

# **2007 Cogeneration Facility Annual Air Emissions Inventory**

**Cogeneration Facility  
University of North Carolina at Chapel Hill  
Chapel Hill, North Carolina**

**Facility ID # 6800043  
Permit # 03069T20**

*Prepared for:*

**University of North Carolina at Chapel Hill**  
Cogeneration Systems  
501 Cameron Avenue, CB# 1855  
Chapel Hill, North Carolina 27599-1855

*Prepared by:*

**RST Engineering**  
5416 Orchard Oriole Trail  
Wake Forest, North Carolina 27587-6770

**March 2008**

# **2007 Cogeneration Facility Annual Air Emissions Inventory**

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# University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

*Orange County*

Facility ID # 6800043

Permit # 03069T20

## 2007 Annual Emissions Inventory

### Supporting Documentation

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##### Supporting Documentation

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Coal Usage

##### Emissions Calculations

<u>ES ID</u>	<u>Source/Operating Scenario Description</u>
ES-010	Enclosed Railcar Dump Pits
ES-1, ES-2	Coal Storage Silos
ES-3.1 - ES-3.5	Silo Conveyors
T-001	Fuel Oil Storage Tank
T-002	Fuel Oil Storage Tank
ES-001	Boiler #6 <ul style="list-style-type: none"><li>- No. 2 Fuel Oil Firing</li><li>- Coal Firing</li><li>- Natural Gas Firing</li><li>- No. 6 Fuel Oil Firing</li></ul>
ES-002	Boiler #7 <ul style="list-style-type: none"><li>- No. 2 Fuel Oil Firing</li><li>- Coal Firing</li><li>- Natural Gas Firing</li><li>- No. 6 Fuel Oil Firing</li></ul>
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ES-007	Cogeneration - 2,000 kW Generator #1
ES-008	Cogeneration - 2,000 kW Generator #2
ES-009	Cogeneration - 2,000 kW Generator #3
ES-010A	Coal Crusher/Conveyor Building
ES-030	Ash Silo with Loadout
ES-030A	Wet Ash Loadout
IS-53	Enclosed Sorbent Railcar Dump Pit

Facility Total CY 2007 Emissions Summary

Facility ID #: 6800043

Permit #(s): 03069T20

Facility Name: University of North Carolina at Chapel Hill

North Carolina Department of Environment and Natural Resources  
 Division of Air Quality  
 Air Pollutant Point Source Emissions Inventory - Calendar Year 2007

Record Facility-Wide Totals Below From all Permitted and Non-Permitted Air Pollutant Emission Sources

<i>Criteria Pollutants</i>	ID #'s of Contributing Sources	Actual Emissions (Tons/Year)*	
			CY 2007
<b>Carbon Monoxide (CO)</b> (Reporting required, but no fees based on CO)	<b>Boiler 6,7,8, 2-Generators</b>		<b>925.5</b>
<b>Oxides of Nitrogen (NOx)</b> (Report as tons of NO <sub>2</sub> equivalent)	<b>Boiler 6,7,8, 2-Generators</b>		<b>417.5</b>
<b>PM/TSP - Particulate Matter</b> (Total - not used for emission fees)	<b>Boiler 6,7,8 &amp; Coal and Ash Handling &amp; 2-Generators</b>		<b>6.4</b>
<b>PM-10</b> Particulate Matter with mean aerodynamic particle size less than 10 micrometers. Include all condensibles, including Sulfur Trioxide and Sulfuric Acid as PM-10	<b>Boiler 6,7,8 &amp; Coal and Ash Handling &amp; 2-Generators</b>		<b>6.4</b>
<b>PM-2.5</b> Particulate Matter with mean aerodynamic particle size less than 2.5 micrometers. This pollutant includes all condensibles using best information available.	<b>Boiler 6,7,8 &amp; Coal and Ash Handling &amp; 2-Generators</b>		<b>5.2</b>
<b>Sulfur Dioxide (SO<sub>2</sub>)</b> Do not include Sulfur Trioxide and Sulfuric Acid	<b>Boiler 6,7,8, 2-Generators</b>		<b>228.8</b>
<b>VOC</b> Volatile Organic Compounds - See instructions for Federal definition excluding some non-photochemically reactive organics	<b>Boiler 6,7,8, 2-Generators</b>		<b>3.7</b>

<i>Greenhouse Gases</i>	ID #'s of Contributing Sources	Actual Emissions (Tons/Year)*	
			CY 2007
<b>Carbon Dioxide (CO<sub>2</sub>)</b> (Reporting required, but no fees based on CO <sub>2</sub> )	<b>Boiler 6,7,8, 2-Generators</b>		<b>301,851.0</b>
<b>Methane (MeOH)</b> (Reporting required, but no fees based on MeOH)	<b>Boiler 6,7,8, 2-Generators</b>		<b>3.4</b>
<b>Nitrous Oxide (N<sub>2</sub>O)</b> (Reporting required, but no fees based on CO <sub>2</sub> )	<b>Boiler 6,7,8, 2-Generators</b>		<b>177.6</b>

**On Next Page: Enter, in Alphabetical Order, All HAPs/TAPs Required by Instructions**

(Sum Source Emissions From Emission Source / Operating Scenario Forms)

**Information on this form cannot be held confidential.**

Facility Name: University of North Carolina at Chapel Hill

North Carolina Department of Environment and Natural Resources

Division of Air Quality

Air Pollutant Point Source Emissions Inventory - Calendar Year 2007

Hazardous Air Pollutants (HAPs) and/or Toxic Air Pollutants (TAPs)	CAS Number or Symbol (see instructions)	ID Numbers of Contributing Sources	Actual Emissions (Pounds/Year)*	
				CY 2007
2,3,7,8-TCDD		Boilers 6,7,8		0.000001
2,4-Dinitrotoluene	121-14-2	Boilers 6,7,8		0.03
2-Chloroacetophenone	532-27-4	Boilers 6,7,8		0.71
Acetaldehyde	75-07-0	Boilers 6,7,8		57.93
Acetophenone	98-86-2	Boilers 6,7,8		1.52
Acrolein	107-02-8	Boilers 6,7,8		29.44
Arsenic	ARSENICCPDS	Boilers 6,7,8		1.09
Benzene	71-43-2	Boilers 6,7,8		137.90
Benzo(a)pyrene	50-32-8	Boilers 6,7,8		0.004
Benzyl Chloride	100-44-7	Boilers 6,7,8		70.92
Beryllium	BERYLCPDS	Boilers 6,7,8		48.27
Biphenyl	92-52-4	Boilers 6,7,8		0.17
Bis(2-ethylhexyl)phthalate (DEHP)		Boilers 6,7,8		7.40
Bromine	7726-95-6	Boilers 6,7,8		21.05
Bromoform	75-25-2	Boilers 6,7,8		3.95
Cadmium	CADMIUMCPDS	Boilers 6,7,8		0.32
Carbon Disulfide	75-15-0	Boilers 6,7,8		13.17
Chlorobenzene	108-90-7	Boilers 6,7,8		2.23
Chloroform	67-66-3	Boilers 6,7,8		5.98
Chromium	CROMCPDS	Boilers 6,7,8		2.01
Chromium VI	CHROM6CPDS	Boilers 6,7,8		2.01
Cobalt	COBALTCPDS	Boilers 6,7,8		0.00
Cumene	98-82-8	Boilers 6,7,8		0.54
Cyanide	CNC	Boilers 6,7,8		253
Dibenzofurans	132-64-9	Boilers 6,7,8		0.02
Dichlorobenzene	106-46-7	Boilers 6,7,8		0.30
Dimethyl Sulfate	77-78-1	Boilers 6,7,8		4.86
Ethyl Benzene	100-41-4	Boilers 6,7,8		9.52
Ethyl Chloride	75-00-3	Boilers 6,7,8		4.26
Ethylene Dibromide	106-93-4	Boilers 6,7,8		0.12
Ethylene Dichloride	107-06-2	Boilers 6,7,8		4.05

Inventory Report Prepared by RST Engineering, PLLC - S.G. "Butch" Smith, P.E.  
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Facility Total CY 2007 Emissions Summary

Facility ID #: 6800043

Permit #(s): 03069T20

Facility Name: University of North Carolina at Chapel Hill

North Carolina Department of Environment and Natural Resources

Division of Air Quality

Air Pollutant Point Source Emissions Inventory - Calendar Year 2007

Hazardous Air Pollutants (HAPs) and/or Toxic Air Pollutants (TAPs)	CAS Number or Symbol (see instructions)	ID Numbers of Contributing Sources	Actual Emissions (Pounds/Year)*	
				CY 2007
Fluoride	16984-48-8	Boilers 6,7,8		0.00
Formaldehyde	50-00-0	Boilers 6,7,8		43.85
Hexane	110-54-3	Boilers 6,7,8		461.84
Hydrogen Chloride	7647-01-0	Boilers 6,7,8		87,924.5
Hydrogen Fluoride	7664-39-3	Boilers 6,7,8		4,457.7
Isophorone	78-59-1	Boilers 6,7,8		58.76
Lead	LEADCPDS	Boilers 6,7,8		0.80
Manganese	MANGCPDS	Boilers 6,7,8		2.97
Mercury	MERCCPDS	Boilers 6,7,8		3.84
Methyl Chloride	74-87-3	Boilers 6,7,8		53.69
Methyl Ethyl Ketone	78-93-3	Boilers 6,7,8		39.51
Methyl Bromide	74-83-9	Boilers 6,7,8		16.21
Methyl Chloroform	71-55-6	Boilers 6,7,8		0.00
Methyl Hydrazine	60-34-4	Boilers 6,7,8		17.22
Methyl Methacrylate	80-62-6	Boilers 6,7,8		2.03
Methyl Tert Butyl Ether	1634-04-4	Boilers 6,7,8		3.55
Methylene Chloride	75-09-2	Boilers 6,7,8		29.38
Napthalene	91-20-3	Boilers 6,7,8		2.42
Nickel	NICKCPDS	Boilers 6,7,8		1.90
Phenol	108-95-2	Boilers 6,7,8		1.62
POM	POM	Boilers 6,7,8		5.92
Propionaldehyde	123-38-6	Boilers 6,7,8		38.50
Selenium	SEC	Boilers 6,7,8		0.00E+00
Styrene	100-42-5	Boilers 6,7,8		2.53
Tetrachloroethane	79-34-5	Boilers 6,7,8		4.36
Toluene	108-88-3	Boilers 6,7,8		27.23
Vinyl Acetate	108-05-4	Boilers 6,7,8		0.77
Xylenes	1330-20-7	Boilers 6,7,8		5.16

Inventory Report Prepared by RST Engineering, PLLC - S.G. "Butch" Smith, P.E.

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# **University of North Carolina at Chapel Hill**

Chapel Hill, North Carolina

*Orange County*

Facility ID # 6800043

Permit # 03069T20

## **2007 Annual Emissions Inventory**

### **Facility Summary of Sources**

# University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

Orange County

Facility ID# 6800043

Permit # 03069T20

## 2007 Annual Emissions Inventory

### *Insignificant Activities*

Enclosed Sorbent Railcar Dump Pit

### *Emission Sources*

<b>Source</b>	<b>Source ID #</b>	<b>Control Device #</b>	<b>Control Device</b>
Boiler #6	ES-001-Boiler #6	CD-004	Bagfilter w/ CaCO <sub>3</sub> Injection
Boiler #7	ES-002-Boiler #7	CD-005	Bagfilter w/ CaCO <sub>3</sub> Injection
Boiler #8	ES-003-Boiler #8		
2,000 kW Generator	ES-007		
2,000 kW Generator	ES-008		
2,000 kW Generator*	ES-009		
Three Enclosed Railcar Dump Pits	ES-010	CD-018	Wet Spray
One Coal Silo	ES-1	CD-011	Bagfilter
One Coal Silo	ES-2	CD-012	Bagfilter
Five Silo Feed Conveyors	ES-3	CD-019	Bagfilter
Coal Crusher Building	ES-010A	CD-013	Bagfilter
Ash Silo w/ Loadout	ES-030	CD-031	Bagfilter
Wet Ash Loadout	ES-030A	CD-032	Water Injection
Fuel Oil Storage Tanks	T-001, 002		

