applicable SCLs. Therefore, facility-wide modeling must be conducted to determine if the facility meets the applicable NAAQS. The following table summarizes the results of the significant impact analysis.

Table 3.4 SIGNIFICANT IMPACT ANALYSIS RESULTS

Pollutant	Averaging Period	Concentration (µg/m3)	SIL (µg/m3)	Exceeds SIL (Y/N)
PM_{10}	24-hr	11.5	5	Y
	Annual	2.2	1	Y

3.4.2 Full Impact Analysis Results

The results of the impact analysis demonstrate, to DEQ's satisfaction, that the ISU facility will not cause or significantly contribute to a violation of any ambient air quality standards. DEQ reviewed the PM_{10} impacts from this facility and determined that the addition of the natural gas-fired boiler will cause a significant increase in 24-hour PM_{10} impacts. However, DEQ reviewed the facility-wide PM_{10} impacts and determined that the facility will not cause or significantly contribute to a violation of the PM_{10} NAAQS. The following supports DEQ's finding:

1) The Portneuf Valley was determined to have attained the NAAQS for PM_{10} by December 31, 1996.

2) EPA has proposed the "Approval and Promulgation of Implementation Plans and Designation of Areas for Air Quality Planning Purposes: Portneuf Valley, Idaho, Area" (Federal Register, Volume 70, Number 97, May 20, 2005).

Ambient air monitoring data indicate an appropriate PM_{10} background concentration of 124 $\mu g/m^3$ for a 24-hour averaging period. Based on the above information DEQ determined that the facility's impact, when added to the background concentration, remains below the NAAQS for PM_{10}. The emissions of all other criteria pollutants, when added to their applicable background concentrations, do not exceed their applicable NAAQS. The following table summarizes the results of the criteria pollutant impact analysis.

Table 3.5 CRITERIA POLLUTANT IMPACT ANALYSIS RESULTS

Pollutant	Averaging Period	Concentration ($\mu g/m^3$)	Background Concentration ($\mu g/m^3$)	Total Concentration (µg/m3)	NAAQS (µg/m3)	Percent of NAAQS
PM_{10}	24-hr	17.9	124	141.9	150	94.6%
PM_{10}	Annual	3.4	28	31.4	50	62.8%
CO	1-hr	526.0	13,800	14,326.0	40,000	35.8%
CO	8-hr	285.2	4,600	4,885.2	10,000	48.9%
NO_2	Annual	65.2	32	97.2	100	97.2%
SO_2	3-hr	597.5	280	877.5	1,300	67.5%
SO_2	24-hr	211.3	94	305.3	365	83.7%
SO_2	Annual	43.9	21	64.9	80	81.1%

3.4.3 *Toxic Air Pollutants Results*

Table 3.6 summarizes the results of the TAP impact analysis. The results of the analysis demonstrate, to DEQ's satisfaction, that the emissions from the new natural gas-fired boiler will not cause an increase in TAP concentrations which exceed the allowable increments in IDAPA 58.01.01.585-586.

Table 3.6 TOXIC POLLUTANT RESULTS

Pollutant	Averaging Period	Modeled Concentration ($\mu g/m^3$)	AACC ($\mu g/m^3$)	Percent of AACC
Arsenic	Annual	0.00006	2.30E-04	26.1%
Cadmium	Annual	0.00032	5.60E-04	57.1%
Formaldehyde	Annual	0.02190	7.70E-02	28.4%
Nickel	Annual	0.00061	4.20E-03	14.5%

APPENDIX C

AIRS Form

AIRS/AFS[a] FACILITY-WIDE CLASSIFICATION[b] DATA ENTRY FORM

Facility Name: Idaho State University
Facility Location: Pocatello
AIRS Number: 005-00029

AIR PROGRAM POLLUTANT	SIP	PSD	NSPS (Part 60)	NESHAP (Part 61)	MACT (Part 63)	SM80	TITLE V	AREA CLASSIFICATION A-Attainment U-Unclassified N- Nonattainment
SO_2	SM					Y		U
NO_x	SM		Dc			Y		U
CO	B							U
PM_{10}	B							A
PT (Particulate)	SM							U
VOC	B							U
THAP (Total HAPs)	B							U
			APPLICABLE SUBPART					
			Dc					

[a] Aerometric Information Retrieval System (AIRS) Facility Subsystem (AFS)

[b] AIRS/AFS Classification Codes:

A = Actual or potential emissions of a pollutant are above the applicable major source threshold. For HAPs only, class "A" is applied to each pollutant which is at or above the 10 T/yr threshold, or each pollutant that is below the 10 T/yr threshold, but contributes to a plant total in excess of 25 T/yr of all HAPs.

SM = Potential emissions fall below applicable major source thresholds if and only if the source complies with federally enforceable regulations or limitations.

B = Actual and potential emissions below all applicable major source thresholds.

C = Class is unknown.

ND = Major source thresholds are not defined (e.g., radionuclides).