*\*Not installed.*



# **University of North Carolina at Chapel Hill**

Chapel Hill, North Carolina

*Orange County*

Facility ID # 6800043

Permit # 03069T20

## **2007 Annual Emissions Inventory**

### **Fuel Use Summary**

# University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

Orange County

Facility ID # 6800043

Permit # 03069T20

## 2007 Annual Emissions Inventory

### Seasonal Fuel Usage Breakdown

Month	Boiler #6			Boiler #7			Boiler #8	
	Coal (tons)	Gas (1,000cf)	Oil (gallons)	Coal (tons)	Gas (1,000cf)	Oil (gallons)	Gas (1,000cf)	Oil (gallons)
December 2007	6,359	156	0	6,090	144	0	0	0
January 2007	5,826	190	0	5,528	90	0	6,901	0
February 2007	5,488	20	0	5,603	20	0	19,870	0
<i>1st Quarter Total</i>	<i>17,673</i>	<i>366</i>	<i>0</i>	<i>17,221</i>	<i>254</i>	<i>0</i>	<i>26,771</i>	<i>0</i>
March 2007	4,445	180	0	3,908	241	0	0	0
April 2007	5,060	400	0	1,212	1,877	0	6,159	0
May 2007	2,758	11	0	2,846	79	0	30	0
<i>2nd Quarter Total</i>	<i>12,264</i>	<i>591</i>	<i>0</i>	<i>7,966</i>	<i>2,197</i>	<i>0</i>	<i>6,189</i>	<i>0</i>
June 2007	3,559	40	0	2,536	270	0	0	0
July 2007	4,765	359	0	4,544	142	0	0	0
August 2007	6,482	10,611	0	6,624	10,128	0	1,673	0
<i>3rd Quarter Total</i>	<i>14,805</i>	<i>11,011</i>	<i>0</i>	<i>13,704</i>	<i>10,540</i>	<i>0</i>	<i>1,673</i>	<i>0</i>
September 2007	1,290	20,632	0	2,291	39,613	0	17,860	0
October 2007	1,236	16,257	0	3,133	43,719	0	23,021	0
November 2007	4,064	8,718	0	5,665	8,641	0	14,757	0
<i>4th Quarter Total</i>	<i>6,590</i>	<i>45,607</i>	<i>0</i>	<i>11,089</i>	<i>91,973</i>	<i>0</i>	<i>55,638</i>	<i>0</i>
<b>2007 TOTAL</b>	<b>51,331</b>	<b>57,575</b>	<b>0</b>	<b>49,980</b>	<b>104,963</b>	<b>0</b>	<b>90,271</b>	<b>0</b>

### Seasonal Btu Breakdown

Coal (btu/lb)	12,669	Natural Gas (btu/ft <sup>3</sup> )	1,030	Fuel Oil (btu/gal)	137,006
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Month	Boiler #6			Boiler #7			Boiler #8	
	Coal	Gas	Oil	Coal	Gas	Oil	Gas	Oil
December 2007	1.61E+11	1.61E+08	0	1.54E+11	1.48E+08	0	0.00E+00	0
January 2007	1.48E+11	195700000	0	1.40E+11	9.27E+07	0	7.11E+09	0
February 2007	1.39E+11	2.06E+07	0	1.42E+11	2.06E+07	0	2.05E+10	0
<i>1st Quarter Total</i>	<i>4.48E+11</i>	<i>3.77E+08</i>	<i>0</i>	<i>4.36E+11</i>	<i>2.62E+08</i>	<i>0</i>	<i>2.76E+10</i>	<i>0</i>
March 2007	1.13E+11	1.86E+08	0	9.90E+10	2.48E+08	0	0	0
April 2007	1.28E+11	4.12E+08	0	3.07E+10	1.93E+09	0	6.34E+09	0
May 2007	6.99E+10	1.13E+07	0	7.21E+10	8.14E+07	0	30900000	0
<i>2nd Quarter Total</i>	<i>3.11E+11</i>	<i>6.09E+08</i>	<i>0</i>	<i>2.02E+11</i>	<i>2.26E+09</i>	<i>0</i>	<i>6.37E+09</i>	<i>0</i>
June 2007	9.02E+10	4.12E+07	0	6.42E+10	2.78E+08	0	0.00E+00	0
July 2007	1.21E+11	3.70E+08	0	1.15E+11	1.46E+08	0	0.00E+00	0
August 2007	1.64E+11	1.09E+10	0	1.68E+11	10432252000	0	1.72E+09	0
<i>3rd Quarter Total</i>	<i>3.75E+11</i>	<i>1.13E+10</i>	<i>0</i>	<i>3.47E+11</i>	<i>1.09E+10</i>	<i>0</i>	<i>1.72E+09</i>	<i>0</i>
September 2007	3.27E+10	2.13E+10	0.00E+00	5.81E+10	40801184000	0.00E+00	18395285000	0
October 2007	3.13E+10	1.67E+10	0	7.94E+10	4.50E+10	0	2.37E+10	0
November 2007	1.03E+11	8.98E+09	0	1.44E+11	8.90E+09	0	1.52E+10	0.00E+00
<i>4th Quarter Total</i>	<i>1.67E+11</i>	<i>4.70E+10</i>	<i>0.00E+00</i>	<i>2.81E+11</i>	<i>9.47E+10</i>	<i>0.00E+00</i>	<i>5.73E+10</i>	<i>0.00E+00</i>
<b>2007 TOTAL</b>	<b>1.30E+12</b>	<b>5.93E+10</b>	<b>0.00E+00</b>	<b>1.27E+12</b>	<b>1.08E+11</b>	<b>0.00E+00</b>	<b>9.30E+10</b>	<b>0.00E+00</b>

### Seasonal Total Fuel Usage (%)

	Boiler #6	Boiler #7	Boiler #8
Dec., Jan., Feb.	32.96	31.77	29.66
Mar., Apr., May	22.89	14.85	7
June, July, Aug.	28.42	26.05	1.85
Sept., Oct., Nov.	15.73	27.33	61.63
	100	100	100

# University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

Orange County

Facility ID # 6800043

Permit # 03069T20

## 2007 Annual Emissions Inventory

### Coal Usage Breakdown

Month	Boiler #6 Coal (tons)	Boiler #7 Coal (tons)
December 2007	6,359	6,090
January 2007	5,826	5,528
February 2007	5,488	5,603
<i>1st Quarter Total</i>	<b>17,673</b>	<b>17,221</b>
March 2007	4,445	3,908
April 2007	5,060	1,212
May 2007	2,758	2,846
<i>2nd Quarter Total</i>	<b>12,264</b>	<b>7,966</b>
June 2007	3,559	2,536
July 2007	4,765	4,544
August 2007	6,482	6,624
<i>3rd Quarter Total</i>	<b>14,805</b>	<b>13,704</b>
September 2007	1,290	2,291
October 2007	1,236	3,133
November 2007	4,064	5,665
<i>4th Quarter Total</i>	<b>6,590</b>	<b>11,089</b>
<b>2007 TOTAL</b>	<b>51,331</b>	<b>49,980</b>

**Facility-Wide Coal Usage                      101,311                      Tons/year**

### Seasonal Coal Usage (%)

	Boiler #6	Boiler #7	Average (%)
<b>Dec., Jan., Feb.</b>	34.43%	34.46%	34.44%
<b>Mar., Apr., May</b>	23.89%	15.94%	19.91%
<b>June, July, Aug.</b>	28.84%	27.42%	28.13%
<b>Sept., Oct., Nov.</b>	12.84%	22.19%	17.51%
	100%	100%	100%

# University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

Orange County

Facility ID # 6800043

Permit # 03069T20

## 2007 Annual Emissions Inventory

### Blackstart Generator Fuel Usage Breakdown

Month	DG1 & DG2 #2 Oil (gallons)
December 2007	696
January 2007	0
February 2007	0
<i>1st Quarter Total</i>	<b>696</b>
March 2007	1,151
April 2007	4
May 2007	446
<i>2nd Quarter Total</i>	<b>1,601</b>
June 2007	585
July 2007	7,194
August 2007	42,544
<i>3rd Quarter Total</i>	<b>50,324</b>
September 2007	481
October 2007	101
November 2007	87
<i>4th Quarter Total</i>	<b>669</b>
<b>2007 TOTAL</b>	<b>53,289</b>

### Seasonal Oil Usage (%)

	DG1 & DG2
<b>Dec., Jan., Feb.</b>	1.31%
<b>Mar., Apr., May</b>	3.00%
<b>June, July, Aug.</b>	94.44%
<b>Sept., Oct., Nov.</b>	1.25%
	100%

**University of North Carolina at Chapel Hill**

Chapel Hill, North Carolina

*Orange County*

Facility ID # 6800043

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**2007 Annual Emissions Inventory**

**Supporting Documentation**

**Facility Summary Forms**

**University of North Carolina at Chapel Hill**

Chapel Hill, North Carolina

*Orange County*

Facility ID # 6800043

Permit # 03069T20

**2007 Annual Emissions Inventory**

**Three Enclosed Railcar Dump Pits  
(ES-010)**

<b>Emission Source/Operating Scenario Data</b> Page 1 of 2		Facility ID #: <b>6800043</b>					
<b>Railcar Dump Pits</b> <small>If Emission Source has multiple Operating Scenarios, complete one form for each. (All permitted, Insignificant and/or Non-permitted Sources)</small>		Permit #: <b>03069T20</b>					
Facility Name: <u>University of North Carolina at Chapel Hill</u>		County: <b>Orange</b>					
		DAQ Region: <b>Raleigh</b>					
<b>North Carolina Department of Environment and Natural Resources</b> <b>Division of Air Quality</b> <b>Air Pollutant Point Source Emissions Inventory - Calendar Year 2007</b>							
1. Emission Source ID No. (same as in permit - Use "U" prefix for non-permitted and "I" for insignificant)			<b>ES-010</b>				
2. Emission Source Description		<b>Three Enclosed Railcar Dump Pits</b>					
3. Operating Scenario Description		<b>N/A</b>					
4. Maximum Permitted Operating Rate <small>With Units (Ex. gal/hr, mmBtu/hr)</small>		<b>350 tons/hr</b>					
5. Throughput in CY (e.g. production or fuel use) <small>With Units (Ex. lbs/yr, gal/yr)</small>		<b>101,311</b>	<b>tons/yr</b>				
6. Fuel Information (if fuel used)	% Sulfur	<b>N/A</b>	% Ash <b>N/A</b> Heat Content (Btu/lb or mmCF) <b>N/A</b>				
If you do not provide annual throughput/fuel use, your inventory will be deemed incomplete and returned to you.							
7. Capture Efficiency (% Emissions from Emission Source Vented to Control Device or Stack)			<b>N/A</b>				
8. Control Device Information, if none, write "none"							
	<b>Control Device ID #</b> <small>(as listed in permit)</small>	<b>Control Device Description</b>					
i. (nearest stack)	<b>N/A</b>	<b>Enclosed Dump Pits</b>					
ii.	<b>CD-018</b>	<b>Wet Spray Dust Suppression System</b>					
iii.	<b>N/A</b>	<b>N/A</b>					
iv.	<b>N/A</b>	<b>N/A</b>					
9. Stack Information (sources vented to more than one stack use additional entry lines)							
Stack ID #	Height <small>(in whole feet)</small>	Diameter (feet) <small>Circle (enter #), Rectangle (L#, W#) (in 0.1 feet)</small>	Temperature <small>(F)</small>	Velocity <small>(feet/sec)</small>	Volume Flow Rate <small>(acfm)</small>	Release Point Description <small>(Fugitive, Vertical, Vertical w/ cap, Horizontal, Downward - see instructions)</small>	
<b>Fugitive</b>							
--	--	--	--	--	--	--	
--	--	--	--	--	--	--	
10. Operating Schedule (Source/Operating Scenario that best characterizes calendar year)							
Hours/Day	<b>1.5</b>	Days/Week	<b>5</b>	Weeks/Year	<b>52</b>	Hours/Year	<b>390</b>
Typical Start & End Times in CY:				Start:	<b>N/A</b>	End:	<b>N/A</b>
11. Seasonal Periods Percent Annual Throughput (for Emission Source in CY, MUST total 100%)							
Jan-Feb, 2002 + Dec, 2002	<b>34.44%</b>	Mar-May	<b>19.91%</b>	June-Aug	<b>28.13%</b>	Sept-Nov	<b>17.51%</b>

To review instructions or get a blank copy, go to web page: <http://daq.state.nc.us/Offices/Planning/Attainment/est.html>

Copy and Use additional Sheets as needed

**Railcar Dump Pits**

If Emission Source has multiple Operating Scenarios, complete one form for each.  
(All permitted, Insignificant and/or Non-permitted Sources)

Facility ID #: 6800043

Permit #: 03069T20

County: Orange

DAQ Region: Raleigh

Facility Name: University of North Carolina at Chapel Hill

North Carolina Department of Environment and Natural Resources

Division of Air Quality

**Air Pollutant Point Source Emissions Inventory - Calendar Year 2007**

**Emissions:** Attach calculations and documentation of emission factors or other estimation methods used.

Emission Source ID No. (same as in permit - Use "U" prefix for non-permitted and "I" for insignificant)

ES-010

Criteria (NAAQS) Pollutants	Pollutant Code	Emissions Criteria (Tons/Year)	Emissions Estimation Method Code (see instructions for code)	Control Efficiency (Net after all controls)
Carbon Monoxide	CO	N/A	N/A	N/A
NOx	NOx	N/A	N/A	N/A
PM Total	PM	6.69E-03	2	67%
PM-2.5	PM-2.5	9.94E-04	2	40%
PM-10	PM-10	3.16E-03	2	63%
SO2	SO2	N/A	N/A	N/A
VOC	VOC	N/A	N/A	N/A
HAP/TAP Pollutants (In Alphabetical Order)	CAS # (or other code - see instructions)	Emissions HAP/TAP (Pounds/Year)	Emissions Estimation Method Code (see instructions for code)	Control Efficiency (Net after all controls)

**Emissions and data on this form required to report or verify emissions cannot be held confidential.**  
 To review instructions or get a blank copy, go to web page: <http://daq.state.nc.us/Offices/Planning/Attainment/est.html>  
 Copy and Use additional Sheets as needed.



# University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

Orange County

Facility ID # 6800043

Permit # 03069T20

## 2007 Annual Emissions Inventory

### Fugitive Losses from the unloading of coal from railcars into a dump pit.

(ES-010)

Assume that the total amount of coal unloaded is equal to the total amount of coal combusted in 2006.

Boiler #6	51,331	Tons/yr
Boiler #7	49,980	Tons/yr
Total	101,311	Tons/yr

From section 13.2.4 of the AP-42, coal handling is well approximated by aggregate handling operations. The following equation represents the particulate emissions generated by the dropping of coal into the dump pit.

$$E = k (0.0032) \frac{(u/5)^{1.3}}{(m/2)^{1.4}}$$

E = Emission Factor (lb/ton)

k = Particle Size Multiplier

u = Mean Wind Speed (mph)

m = Material Moisture Content (%)

k Value	Particulate Size	Emission Factor (lb/ton)
0.74	PM	1.32E-04
0.35	PM-10	6.25E-05
0.11	PM-2.5	1.96E-05

Average moisture content of coal is 4.5%

The dump area is fully enclosed, therefore the minimum wind speed of 1.3 mph was used.

**Total Coal            101,311 tons/yr**

*Emissions from the unloading of coal:*

	Emission Factor (lb/ton)	Emissions (lb/yr)	Emissions (ton/yr)
PM	1.32E-04	13.38	6.69E-03
PM-10	6.25E-05	6.33	3.16E-03
PM-2.5	1.96E-05	1.99	9.94E-04

**University of North Carolina at Chapel Hill**

Chapel Hill, North Carolina

*Orange County*

Facility ID # 6800043

Permit # 03069T20

**2007 Annual Emissions Inventory**

**Coal Silos  
(ES-1, ES-2)**

<b>Emission Source/Operating Scenario Data</b> Page 1 of 2		Facility ID #: <b>6800043</b>					
<i>Coal Silos</i> <small>If Emission Source has multiple Operating Scenarios, complete one form for each. (All permitted, Insignificant and/or Non-permitted Sources)</small>		Permit #: <b>03069T20</b>					
Facility Name: <u>University of North Carolina at Chapel Hill</u>		County: <b>Orange</b>					
		DAQ Region: <b>Raleigh</b>					
<b>North Carolina Department of Environment and Natural Resources</b> <b>Division of Air Quality</b> <b>Air Pollutant Point Source Emissions Inventory - Calendar Year 2007</b>							
1. Emission Source ID No. (same as in permit - Use "U" prefix for non-permitted and "I" for insignificant)		<b>ES-1 and ES-2</b>					
2. Emission Source Description		<b>Two Coal Storage Silos</b>					
3. Operating Scenario Description		<b>N/A</b>					
4. Maximum Permitted Operating Rate <small>With Units (Ex. gal/hr, mmBtu/hr)</small>		<b>350 tons/hr</b>					
5. Throughput in CY (e.g. production or fuel use) <small>With Units (Ex. lbs/yr, gal/yr)</small>		<b>101,311 tons/yr</b>					
6. Fuel Information (if fuel used)		% Sulfur	<b>N/A</b>				
		% Ash	<b>N/A</b>				
		Heat Content (Btu/lb or mmCF)	<b>N/A</b>				
<small>If you do not provide annual throughput/fuel use, your inventory will be deemed incomplete and returned to you.</small>							
7. Capture Efficiency (% Emissions from Emission Source Vented to Control Device or Stack)		<b>100%</b>					
8. Control Device Information, if none, write "none"							
	<b>Control Device ID #</b> <small>(as listed in permit)</small>	<b>Control Device Description</b>					
<i>i.</i> (nearest stack)	<b>CD-011</b>	<b>Bagfilter Installed on Silo ES-1</b>					
<i>ii.</i>	<b>CD-012</b>	<b>Bagfilter Installed on Silo ES-2</b>					
<i>iii.</i>	<b>N/A</b>	<b>N/A</b>					
<i>iv.</i>	<b>N/A</b>	<b>N/A</b>					
9. Stack Information (sources vented to more than one stack use additional entry lines)							
Stack ID #	Height <small>(in whole feet)</small>	Diameter (feet) <small>Circle (enter #), Rectangle (L#, W#) (in 0.1 feet)</small>	Temperature  (F)	Velocity  (feet/sec)	Volume Flow Rate  (acfm)	Release Point Description  <small>(Fugitive, Vertical, Vertical w/ cap, Horizontal, Downward - see instructions)</small>	
<b>EP-12-028</b>	<b>140</b>	<b>0.9</b>	<b>Ambient</b>	<b>61</b>	<b>2,500</b>	<b>Horizontal</b>	
<b>EP-12-036</b>	<b>140</b>	<b>0.9</b>	<b>Ambient</b>	<b>61</b>	<b>2,500</b>	<b>Horizontal</b>	
--	--	--	--	--	--	--	
10. Operating Schedule (Source/Operating Scenario that best characterizes calendar year)							
Hours/Day	<b>1.5</b>	Days/Week	<b>5</b>	Weeks/Year	<b>52</b>	Hours/Year	<b>390</b>
Typical Start & End Times in CY:				Start:	<b>N/A</b>	End:	<b>N/A</b>
11. Seasonal Periods Percent Annual Throughput (for Emission Source in CY, MUST total 100%)							
Jan-Feb, 2002 + Dec, 2002	<b>34.44%</b>	Mar-May	<b>19.91%</b>	June-Aug	<b>28.13%</b>	Sept-Nov	<b>17.51%</b>

To review instructions or get a blank copy, go to web page: <http://daq.state.nc.us/Offices/Planning/Attainment/est.html>

Copy and Use additional Sheets as needed



# University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

Orange County

Facility ID # 6800043

Permit # 03069T20

## 2007 Annual Emissions Inventory

### Emissions from the loading of 2 coal storage silos.

(ES-1, ES-2)

Assume that the total amount of coal fed to the silos is equal to the total amount of coal combusted in 2007.

Boiler #6	51,331	Tons/yr
Boiler #7	49,980	Tons/yr
Total	101,311	Tons/yr

The bulk density of coal is 47 lb/ft<sup>3</sup>

Total volume of coal combusted is = 4,311,116 ft<sup>3</sup>/yr  
(Volume of coal combusted = volume of displaced air through bin filter)

These emissions are routed through bin filters (baghouses). Emissions from the bin filters are conservatively estimated at 0.015 gr/acfm (displaced air through bin filters).

$$\text{lb/yr} = (\text{volume of coal, ft}^3/\text{yr}) (0.015 \text{ gr/acf}) (1/7000 \text{ lb/gr})$$

<b>Total Emissions from the silos</b>	<b>64,667</b>	<b>gr/yr</b>
	<b>9.238</b>	<b>lb/yr</b>
	<b>0.005</b>	<b>ton/yr</b>

100% of these emissions are PM-10

95% of these emissions are PM-2.5

**University of North Carolina at Chapel Hill**

Chapel Hill, North Carolina

*Orange County*

Facility ID # 6800043

Permit # 03069T20

**2007 Annual Emissions Inventory**

**Silo Feed Conveyors  
(ES-3)**

<b>Emission Source/Operating Scenario Data</b> Page 1 of 2		<b>Facility ID #:</b> 6800043					
<i>Silo Feed Conveyors</i> <small>If Emission Source has multiple Operating Scenarios, complete one form for each. (All permitted, Insignificant and/or Non-permitted Sources)</small>		<b>Permit #:</b> 03069T20					
<b>Facility Name:</b> University of North Carolina at Chapel Hill		<b>County:</b> Orange					
		<b>DAQ Region:</b> Raleigh					
<b>North Carolina Department of Environment and Natural Resources</b> <b>Division of Air Quality</b> <b>Air Pollutant Point Source Emissions Inventory - Calendar Year 2007</b>							
<b>1. Emission Source ID No.</b> (same as in permit - Use "U" prefix for non-permitted and "I" for insignificant)		ES-3					
<b>2. Emission Source Description</b>		Silo Feed Conveyors					
<b>3. Operating Scenario Description</b>		N/A					
<b>4. Maximum Permitted Operating Rate</b> <small>With Units (Ex. gal/hr, mmBtu/hr)</small>		700 tons/hr					
<b>5. Throughput in CY</b> (e.g. production or fuel use) <small>With Units (Ex. lbs/yr, gal/yr)</small>		101,311 tons/yr					
<b>6. Fuel Information</b> (if fuel used)		% Sulfur	N/A				
		% Ash	N/A				
		Heat Content (Btu/lb or mmCF)	N/A				
<small>If you do not provide annual throughput/fuel use, your inventory will be deemed incomplete and returned to you.</small>							
<b>7. Capture Efficiency</b> (% Emissions from Emission Source Vented to Control Device or Stack)		100%					
<b>8. Control Device Information</b> , if none, write "none"							
	<b>Control Device ID #</b> <small>(as listed in permit)</small>	<b>Control Device Description</b>					
i. (nearest stack)	CD-019	Bagfilter					
ii.	N/A	N/A					
iii.	N/A	N/A					
iv.	N/A	N/A					
<b>9. Stack Information</b> (sources vented to more than one stack use additional entry lines)							
Stack ID #	Height <small>(in whole feet)</small>	Diameter (feet) <small>Circle (enter #), Rectangle (L#, W#) (in 0.1 feet)</small>	Temperature <small>(F)</small>	Velocity <small>(feet/sec)</small>	Volume Flow Rate <small>(acfm)</small>	Release Point Description <small>(Fugitive, Vertical, Vertical w/ cap, Horizontal, Downward - see instructions)</small>	
EP-12-6901	200	2	Ambient	45	8,500	Vertical	
--	--	--	--	--	--	--	
--	--	--	--	--	--	--	
<b>10. Operating Schedule</b> (Source/Operating Scenario that best characterizes calendar year)							
Hours/Day	N/A	Days/Week	N/A	Weeks/Year	N/A	Hours/Year	N/A
Typical Start & End Times in CY:				Start:	N/A	End:	N/A
<b>11. Seasonal Periods Percent Annual Throughput</b> (for Emission Source in CY, MUST total 100%)							
Jan-Feb, 2002 + Dec, 2002	25.00%	Mar-May	25.00%	June-Aug	25.00%	Sept-Nov	25.00%

To review instructions or get a blank copy, go to web page: <http://daq.state.nc.us/Offices/Planning/Attainment/est.html>

Copy and Use additional Sheets as needed





# University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

Orange County

Facility ID # 6800043

Permit # 03069T20

## 2007 Annual Emissions Inventory

### Emissions from silo feed conveyors.

(ES-3)

Assume that the total amount of coal fed to the silos is equal to the total amount of coal combusted in 2007.

Boiler #6	51,331	Tons/yr
Boiler #7	49,980	Tons/yr
Total	101,311	Tons/yr

The bulk density of coal is 47 lb/ft<sup>3</sup>

Total volume of coal combusted is = 4,311,116 ft<sup>3</sup>/yr  
(Volume of coal combusted = volume of displaced air through bin filter)

These emissions are routed through bin filters (baghouses). Emissions from the bin filters are conservatively estimated at 0.015 gr/acfm (displaced air through bin filters).

$$\text{lb/yr} = (\text{volume of coal, ft}^3/\text{yr}) (0.015 \text{ gr/acf}) (1/7000 \text{ lb/gr})$$

<b>Total Emissions from the conveyors</b>	<b>64,667</b>	<b>gr/yr</b>
	<b>9.238</b>	<b>lb/yr</b>
	<b>0.005</b>	<b>ton/yr</b>

100% of these emissions are PM-10

95% of these emissions are PM-2.5

# **University of North Carolina at Chapel Hill**

Chapel Hill, North Carolina

*Orange County*

Facility ID # 6800043

Permit # 03069T20

## **2007 Annual Emissions Inventory**

### **Fuel Oil Storage Tanks**

**(T-001 and T-002)**

<b>Emission Source/Operating Scenario Data</b> Page 1 of 2		<b>Facility ID #:</b> 6800043					
<i>Silo Feed Conveyors</i> <small>If Emission Source has multiple Operat</small>		<b>Permit #:</b> 03069T20					
<b>Facility Name:</b> University of North Carolina at Chapel Hill		<b>County:</b> Orange					
		<b>DAQ Region:</b> Raleigh					
<b>North Carolina Department of Environment and Natural Resources</b> <b>Division of Air Quality</b> <b>Air Pollutant Point Source Emissions Inventory - Calendar Year 2007</b>							
<b>1. Emission Source ID No.</b> ( <i>same as in permit - Use "U" prefix for non-permitted and "I" for insignificant</i> )		<b>T-001, T-002</b>					
<b>2. Emission Source Description</b>		<b>2 - 500,000 gallon No.2 Fuel Oil Tanks</b>					
<b>3. Operating Scenario Description</b>		<b>No.2 Fuel Oil Storage</b>					
<b>4. Maximum Permitted Operating Rate</b> <small>With Units (Ex. gal/hr, mmBtu/hr)</small>		<b>500,000 gallons capacity - each tank</b>					
<b>5. Throughput in CY</b> (e.g. production or fuel use) <small>With Units (Ex. lbs/yr, gal/yr)</small>		<b>53,289 gal/yr</b>					
<b>6. Fuel Information</b> ( <i>if fuel used</i> )		<b>% Sulfur</b>	<b>N/A</b>				
		<b>% Ash</b>	<b>N/A</b>				
		<b>Heat Content</b> (Btu/lb or mmCF)	<b>N/A</b>				
<small>If you do not provide annual throughput/fuel use, your inventory will be deemed incomplete and returned to you.</small>							
<b>7. Capture Efficiency</b> ( <i>% Emissions from Emission Source Vented to Control Device or Stack</i> )		<b>NA</b>					
<b>8. Control Device Information</b> , if none, write "none"							
	<b>Control Device ID #</b> <small>(as listed in permit)</small>	<b>Control Device Description</b>					
<i>i. (nearest stack)</i>	<b>N/A</b>	<b>N/A</b>					
<i>ii.</i>	<b>N/A</b>	<b>N/A</b>					
<i>iii.</i>	<b>N/A</b>	<b>N/A</b>					
<i>iv.</i>	<b>N/A</b>	<b>N/A</b>					
<b>9. Stack Information</b> (sources vented to more than one stack use additional entry lines)							
Stack ID #	Height <small>(in whole feet)</small>	Diameter (feet) <small>Circle (enter #), Rectangle (L#, W#) (in 0.1 feet)</small>	Temperature  (F)	Velocity  (feet/sec)	Volume Flow Rate  (acfm)	Release Point Description  <small>(Fugitive, Vertical, Vertical w/ cap, Horizontal, Downward - see instructions)</small>	
--	--	--	--	--	--	--	
--	--	--	--	--	--	--	
--	--	--	--	--	--	--	
<b>10. Operating Schedule</b> (Source/Operating Scenario that best characterizes calendar year)							
Hours/Day	<b>24</b>	Days/Week	<b>7</b>	Weeks/Year	<b>52</b>	Hours/Year	<b>8760</b>
Typical Start & End Times in CY:				Start:	<b>N/A</b>	End:	<b>N/A</b>
<b>11. Seasonal Periods Percent Annual Throughput</b> (for Emission Source in CY, <b>MUST</b> total 100%)							
Jan-Feb, 2002 + Dec, 2002	<b>25.00%</b>	Mar-May	<b>25.00%</b>	June-Aug	<b>25.00%</b>	Sept-Nov	<b>25.00%</b>

To review instructions or get a blank copy, go to web page: <http://daq.state.nc.us/Offices/Planning/Attainment/est.html>

Copy and Use additional Sheets as needed



# University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

*Orange County*

Facility ID # 6800043

Permit # 03069T20

## *2007 Annual Emissions Inventory*

### **Summary of Emissions from Tanks T-001 & T-002** **(ES-T-001 and ES-T-002)**

VOC Emissions calculated with EPA TANKS 4.0 Program

T-001	213.06	lb/yr	0.107	Tons/yr
T-002	213.06	lb/yr	0.107	Tons/yr
Total	426.12	lb/yr	0.213	Tons/yr

# University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

*Orange County*

Facility ID # 6800043

Permit # 03069T18

## **2007 Annual Emissions Inventory**

### **Boiler #6 (ES-001-Boiler #6)**

#### Operating Scenarios

#1 - Coal Firing

#2 - Natural Gas Firing

#4 - No.2 Fuel Oil Firing

(#3 - No.6 Fuel Oil Firing is no longer permitted)

Boilers #6 and #7 are equipped with Continuous Emission Monitoring (CEMs) devices to measure SO<sub>2</sub> and NO<sub>x</sub> emissions from each of the boilers. The monthly averages presented in the attached spreadsheets are for the total emissions from firing all types of fuel. The 2007 Annual Emission Inventory forms require that the emissions be divided among the three possible operating scenarios.

NO<sub>x</sub> emissions have been divided between the three operating scenarios based on the percentage of total heat input by each fuel. These calculations are detailed in the attached spreadsheets.

SO<sub>2</sub> emissions from natural gas combustion are insignificant, therefore, SO<sub>2</sub> emissions have been divided between the fuel oil and coal operating scenarios based on the percentage of total heat input by each fuel. These calculations are detailed in the attached spreadsheets.

### ***Emissions Calculations***

SO<sub>2</sub> and NO<sub>x</sub> Emissions are taken from CEMs data

HCl emissions are based on stack testing for Boiler MACT HCl eligibility demonstration completed in year 2006

Hf and Hg emissions are based on stack testing for Boiler MACT compliance planning completed in year 2004

All other estimates are from DAQ and EPA Emission Factors

**Boiler #6 - Operating Scenario #4 - No. 2 Fuel Oil**  
 If Emission Source has multiple Operating Scenarios, complete one form for each.  
 (All permitted, Insignificant and/or Non-permitted Sources)

Facility ID #: **6800043**  
 Permit #: **03069T20**  
 County: **Orange**  
 DAQ Region: **Raleigh**

Facility Name: University of North Carolina at Chapel Hill

**North Carolina Department of Environment and Natural Resources  
 Division of Air Quality  
 Air Pollutant Point Source Emissions Inventory - Calendar Year 2007**

1. Emission Source ID No. (same as in permit - Use "U" prefix for non-permitted and "I" for insignificant)		ES-001-Boiler #6					
2. Emission Source Description		Coal / Natural Gas / No. 6 Fuel Oil / No. 2 Fuel Oil Fired Circulating Fluidized Bed Combustion - Steam Generating Unit					
3. Operating Scenario Description		Operating Scenario #4 - No. 2 Fuel Oil					
4. Maximum Permitted Operating Rate With Units (Ex. gal/hr, mmBtu/hr)		323.17 MMBtu/hr					
5. Throughput in CY (e.g. production or fuel use) With Units (Ex. lbs/yr, gal/yr)		0 gallons/yr					
6. Fuel Information (if fuel used)		% Sulfur	0.05%	% Ash		Heat Content (Btu/lb or mmCF)	137,006 Btu/gal

If you do not provide annual throughput/fuel use, your inventory will be deemed incomplete and returned to you.

7. Capture Efficiency (% Emissions from Emission Source Vented to Control Device or Stack)	100%
--	------

8. Control Device Information, if none, write "none"

	Control Device ID # (as listed in permit)	Control Device Description
i. (nearest stack)	CD-004	Bagfilter with Calcium Carbonate (CaCO <sub>3</sub> ) Sorbent Injection
ii.	N/A	N/A
iii.	N/A	N/A
iv.	N/A	N/A

9. Stack Information (sources vented to more than one stack use additional entry lines)

Stack ID #	Height (in whole feet)	Diameter (feet) Circle (enter #), Rectangle (L#, W#) (in 0.1 feet)	Temperature (F)	Velocity (feet/sec)	Volume Flow Rate (acfm)	Release Point Description (Fugitive, Vertical, Vertical w/ cap, Horizontal, Downward - see instructions)
EP-14-136	220	9	305	56.1	214,000	Vertical
--	--	--	--	--	--	--
--	--	--	--	--	--	--

10. Operating Schedule (Source/Operating Scenario that best characterizes calendar year)

Hours/Day	24	Days/Week	7	Weeks/Year	50	Hours/Year	8,057 Total
Typical Start & End Times in CY:				Start:	N/A	End:	N/A

11. Seasonal Periods Percent Annual Throughput (for Emission Source in CY, MUST total 100%)

Jan-Feb, 2002 + Dec, 2002	#DIV/0!	Mar-May	#DIV/0!	June-Aug	#DIV/0!	Sept-Nov	#DIV/0!
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Facility ID #: **6800043**  
 Permit #: **03069T20**  
 County: **Orange**  
 DAQ Region: **Raleigh**

Facility Name: University of North Carolina at Chapel Hill

**North Carolina Department of Environment and Natural Resources  
 Division of Air Quality  
 Air Pollutant Point Source Emissions Inventory - Calendar Year 2007**

**Emissions:** Attach calculations and documentation of emission factors or other estimation methods used.

Emission Source ID No. (same as in permit - Use "U" prefix for non-permitted and "I" for insignificant) ES-001-Boiler #6

Criteria (NAAQS) Pollutants	Pollutant Code	Emissions Criteria (Tons/Year)	Emissions Estimation Method Code (see instructions for code)	Control Efficiency (Net after all controls)
Carbon Monoxide	CO	0.00	8	N/A
NOx	NOx	0.00	1	N/A
PM Total	PM	0.000	8	99.0%
PM-2.5	PM-2.5	0.0000	8	99.0%
PM-10	PM-10	0.000	8	99.0%
SO2	SO2	0.00	1	90.0%
VOC	VOC	0.000	8	N/A
HAP/TAP Pollutants (In Alphabetical Order)	CAS # (or other code - see instructions)	Emissions HAP/TAP (Pounds/Year)	Emissions Estimation Method Code (see instructions for code)	Control Efficiency (Net after all controls)
Antimony	ANTIMONYPDS	0.00E+00	8	99.0%
Arsenic	ARSENICPDS	0.00E+00	8	99.0%
Benzene	71-43-2	0.00E+00	8	N/A
Beryllium	BERYLCPDS	0.00E+00	8	99.0%
Cadmium	CADMIUMCPDS	0.00E+00	8	99.0%
Chromium	CROMCPDS	0.00E+00	8	99.0%
Chromium VI	CHROM6CPDS	0.00E+00	8	99.0%
Cobalt	COBALTCPDS	0.00E+00	8	99.0%
Ethylbenzene	100-41-4	0.00E+00	8	N/A
Fluoride	16984-48-8	0.00	8	N/A
Formaldehyde	50-00-0	0.00	8	N/A
Lead	LEADCPDS	0.00E+00	8	99.0%
Manganese	MANGCPDS	0.00E+00	8	99.0%
Mercury	MERCPDS	0.00E+00	8	99.0%
Methyl chloroform	71-55-6	0.00E+00	8	N/A
Napthalene	91-20-3	0.00E+00	8	N/A
Nickel	NICKCPDS	0.00E+00	8	99.0%
POM	POM	0.00E+00	8	99.0%
Selenium	SEC	0.00E+00	8	99.0%
Toluene	108-88-3	0.00	8	N/A
Xylene	1330-20-7	0.00E+00	8	N/A
Greenhouse Gas Pollutants	Pollutant Code	Emissions Criteria (Tons/Year)	Emissions Estimation Method Code (see instructions for code)	Control Efficiency (Net after all controls)
Carbon Dioxide	CO <sub>2</sub>	0.00	8	N/A
Methane	CH <sub>4</sub>	0.00	8	N/A
Nitrous oxide	N <sub>2</sub> O	0.00	8	N/A

**Emissions and data on this form required to report or verify emissions cannot be held confidential.**

To review instructions or get a blank copy, go to web page: <http://daq.state.nc.us/Offices/Planning/Attainment/est.html>

Copy and Use additional Sheets as needed.



**Boiler #6 - Operating Scenario #1 - Coal**  
 If Emission Source has multiple Operating Scenarios, complete one form for each.  
 (All permitted, Insignificant and/or Non-permitted Sources)

Facility ID #: **6800043**  
 Permit #: **03069T20**  
 County: **Orange**  
 DAQ Region: **Raleigh**

Facility Name: University of North Carolina at Chapel Hill

**North Carolina Department of Environment and Natural Resources  
 Division of Air Quality  
 Air Pollutant Point Source Emissions Inventory - Calendar Year 2007**

1. Emission Source ID No. (same as in permit - Use "U" prefix for non-permitted and "I" for insignificant)		<b>ES-001-Boiler #6</b>					
2. Emission Source Description		<b>Coal / Natural Gas / No. 2 Fuel Oil Fired Circulating Fluidized Bed Combustion - Steam Generating Unit</b>					
3. Operating Scenario Description		<b>Operating Scenario #1 - Coal</b>					
4. Maximum Permitted Operating Rate With Units (Ex. gal/hr, mmBtu/hr)		<b>323.17 MMBtu/hr</b>					
5. Throughput in CY (e.g. production or fuel use) With Units (Ex. lbs/yr, gal/yr)		<b>51,331</b>			<b>tons/yr</b>		
6. Fuel Information (if fuel used)		% Sulfur	<b>1.46%</b>	% Ash	<b>12.52%</b>	Heat Content (Btu/lb or mmCF)	<b>12,669 Btu/lb</b>

If you do not provide annual throughput/fuel use, your inventory will be deemed incomplete and returned to you.

7. Capture Efficiency (% Emissions from Emission Source Vented to Control Device or Stack)	<b>100%</b>
--	-------------

8. Control Device Information, if none, write "none"

	Control Device ID # (as listed in permit)	Control Device Description
i. (nearest stack)	<b>CD-004</b>	<b>Bagfilter with Calcium Carbonate (CaCO<sub>3</sub>) Sorbent Injection</b>
ii.	N/A	N/A
iii.	N/A	N/A
iv.	N/A	N/A

9. Stack Information (sources vented to more than one stack use additional entry lines)

Stack ID #	Height (in whole feet)	Diameter (feet) Circle (enter #), Rectangle (L#, W#) (in 0.1 feet)	Temperature (F)	Velocity (feet/sec)	Volume Flow Rate (acfm)	Release Point Description (Fugitive, Vertical, Vertical w/ cap, Horizontal, Downward - see instructions)
<b>EP-14-136</b>	<b>220</b>	<b>9</b>	<b>305</b>	<b>56.1</b>	<b>214,000</b>	<b>Vertical</b>
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10. Operating Schedule (Source/Operating Scenario that best characterizes calendar year)

Hours/Day	<b>24</b>	Days/Week	<b>7</b>	Weeks/Year	<b>50</b>	Hours/Year	<b>8057 Total</b>
Typical Start & End Times in CY:				Start:	N/A	End:	N/A

11. Seasonal Periods Percent Annual Throughput (for Emission Source in CY, MUST total 100%)

Jan-Feb, 2002 + Dec, 2002	<b>34.43%</b>	Mar-May	<b>23.89%</b>	June-Aug	<b>28.84%</b>	Sept-Nov	<b>12.84%</b>
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**Boiler #6 - Operating Scenario #1 - Coal**

If Emission Source has multiple Operating Scenarios, complete one form for each.

(All permitted, Insignificant and/or Non-permitted Sources)

Facility ID #: **6800043**Permit #: **03069T20**County: **Orange**DAQ Region: **Raleigh**

Facility Name:

University of North Carolina at Chapel Hill

North Carolina Department of Environment and Natural Resources  
Division of Air Quality  
Air Pollutant Point Source Emissions Inventory - Calendar Year 2007

**Emissions:** Attach calculations and documentation of emission factors or other estimation methods used.

Emission Source ID No. (same as in permit - Use "U" prefix for non-permitted and "I" for insignificant)

ES-001-Boiler #6

Criteria (NAAQS) Pollutants	Pollutant Code	Emissions Criteria (Tons/Year)	Emissions Estimation Method Code (see instructions for code)	Control Efficiency (Net after all controls)
Carbon Monoxide	CO	461.98	8	N/A
NOx	NOx	181.06	1	N/A
PM Total	PM	1.27	8	99.80%
PM-2.5	PM-2.5	0.75	8	97.90%
PM-10	PM-10	1.27	8	99.60%
SO2	SO2	113.82	1	90.00%
VOC	VOC	1.28	8	N/A
HAP/TAP Pollutants (In Alphabetical Order)	CAS # (or other code - see instructions)	Emissions HAP/TAP (Pounds/Year)	Emissions Estimation Method Code (see instructions for code)	Control Efficiency (Net after all controls)
Acetaldehyde	750-07-0	29.26	8	N/A
Acetophenone	98-86-2	0.77	8	N/A
Acrolein	107-02-8	14.89	8	N/A
Arsenic	ARSENICPDS	0.53	8	99.60%
Benzene	71-43-2	66.73	8	N/A
Benzo(a)pyrene	50-32-8	1.95E-03	8	N/A
Benzyl chloride	100-44-7	35.93	8	N/A
Beryllium	BERYLCPDS	24.46	8	N/A
Biphenyl	92-52-4	8.73E-02	8	N/A
Bis(2-ethylhexyl)phthalate (DEHP)	117-81-7	3.75	8	N/A
Bromine	7726-95-6	10.67	8	99.60%
Bromoform	75-25-2	2.00	8	N/A
Cadmium	CADMIUMCPDS	2.14E-02	8	99.60%
Carbon disulfide	75-10-0	6.67	8	N/A
2-Chloroacetophenone	532-27-4	0.36	8	N/A
Chlorobenzene	108-90-7	1.13	8	N/A
Chloroform	67-66-3	3.03	8	N/A
Chromium	CROMCPDS	0.84	8	99.60%
Chromium (VI)	CHROM6CPDS	0.84	8	99.60%
Cumene	98-82-8	0.27	8	N/A
Cyanide	CNC	128.33	8	N/A
Dibenzofurans	132-64-9	1.03E-02	8	N/A
Dimethyl sulfate	77-78-1	2.46	8	N/A
2,4-Dinitrotoluene	121-14-2	1.44E-02	8	N/A
Ethyl benzene	100-41-4	4.83	8	N/A
Ethyl chloride	75-00-3	2.16	8	N/A
Ethylene dibromide	106-93-4	6.16E-02	8	N/A
Ethylene dichloride	107-06-2	2.05	8	N/A

Emissions and data on this form required to report or verify emissions cannot be held confidential.

To review instructions or get a blank copy, go to web page: <http://daq.state.nc.us/Offices/Planning/Attainment/est.html>

Copy and Use additional Sheets as needed.

**Boiler #6 - Operating Scenario #1 - Coal**If Emission Source has multiple Operating Scenarios, complete one form for each.  
(All permitted, Insignificant and/or Non-permitted Sources)Facility ID #: 6800043Permit #: 03069T20County: OrangeDAQ Region: RaleighFacility Name: University of North Carolina at Chapel Hill

## North Carolina Department of Environment and Natural Resources

## Division of Air Quality

## Air Pollutant Point Source Emissions Inventory - Calendar Year 2007

**Emissions:** Attach calculations and documentation of emission factors or other estimation methods used.

Emission Source ID No. (same as in permit - Use "U" prefix for non-permitted and "I" for insignificant)

ES-001-Boiler #6

Criteria (NAAQS) Pollutants	Pollutant Code	Emissions Criteria (Tons/Year)	Emissions Estimation Method Code (see instructions for code)	Control Efficiency (Net after all controls)
Carbon Monoxide	CO	N/A	N/A	N/A
NOx	NOx	N/A	N/A	N/A
PM Total	PM	N/A	N/A	N/A
PM-2.5	PM-2.5	N/A	N/A	N/A
PM-10	PM-10	N/A	N/A	N/A
SO2	SO2	N/A	N/A	N/A
VOC	VOC	N/A	N/A	N/A
HAP/TAP Pollutants (In Alphabetical Order)	CAS # (or other code - see instructions)	Emissions HAP/TAP (Pounds/Year)	Emissions Estimation Method Code (see instructions for code)	Control Efficiency (Net after all controls)
Formaldehyde	50-00-00	12.32	8	N/A
Hexane	HEXANEISO	3.44	8	N/A
Hydrogen Chloride ***	7647-01-0	38344.59	8	N/A
Hydrogen Fluoride ***	7664-39-3	2258.58	8	90% Control with CaCO <sub>3</sub>
Isophorone	78-59-1	29.77	8	N/A
Lead	LEADCPDS	0.34	8	99.60%
Manganese	MANGCPDS	1.45	8	99.60%
Mercury***	MERCCPDS	1.91	8	N/A
Methyl bromide	74-83-9	8.21	8	N/A
Methyl chloride	74-87-3	27.21	8	N/A
Methyl ethyl ketone	78-93-3	20.02	8	N/A
Methyl hydrazine	60-34-4	8.73	8	N/A
Methyl methacrylate	80-62-6	1.03	8	N/A
Methyl tert butyl ether	1634-04-4	1.80	8	N/A
Methylene chloride	75-09-2	14.89	8	N/A
Naphthalene	91-20-3	0.67	8	N/A
Nickel	NICKCPDS	0.69	8	99.60%
Phenol	108-95-2	0.82	8	N/A
POM	POM	2.91	8	N/A
Propionaldehyde	123-38-6	19.51	8	N/A
Styrene	100-42-5	1.28	8	N/A
2,3,7,8-TCDD	1746-01-6	7.34E-07	8	N/A
Tetrachloroethylene	79-34-5	2.21	8	N/A
Toluene	108-88-3	12.32	8	N/A
1,1,1-Trichloroethane	79-00-5	1.03	8	N/A
Vinyl acetate	108-05-4	0.39	8	N/A
Xylenes	1330-20-7	1.90	8	N/A
Greenhouse Gas Pollutants	Pollutant Code	Emissions Criteria (Tons/Year)	Emissions Estimation Method Code (see instructions for code)	Control Efficiency (Net after all controls)
Carbon Dioxide	CO <sub>2</sub>	144,925.60	8	N/A
Methane	CH <sub>4</sub>	1.54	8	N/A
Nitrous oxide	N <sub>2</sub> O	89.83	8	N/A

**Boiler #6 - Operating Scenario #3 - Natural Gas**If Emission Source has multiple Operating Scenarios, complete one form for each.  
(All permitted, Insignificant and/or Non-permitted Sources)Facility Name: University of North Carolina at Chapel HillFacility ID #: 6800043Permit #: 03069T20County: OrangeDAQ Region: Raleigh

## North Carolina Department of Environment and Natural Resources

## Division of Air Quality

## Air Pollutant Point Source Emissions Inventory - Calendar Year 2007

1. Emission Source ID No. (same as in permit - Use "U" prefix for non-permitted and "I" for insignificant)		ES-001-Boiler #6					
2. Emission Source Description		Coal / Natural Gas / No. 2 Fuel Oil Fired Circulating Fluidized Bed Combustion - Steam Generating Unit					
3. Operating Scenario Description		Operating Scenario #2 - Natural Gas					
4. Maximum Permitted Operating Rate With Units (Ex. gal/hr, mmBtu/hr)		323.17 MMBtu/hr					
5. Throughput in CY (e.g. production or fuel use) With Units (Ex. lbs/yr, gal/yr)		57,575			1,000 ft <sup>3</sup> /yr		
6. Fuel Information (if fuel used)		% Sulfur	N/A	% Ash	N/A	Heat Content (Btu/lb or mmCF)	1,030 Btu/ft <sup>3</sup>

If you do not provide annual throughput/fuel use, your inventory will be deemed incomplete and returned to you.

7. Capture Efficiency (% Emissions from Emission Source Vented to Control Device or Stack)	100%
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## 8. Control Device Information, if none, write "none"

	Control Device ID # (as listed in permit)	Control Device Description
i. (nearest stack)	CD-004	Bagfilter with Calcium Carbonate (CaCO <sub>3</sub> ) Sorbent Injection
ii.	N/A	N/A
iii.	N/A	N/A
iv.	N/A	N/A

## 9. Stack Information (sources vented to more than one stack use additional entry lines)

Stack ID #	Height (in whole feet)	Diameter (feet) Circle (enter #), Rectangle (L#, W#) (in 0.1 feet)	Temperature (F)	Velocity (feet/sec)	Volume Flow Rate (acfm)	Release Point Description (Fugitive, Vertical, Vertical w/ cap, Horizontal, Downward - see instructions)
EP-14-136	220	9	305	56.1	214,000	Vertical
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## 10. Operating Schedule (Source/Operating Scenario that best characterizes calendar year)

Hours/Day	24	Days/Week	7	Weeks/Year	50	Hours/Year	8059 Total
Typical Start & End Times in CY:				Start:	N/A	End:	N/A

## 11. Seasonal Periods Percent Annual Throughput (for Emission Source in CY, MUST total 100%)

Jan-Feb, 2002 + Dec, 2002	0.64%	Mar-May	1.03%	June-Aug	19.12%	Sept-Nov	79.21%
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Facility ID #: **6800043**  
 Permit #: **03069T20**  
 County: **Orange**  
 DAQ Region: **Raleigh**

Facility Name: University of North Carolina at Chapel Hill

**North Carolina Department of Environment and Natural Resources  
 Division of Air Quality  
 Air Pollutant Point Source Emissions Inventory - Calendar Year 2007**

**Emissions:** Attach calculations and documentation of emission factors or other estimation methods used.

Emission Source ID No. (same as in permit - Use "U" prefix for non-permitted and "I" for insignificant) ES-001-Boiler #6

Criteria (NAAQS) Pollutants	Pollutant Code	Emissions Criteria (Tons/Year)	Emissions Estimation Method Code (see instructions for code)	Control Efficiency (Net after all controls)
Carbon Monoxide	CO	2.42	8	N/A
NOx	NOx	8.26	1	N/A
PM Total	PM	0.22	8	N/A
PM-2.5	PM-2.5	0.22	8	N/A
PM-10	PM-10	0.22	8	N/A
SO2	SO2	0.00	1	N/A
VOC	VOC	0.16	8	N/A
HAP/TAP Pollutants (In Alphabetical Order)	CAS # (or other code - see instructions)	Emissions HAP/TAP (Pounds/Year)	Emissions Estimation Method Code (see instructions for code)	Control Efficiency (Net after all controls)
Arsenic	ARSENICPDS	1.15E-02	8	N/A
Benzene	71-43-2	0.12	8	N/A
Cadmium	CADMIUMCPDS	6.33E-02	8	N/A
Chromium	CROMCPDS	8.06E-02	8	N/A
Chromium VI	CHROM6CPDS	8.06E-02	8	N/A
Dichlorobenzene	106-46-7	6.91E-02	8	N/A
Formaldehyde	50-00-0	4.32	8	N/A
Hexane	HEXANEISO	103.64	8	N/A
Lead	LEADCPDS	2.88E-02	8	N/A
Manganese	MANGCPDS	2.19E-02	8	N/A
Mercury	MERCPDS	1.50E-02	8	N/A
Napthalene	91-20-3	3.51E-02	8	N/A
Nickel	NICKCPDS	0.12	8	N/A
POM	POM	3.81E-02	8	N/A
Toluene	108-88-3	0.20	8	N/A
Greenhouse Gas Pollutants	Pollutant Code	Emissions Criteria (Tons/Year)	Emissions Estimation Method Code (see instructions for code)	Control Efficiency (Net after all controls)
Carbon Dioxide	CO <sub>2</sub>	3,464.78	8	N/A
Methane	CH <sub>4</sub>	0.066	8	N/A
Nitrous oxide	N <sub>2</sub> O	0.063	8	N/A

# **University of North Carolina at Chapel Hill**

Chapel Hill, North Carolina

*Orange County*

Facility ID # 6800043

Permit # 03069T20

## **2007 Annual Emissions Inventory**

**Boiler #6**

**(ES-001-Boiler #6)**

***Emissions Calculations***

SO<sub>2</sub> and NO<sub>x</sub> Emissions are Taken from CEMs Data

HCl, HF, Hg emissions are based on stack test data

All other estimates are from DAQ Spreadsheets

**Fuel Oil Combustion Emissions Calculator FO2000 Revision A  
2007 Annual Emissions Inventory**

**Boiler #6  
(ES-001-Boiler #6)  
Facility ID # 6800043  
Permit # 03069T20**

Operating Scenario #4 - No.2 Fuel Oil

<b>User Input</b>	
Company Name:	University of North Carolina at Chapel Hill
Plant County:	Orange County
Plant City:	Chapel Hill
Permit Number:	03069T20
User:	RST Engineering
Heat Input Capacity (mmBtu/hr):	323.17
Fuel Input Capacity (10 <sup>3</sup> gal/hr):	2.31
Annual Fuel Throughput (1000 gal):	0.00
Maximum fuel sulfur content (%):	0.5
Latest Construction/Modification Date:	N/A
<b>Enter the boiler type below ↘</b>	
	15

<b>Boilers =&gt;100 mmBtu/hr</b>	<b>Boilers =&gt;100 mmBtu/hr (cont'd)</b>
1 = No. 6 oil fired, normal firing (U)	16 = No. 2 oil fired (C)
2 = No. 6 oil fired, normal firing (I)	17 = No. 2 oil fired, LNB/FGR (U,I)
3 = No. 6 oil fired, normal firing (C)	18 = No. 2 oil fired, LNB/FGR (C)
4 = No. 6 oil fired, normal firing, low NOx burner (U)	
5 = No. 6 oil fired, normal firing, low NOx burner (I)	19 = Vertical fired utility boiler
6 = No. 6 oil fired, normal firing, low NOx burner (C)	
7 = No. 6 oil fired, tangential firing (U)	<b>Small Boilers (&lt;100 mmBtu/hr)</b>
8 = No. 6 oil fired, tangential firing, low NOx burner (U)	20 = No. 6 oil fired (I)
9 = No. 5 oil fired, normal firing (U)	21 = No. 6 oil fired (C)
10 = No. 5 oil fired, normal firing (I)	22 = No. 5 oil fired (C)
11 = No. 5 oil fired, tangential firing (U)	23 = No. 4 oil fired (C)
12 = No. 4 oil fired, normal firing (U)	24 = No. 2 oil fired (I)
13 = No. 4 oil fired, normal firing (I)	25 = No. 2 oil fired (C)
14 = No. 4 oil fired, tangential firing (U)	
15 = No. 2 oil fired (U,I)	26 = Residential Furnace

**Fuel Oil Combustion Emissions Calculator FO2000 Revision A**

**2007 Annual Emissions Inventory**

**Boiler #6**

**(ES-001-Boiler #6)**

**Facility ID # 6800043**

**Permit # 03069T20**

Operating Scenario #4 - No.2 Fuel Oil

<b>User Input</b>	
Company Name:	University of North Carolina at Chapel Hill
Plant County:	Orange County
Plant City:	Chapel Hill
Permit Number:	03069T20
User:	RST Engineering
Heat Input Capacity (mmBtu/hr):	323.17
Fuel Input Capacity (10 <sup>3</sup> gal/hr):	2.31
Annual Fuel Throughput (1000 gal):	0.00
Maximum fuel sulfur content (%):	0.5
Latest Construction/Modification Date:	N/A

**Emission Controls**

Particulate controls

<b>Enter the control type below</b> ▾	Message Area	Or enter a PM control efficiency below to override built in values.
3		
<u>Control Device</u>	<u>Avg. Cont. Effic.</u>	<u>User Input PM Cont. Effic.</u>
0 = None/other		
1 = ESP		
2 = Scrubber		
3 = Bagfilter	99.0	
4 = Multiple cyclone		
		Message Area

Postcombustion SO<sub>2</sub> controls

<b>Enter the control type below</b> ▾	Message Area	Or enter an SO <sub>2</sub> control efficiency below to override built in values.
0		
<u>Control Technology/Process</u>	<u>Avg. Cont. Effic.</u>	<u>User Input SO<sub>2</sub> Cont. Effic.</u>
0 = None/other		90.0
1 = Wet scrubber, Lime/limestone		
2 = Wet scrubber, Sodium carbonate	0.0	
3 = Wet scrubber, Magnesium oxide/hydroxide		
4 = Wet scrubber, Dual alkali		
5 = Spray drying, calcium hydroxide slurry, vap. in spray vessel		
6 = Furnace injection, Dry calcium carbonate/hydrate inj. in upper furn. cavity		
7 = Duct injection, Dry sorbent injection into duct, sometimes combined with water spray	<u>Remarks</u>	
	NA	User entered control efficiency may be overestimated and should be documented.

NO<sub>x</sub> controls

<b>Enter the control type below</b> ▾	Message Area	Or enter a NO <sub>x</sub> control efficiency below to override built in values.
5		
<u>Control Technology/Process</u>	<u>Avg. Cont. Effic.</u>	<u>User Input NO<sub>x</sub> Cont. Effic.</u>
0 = None/other		0.0
1 = Low excess air (LEA)		
2 = Staged combustion (SC)		
3 = Burners out of service (BOOS)	39.0	
4 = Flue gas recirculation (FGR)		
5 = Flue gas recirculation plus staged combustion		
6 = Low NO <sub>x</sub> burners (LNB)		
7 = Reduced air preheat (RAP)		
8 = Selective noncatalytic reduction (SNCR)		
9 = Conventional selective catalytic reduction (SCR)	<u>Remarks</u>	
	Available for boilers with sufficient operational flexibility	Message Area



**Fuel Oil Combustion Emissions Calculator FO2000 Revision A**  
**2007 Annual Emissions Inventory**

**Boiler #6**  
**(ES-001-Boiler #6)**  
**Facility ID # 6800043**  
**Permit # 03069T20**

Operating Scenario #4 - No.2 Fuel Oil

<b>User Input</b>	
Company Name:	University of North Carolina at Chapel Hill
Plant County:	Orange County
Plant City:	Chapel Hill
Permit Number:	03069T20
User:	RST Engineering
Heat Input Capacity (mmBtu/hr):	323.17
Fuel Input Capacity (10 <sup>3</sup> gal/hr):	2.31
Annual Fuel Throughput (1000 gal):	0.00
Maximum fuel sulfur content (%):	0.5
Latest Construction/Modification Date:	N/A

<b>Emissions Output (for operation 3.42 hr/yr)</b>				Emission Factor <sup>1</sup>
<b>Criteria Pollutants</b>				(lb/10 <sup>3</sup> gal)
Pollutant	lb/hr <sup>2</sup>	tpy	lb/yr <sup>3</sup>	
Total PM (FPM + CPM)	3.0	0.000	0	3.30E+00
Filterable PM (FPM) rates @ 99% control	0.0	0.000	0	2.00E+00
Condensable PM (CPM) <sup>4</sup>	3.0	0.000	0	1.30E+00
Filterable PM-10 <sup>5</sup>	0.0	0.000	0	1.00E+00
Filterable PM-2.5 <sup>5</sup>	0.0	0.000	0	2.50E-01
NOx rates @ 39% control	**	**	**	2.40E+01
NMTOC	0	0.000	0	2.00E-01
CO	12	0.000	0	5.00E+00
SO2 rates @ 90% control	**	**	**	2.98E+02
Total HAP <sup>6</sup>	4.17E-01	0.000	0	1.81E-01
Largest HAP <sup>6</sup>	1.84E-01	0.000	0	7.97E-02

<b>Toxic/Hazardous Air Pollutants</b>				Emission Factor <sup>1</sup>
Pollutant	lb/hr <sup>2</sup>	lb/day <sup>7</sup>	lb/yr <sup>3</sup>	(lb/10 <sup>3</sup> gal)
Antimony rates @ 99% control	0.00E+00	NA	0.00E+00	0.00E+00
Arsenic rates @ 99% control	1.29E-05	NA	0.00E+00	5.60E-04
Benzene	6.35E-03	NA	0.00E+00	2.75E-03
Beryllium rates @ 99% control	9.70E-06	NA	0.00E+00	4.20E-04
Cadmium rates @ 99% control	9.70E-06	NA	0.00E+00	4.20E-04
Chromium rates @ 99% control	9.70E-06	NA	0.00E+00	4.20E-04
Chromium VI rates @ 99% control	2.85E-06	NA	0.00E+00	1.23E-04
Cobalt rates @ 99% control	0.00E+00	NA	0.00E+00	0.00E+00
Ethylbenzene	1.89E-03	NA	0.00E+00	8.17E-04
Fluoride	8.61E-02	2.07E+00	0.00E+00	3.73E-02
Formaldehyde	1.11E-01	2.66E+00	0.00E+00	4.80E-02
Lead rates @ 99% control	2.91E-05	NA	0.00E+00	1.26E-03
Manganese rates @ 99% control	1.94E-05	4.65E-04	0.00E+00	8.40E-04
Mercury	9.70E-04	2.33E-02	0.00E+00	4.20E-04
Methyl chloroform (1,1,1-Trichloroethane)	5.45E-04	1.31E-02	0.00E+00	2.36E-04
Naphthalene	7.69E-04	NA	0.00E+00	3.33E-04
Nickel rates @ 99% control	9.70E-06	2.33E-04	0.00E+00	4.20E-04
POM rates @ 99% control	7.62E-05	NA	0.00E+00	3.30E-03
Selenium rates @ 99% control	4.85E-05	NA	0.00E+00	2.10E-03
Toluene	1.84E-01	4.41E+00	0.00E+00	7.97E-02
Xylene	3.23E-03	7.76E-02	0.00E+00	1.40E-03

<b>Greenhouse Gases</b>				Emission Factor
Pollutant	lb/hr <sup>2</sup>	tpy	lb/yr <sup>3</sup>	(lb/10 <sup>3</sup> gal)
Carbon dioxide	50,491	0.0	0	21873.00
Methane	4.99E-01	0.00E+00	0.00E+00	0.216
Nitrous Oxide	2.54E-01	0.00E+00	0.00E+00	0.11

<sup>1</sup>Emission factors represent AP-42 uncontrolled values. Emission rates are reflective of controls where applicable.

<sup>2</sup>Hourly emission rates for all pollutants are based on hourly rated capacity.

<sup>3</sup>Annual emission rates for all pollutants are based on maximum annual fuel throughput.

<sup>4</sup>Wet scrubbers are assumed to control CPM whereas other PM control devices are assumed to only control FPM.

<sup>5</sup>AP-42 assumes PM-10 and PM-2.5 assumes these pollutants are controlled with the same efficiency as total PM.

<sup>6</sup>Total and largest HAP factors and emission rates do not reflect control of metals. Individual metal emission rates are reflective of particulate matter controls where applicable.

Fuel Oil Combustion Emissions Calculator **FO2000 Revision A**

2007 Annual Emissions Inventory

Boiler #6

(ES-001-Boiler #6)

Facility ID # 6800043

Permit # 03069T20

Operating Scenario #4 - No.2 Fuel Oil

<b>User Input</b>	
Company Name:	University of North Carolina at Chapel Hill
Plant County:	Orange County
Plant City:	Chapel Hill
Permit Number:	03069T20
User:	RST Engineering
Heat Input Capacity (mmBtu/hr):	323.17
Fuel Input Capacity (10 <sup>3</sup> gal/hr):	2.31
Annual Fuel Throughput (1000 gal):	0.00
Maximum fuel sulfur content (%):	0.5
Latest Construction/Modification Date:	N/A

<sup>7</sup>Daily emission rates are based on operation 24 hours per day at rated capacity.

\*\*SOx and NOx emissions were estimated using CEMS data, please refer to the attached spreadsheets.

FO2000 Revision A dated March 9, 2000

# Bituminous Coal Combustion

2007 Annual Emissions Inventory

Facility **University of North Carolina at Chapel Hill**  
 City **Chapel Hill**  
 County **Orange County**

APP #/Fac ID **6800043**  
 Input By **RST Engineering**  
 Source ID **Boiler #6**  
 (ES-001-Boiler #6)

Operating Scenario #1

## Data Input

Maximum Heat Input	<input type="text" value="323.17"/>	mmBtu/hr	<b>Boiler Type:</b>	<input type="text" value="7"/>
Boiler Size/Type	Large Industrial		1) Pulverized/Dry Bottom	6) Underfeed Stoker
Actual Fuel Usage	<input type="text" value="51,331"/>	ton/yr	2) Pulverized/Wet Bottom	7) Fluidized Bed Cir.
or	or		3) Cyclone Furnace	8) Fluidized Bed Bub.
Hours of Operation	<input type="text"/>	hr/yr	4) Spreader Stoker	9) Hand Fed
and	and		5) Overfeed Stoker	
Heating Value	<input type="text" value="12,669"/>	Btu/lb	<b>Control Device Efficiencies:</b>	
		ton/yr	PM	<input type="text" value="99.80"/> %
Sulfur Content	<input type="text" value="1.46"/>	%	PM-10	<input type="text" value="99.60"/> %
Ash Content :	<input type="text" value="12.5"/>	%	PM-2.5	<input type="text" value="97.90"/> %
(B)ituminous or (S)ubbituminous?	<input type="text" value="B"/>	(B/S)	SOx*	<input type="text" value="90.00"/> %
Calcium to Sulfur Ratio	<input type="text" value="2.22"/>		NOx*	<input type="text" value="0.00"/> %

*\*SOx and NOx emission estimates were calculated using CEMS data. Please refer to the SOx and NOx emissions data presented in the following CEMs spreadsheets.  
 HCl, HF, and Hg emissions based on stack test data.*

# Bituminous Coal Combustion

2007 Annual Emissions Inventory

Facility **University of North Carolina at Chapel Hill**  
 City **Chapel Hill**  
 County **Orange County**

APP #/Fac ID **6800043**  
 Input By **RST Engineering**  
 Source ID **Boiler #6**  
**(ES-001-Boiler #6)**

Operating Scenario #1

## ACTUAL CRITERIA EMISSIONS

Pollutant	Factor		Emission Rates	
	(lb poll./ton coal)	(lb/hr)	(lb/yr)	(tpy)
PM	17	0.63	2,546	1.27
PM-10	12.4	0.63	2,546	1.27
PM-2.5*	1.4	0.37	1,509	0.75
SO2	12.71	**	**	**
SO3*	0.09	**	**	**
NOx	3.90	**	**	**
VOC	0.05	0.64	2,567	1.28
CO	18	229.58	923,966	461.98

## ACTUAL TOXIC EMISSIONS

Pollutant	Factor		Emission Rates	
	(lb poll./ton coal)	(lb/hr)	(lb/yr)	(tpy)
Acetaldehyde	5.70E-04	7.27E-03	2.93E+01	1.46E-02
Acetophenone	1.50E-05	1.91E-04	7.70E-01	3.85E-04
Acrolein	2.90E-04	3.70E-03	1.49E+01	7.44E-03
Arsenic	5.13E-03	1.31E-04	5.27E-01	2.63E-04
Benzene	1.30E-03	1.66E-02	6.67E+01	3.34E-02
Benzo(a)pyrene	3.80E-08	4.85E-07	1.95E-03	9.75E-07
Benzyl chloride	7.00E-04	8.93E-03	3.59E+01	1.80E-02
Beryllium	4.76E-04	6.08E-03	2.45E+01	1.22E-02
Biphenyl	1.70E-06	2.17E-05	8.73E-02	4.36E-05
Bis(2-ethylhexyl)phthalate (DEHP)	7.30E-05	9.31E-04	3.75E+00	1.87E-03
Bromine	1.04E-01	2.65E-03	1.07E+01	5.33E-03
Bromoform	3.90E-05	4.97E-04	2.00E+00	1.00E-03
Cadmium	2.09E-04	5.33E-06	2.14E-02	1.07E-05
Carbon disulfide	1.30E-04	1.66E-03	6.67E+00	3.34E-03
2-Chloroacetophenone	7.00E-06	8.93E-05	3.59E-01	1.80E-04
Chlorobenzene	2.20E-05	2.81E-04	1.13E+00	5.65E-04
Chloroform	5.90E-05	7.53E-04	3.03E+00	1.51E-03
Chromium	8.20E-03	2.09E-04	8.42E-01	4.21E-04
Chromium (VI)	8.20E-03	2.09E-04	8.42E-01	4.21E-04
Cumene	5.30E-06	6.76E-05	2.72E-01	1.36E-04
Cyanide	2.50E-03	3.19E-02	1.28E+02	6.42E-02
Dibenzofurans	2.01E-07	2.56E-06	1.03E-02	5.16E-06
Dimethyl sulfate	4.80E-05	6.12E-04	2.46E+00	1.23E-03
2,4-Dinitrotoluene	2.80E-07	3.57E-06	1.44E-02	7.19E-06
Ethyl benzene	9.40E-05	1.20E-03	4.83E+00	2.41E-03
Ethyl chloride	4.20E-05	5.36E-04	2.16E+00	1.08E-03
Ethylene dibromide	1.20E-06	1.53E-05	6.16E-02	3.08E-05
Ethylene dichloride	4.00E-05	5.10E-04	2.05E+00	1.03E-03
Formaldehyde	2.40E-04	3.06E-03	1.23E+01	6.16E-03
Hexane	6.70E-05	8.55E-04	3.44E+00	1.72E-03
Hydrogen Chloride ***	<b>7.47E-01</b>	9.53E+00	3.83E+04	1.92E+01
Hydrogen Fluoride ***	<b>4.40E-02</b>	5.61E-01	2.26E+03	1.13E+00
Isophorone	5.80E-04	7.40E-03	2.98E+01	1.49E-02
Lead	3.31E-03	8.44E-05	3.40E-01	1.70E-04

\*\*SO<sub>2</sub> and NO<sub>x</sub> emissions were estimated using CEMS data, please refer to the attached data sheets entitled "Sulfur Dioxide Emissions from Boiler #6" and "Nitrogen Dioxide Emissions from Boiler #6".

\*\*\* HCl, HF, and Hg emissions based on stack test data.

# Bituminous Coal Combustion

2007 Annual Emissions Inventory

Facility **University of North Carolina at Chapel Hill**  
 City **Chapel Hill**  
 County **Orange County**

APP #/Fac ID **6800043**  
 Input By **RST Engineering**  
 Source ID **Boiler #6**  
**(ES-001-Boiler #6)**

Operating Scenario #1

## ACTUAL TOXIC EMISSIONS (continued)

Pollutant	Factor		Emission Rates	
	(lb poll./ton coal)	(lb/hr)	(lb/yr)	(tpy)
Manganese	1.42E-02	3.61E-04	1.45E+00	7.27E-04
Mercury***	<b>3.73E-05</b>	4.75E-04	1.91E+00	9.56E-04
Methyl bromide	1.60E-04	2.04E-03	8.21E+00	4.11E-03
Methyl chloride	5.30E-04	6.76E-03	2.72E+01	1.36E-02
Methyl ethyl ketone	3.90E-04	4.97E-03	2.00E+01	1.00E-02
Methyl hydrazine	1.70E-04	2.17E-03	8.73E+00	4.36E-03
Methyl methacrylate	2.00E-05	2.55E-04	1.03E+00	5.13E-04
Methyl tert butyl ether	3.50E-05	4.46E-04	1.80E+00	8.98E-04
Methylene chloride	2.90E-04	3.70E-03	1.49E+01	7.44E-03
Naphthalene	1.30E-05	1.66E-04	6.67E-01	3.34E-04
Nickel	6.74E-03	1.72E-04	6.92E-01	3.46E-04
Phenol	1.60E-05	2.04E-04	8.21E-01	4.11E-04
POM	5.68E-05	7.24E-04	2.91E+00	1.46E-03
Propionaldehyde	3.80E-04	4.85E-03	1.95E+01	9.75E-03
Styrene	2.50E-05	3.19E-04	1.28E+00	6.42E-04
2,3,7,8-TCDD	1.43E-11	1.82E-10	7.34E-07	3.67E-10
Tetrachloroethylene	4.30E-05	5.48E-04	2.21E+00	1.10E-03
Toluene	2.40E-04	3.06E-03	1.23E+01	6.16E-03
1,1,1-Trichloroethane	2.00E-05	2.55E-04	1.03E+00	5.13E-04
Vinyl acetate	7.60E-06	9.69E-05	3.90E-01	1.95E-04
Xylenes	3.70E-05	4.72E-04	1.90E+00	9.50E-04
Total HAPs		10.21	41,108.65	20.55

## Greenhouse Gases

Pollutant	Factor		Emission Rates	
	(lb poll./ton coal)	(lb/hr)	(lb/yr)	(tpy)
Carbon dioxide	5494.70	70081.39	282,050,918	141,025.46
Methane	0.06	0.77	3,080	1.54
Nitrous Oxide	3.50	44.64	179,660	89.83

### Notes :

- 1) Emission factors are from Supplement B to the 5th edition of AP-42, unless otherwise noted
- 2) Emission calculations will be based on the hours of operation only when actual fuel usage is not supplied
- 3) Particulate controls affect PM, PM-10, PM-2.5, and all toxics that are regulated as particulates except Mercury
- 4) VOC = NMTOC = TOC \* (1-%METHANE)
- 5) PM-2.5 and SO3 do not currently need to be reported
- 6) Dibenzofurans = Polychlorinated dibenzo-p-furans
- 7) The Br emission factor is based on a mass balance generated from a 3 year coal analysis for Duke Power (1990-1992, 7 samples per year). The average concentration of bromine was 55.33 ppm (wet basis) and a heating value of 13,500 Btu/lb was assumed
- 8) For fluidized bed combustion the emission factor for underfeed stokers is utilized whenever the calcium-to-sulfur ratio is outside of the acceptable range of 1.5 to 7

**Natural Gas Combustion Emissions Calculator NG2000 Revision C**  
**2007 Annual Emissions Inventory**

**Boiler #6**  
*(ES-001-Boiler #6)*

Facility ID # 6800043  
 Permit # 03069T20

**Operating Scenario #2**

<b>User Input</b>		<b>Emissions Output (for operation 18.53 hr/yr)</b>			<b>Emission</b>
Company Name:	University of North Carolina at Chapel Hill	<b>Criteria Pollutants</b>			<b>Factor</b> (lb/mmscf)
Plant County:	Orange County	<b>Pollutant</b>	<b>lb/hr</b>	<b>lb/yr</b>	<b>tpy</b>
Plant City:	Chapel Hill	PM	2.4E+00	4.4E+02	2.2E-01
Permit Number:	03069T18	PM-10	2.4E+00	4.4E+02	2.2E-01
User:	RST Engineering	PM-2.5	2.4E+00	4.4E+02	2.2E-01
Heat Input Capacity (mmBtu/hr):	323.17	NOx	**	**	**
Fuel Input Capacity (10 <sup>6</sup> scf/hr):	0.32	VOC	1.7E+00	3.2E+02	1.6E-01
Annual Fuel Throughput (10 <sup>6</sup> scf):	57.58	CO	2.7E+01	4.8E+03	2.4E+00
Latest Construction/Modification Date:	N/A	SO2	**	**	**
<b>Enter the boiler type below ▾</b>		Total HAP	6.0E-01	1.1E+02	5.4E-02
2		Largest HAP	5.7E-01	1.0E+02	5.2E-02
<b>Other NOx Control</b>		<b>Toxic/Hazardous Air Pollutants</b>			
4		<b>Pollutant</b>	<b>lb/hr</b>	<b>lb/day</b>	<b>lb/yr</b>
<b>Large Wall-Fired Boilers (=&gt;100 mmBtu/hr)</b>		Arsenic	6.3E-05	NA	1.2E-02
1 = Uncontrolled (Pre-NSPS)		Benzene	6.7E-04	NA	1.2E-01
2 = Uncontrolled (Post-NSPS)		Cadmium	3.5E-04	NA	6.3E-02
3 = Controlled - Low NOx burners		Chromium	4.4E-04	NA	8.1E-02
4 = Controlled - Flue gas recirculation (FGR)		Chromium VI	4.4E-04	NA	8.1E-02
<b>Small Boilers (&lt;100 mmBtu/hr)</b>		Dichlorobenzene	3.8E-04	NA	6.9E-02
5 = Uncontrolled		Formaldehyde	2.4E-02	NA	4.3E+00
6 = Controlled - Low NOx burners		Hexane	5.7E-01	1.4E+01	1.0E+02
7 = Controlled - Low NOx burners/FGR		Lead	1.6E-04	NA	2.9E-02
<b>Tangential-Fired Boilers (All Sizes)</b>		Manganese	1.2E-04	2.9E-03	2.2E-02
8 = Uncontrolled		Mercury	8.2E-05	2.0E-03	1.5E-02
9 = Controlled - FGR		Naphthalene	1.9E-04	NA	3.5E-02
<b>Residential Furnaces (&lt;0.3 mmBtu/hr)</b>		Nickel	6.7E-04	1.6E-02	1.2E-01
10 = Uncontrolled		POM	2.1E-04	NA	3.8E-02
		Toluene	1.1E-03	2.6E-02	2.0E-01
<b>Greenhouse Gas Pollutants</b>				<b>Em. Factor</b> (lb/mmscf)	
<b>Pollutant</b>	<b>lb/hr</b>	<b>lb/yr</b>	<b>tpy</b>		
Carbon dioxide	38,133	6,929,566	3464.78	120,357	
Methane	0.73	132.42	0.066	2.3	
Nitrous Oxide	0.70	126.67	0.063	2.2	

# University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

Orange County

Facility ID # 6800043

Permit # 03069T20

## 2007 Annual Emissions Inventory

### Sulfur Dioxide Emissions from Boiler #6

#### (ES-001-Boiler #6)

The exhaust duct at Boiler #6 is equipped with a continuous emissions monitor (CEMs) for SO<sub>2</sub> emissions.

For the 2007 calendar year, 30 day facility averages for the SO<sub>2</sub> emission rate measured by the CEM are as follows:

Month	30 day average CEM reading (lb/MMBtu)
January 2007	0.17
February 2007	0.17
March 2007	0.16
April 2007	0.17
May 2007	0.16
June 2007	0.17
July 2007	0.17
August 2007	0.17
September 2007	0.16
October 2007	0.16
November 2007	0.17
December 2007	0.17
<b>Annual Average</b>	<b>0.167</b>

This average includes SO<sub>2</sub> emissions from coal, fuel oil, and natural gas from Boiler #6 over the entire year, representing a composite average for all fuels combusted.

#### Fuel Inputs to Boiler #6 for 2007

Boiler #6		
Coal Tons/yr	Gas 1,000cf/yr	No. 2 Oil Gallons/yr
<b>51,331</b>	<b>57,575</b>	<b>0</b>
Coal (12,669 btu/lb)	Nat. Gas (1,030 btu/cf)	Oil (137,006 btu/gal)
MMBtu/yr		
1.30E+06	5.93E+04	0.00E+00

Total for Boiler #6 (MMBtu/yr)	1.36E+06
--------------------------------	----------

Total SO <sub>2</sub> Emissions from Boiler #6 (lb/yr)	227,648
<b>Total SO<sub>2</sub> Emissions from Boiler #6 (ton/yr)</b>	<b>113.82</b>

<b>SO<sub>2</sub> Emissions Associated with Coal Combustion (ton/yr)</b>	<b>113.82</b>
<b>SO<sub>2</sub> Emissions Associated with No. 2 Fuel Oil Combustion (ton/yr)</b>	<b>0.00</b>

# University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

Orange County

Facility ID # 6800043

Permit # 03069T20

## 2007 Annual Emissions Inventory

### Nitrogen Dioxide Emissions from Boiler #6

#### (ES-001-Boiler #6)

The exhaust duct at Boiler #6 is equipped with a continuous emissions monitor (CEMs) for NOx emissions. For the 2007 calendar year, 30 day facility averages for the NOx emission rate measured by the CEM are as follows:

Month	30 day average CEM reading (lb/MMBtu)
January 2007	0.40
February 2007	0.41
March 2007	0.32
April 2007	0.33
May 2007	0.22
June 2007	0.24
July 2007	0.21
August 2007	0.32
September 2007	0.18
October 2007	0.21
November 2007	0.25
December 2007	0.25
<b>Annual Average</b>	<b>0.28</b>

This average includes NOx emissions from coal, fuel oil, and natural gas from Boiler #6 over the entire year, representing a composite average for all fuels combusted.

#### Fuel Inputs to Boiler #6 for 2007

Boiler #6		
Coal Tons/yr	Gas 1,000cf/yr	No. 2 Oil Gallons/yr
51,331	57,575	0
Coal (12,669 btu/lb)	Nat. Gas (1,030 btu/cf)	Oil (137,006 btu/gal)
MMBtu/yr		
1.30E+06	5.93E+04	0.00E+00

Total for Boiler #6 (MMBtu/yr)	1.36E+06
--------------------------------	----------

Total NOx Emissions from Boiler #6 (lb/yr)	378,630
<b>Total NOx Emissions from Boiler #6 (ton/yr)</b>	<b>189.32</b>

NOx Emissions Associated with Coal Combustion (ton/yr)	181.06
NOx Emissions Associated with Fuel Oil No. 2 Combustion (ton/yr)	0.00
NOx Emissions Associated with Natural Gas Combustion (ton/yr)	8.26



# University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

Orange County

Facility ID # 6800043

Permit # 03069T20

## 2007 Annual Emissions Inventory

### Boiler No.6

### CO<sub>2</sub> Emissions from Limestone.

(ES-3)

Assume that the amount of total limestone distributed between boilers is proportional to percentage of total coal burned in each boiler.

Boiler #6	51,331	Tons/yr	50.7%
Boiler #7	49,980	Tons/yr	49.3%
Total	101,311	Tons/yr	100.0%

Total Limestone Used                      **19,238**    Tons/yr

Limestone Used in Boiler No.6            **9,747**    Tons/yr

85.0% CaCO<sub>3</sub>

100.09 MW, CaCO<sub>3</sub>

44.01 MW, CO<sub>2</sub>

5.00% MgCO<sub>3</sub>

83.43 MW, MgCO<sub>3</sub>

44.01 MW, CO<sub>2</sub>

CO<sub>2</sub> emission rate                              800.2    lb/ton

Boiler No.6                      3,900    tons/yr, CO<sub>2</sub>

# University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

Orange County

Facility ID # 6800043

Permit # 03069T20

## 2007 Annual Emissions Inventory

### **Boiler #7 (ES-002-Boiler #7)**

#### Operating Scenarios

#1 - Coal Firing

#2 - Natural Gas Firing

#4 - No.2 Fuel Oil Firing

(#3 - No.6 Fuel Oil Firing is no longer permitted)

Boilers #6 and #7 are equipped with Continuous Emission Monitoring (CEMs) devices to measure SO<sub>2</sub> and NO<sub>x</sub> emissions from each of the boilers. The monthly averages presented in the attached spreadsheets are for the total emissions from firing all types of fuel. The 2007 Annual Emission Inventory forms require that the emissions be divided among the three possible operating scenarios.

NO<sub>x</sub> emissions have been divided between the three operating scenarios based on the percentage of total heat input by each fuel. These calculations are detailed in the attached spreadsheets.

SO<sub>2</sub> emissions from natural gas combustion are insignificant, therefore, SO<sub>2</sub> emissions have been divided between the fuel oil and coal operating scenarios based on the percentage of total heat input by each fuel. These calculations are detailed in the attached spreadsheets.

### *Emissions Calculations*

SO<sub>2</sub> and NO<sub>x</sub> Emissions are taken from CEMs data

HCl emissions are based on stack testing for Boiler MACT HCl eligibility demonstration completed in year 2006

HF and Hg emissions are based on stack testing for Boiler MACT compliance planning completed in year 2004

All other estimates are from DAQ and EPA Emission Factors

<b>Emission Source/Operating Scenario Data</b> Page 1 of 2		<b>Facility ID #:</b> 680043					
<i>Boiler #7 - Operating Scenario #4 - No. 2 Fuel Oil</i> <small>If Emission Source has multiple Operating Scenarios, complete one form for each. (All permitted, Insignificant and/or Non-permitted Sources)</small>		<b>Permit #:</b> 03069T20					
<b>Facility Name:</b> University of North Carolina at Chapel Hill		<b>County:</b> Orange					
		<b>DAQ Region:</b> Raleigh					
<b>North Carolina Department of Environment and Natural Resources</b> <b>Division of Air Quality</b> <b>Air Pollutant Point Source Emissions Inventory - Calendar Year 2007</b>							
<b>1. Emission Source ID No.</b> (same as in permit - Use "U" prefix for non-permitted and "I" for insignificant)		ES-002-Boiler #7					
<b>2. Emission Source Description</b>		Coal / Natural Gas / No. 6 Fuel Oil Fired Circulating Fluidized Bed Combustion - Steam Generating Unit					
<b>3. Operating Scenario Description</b>		Operating Scenario #4 - No. 2 Fuel Oil					
<b>4. Maximum Permitted Operating Rate</b> <small>With Units (Ex. gal/hr, mmBtu/hr)</small>		323.17 MMBtu/hr					
<b>5. Throughput in CY</b> (e.g. production or fuel use) <small>With Units (Ex. lbs/yr, gal/yr)</small>		0 gallons/yr					
<b>6. Fuel Information</b> (if fuel used)		% Sulfur	0.50%				
		% Ash					
		Heat Content (Btu/lb or mmCF)	137,006 Btu/gal				
<small>If you do not provide annual throughput/fuel use, your inventory will be deemed incomplete and returned to you.</small>							
<b>7. Capture Efficiency</b> (% Emissions from Emission Source Vented to Control Device or Stack)		100%					
<b>8. Control Device Information</b> , if none, write "none"							
	<b>Control Device ID #</b> <small>(as listed in permit)</small>	<b>Control Device Description</b>					
<i>i. (nearest stack)</i>	CD-004	Bagfilter with Calcium Carbonate (CaCO <sub>3</sub> ) Sorbent Injection					
<i>ii.</i>	N/A	N/A					
<i>iii.</i>	N/A	N/A					
<i>iv.</i>	N/A	N/A					
<b>9. Stack Information</b> (sources vented to more than one stack use additional entry lines)							
Stack ID #	Height <small>(in whole feet)</small>	Diameter (feet) <small>Circle (enter #), Rectangle (L#, W#) (in 0.1 feet)</small>	Temperature <small>(F)</small>	Velocity <small>(feet/sec)</small>	Volume Flow Rate <small>(acfm)</small>	Release Point Description <small>(Fugitive, Vertical, Vertical w/ cap, Horizontal, Downward - see instructions)</small>	
EP-14-136	220	9	305	56.1	214,000	Vertical	
--	--	--	--	--	--	--	
--	--	--	--	--	--	--	
<b>10. Operating Schedule</b> (Source/Operating Scenario that best characterizes calendar year)							
Hours/Day	24	Days/Week	7	Weeks/Year	50	Hours/Year	7,848 Total
Typical Start & End Times in CY:				Start:	N/A	End:	N/A
<b>11. Seasonal Periods Percent Annual Throughput</b> (for Emission Source in CY, MUST total 100%)							
Jan-Feb, 2002 + Dec, 2002	#DIV/0!	Mar-May	#DIV/0!	June-Aug	#DIV/0!	Sept-Nov	#DIV/0!

To review instructions or get a blank copy, go to web page: <http://daq.state.nc.us/Offices/Planning/Attainment/est.html>

Copy and Use additional Sheets as needed

**Boiler #7 - Operating Scenario #4 - No. 2 Fuel Oil**If Emission Source has multiple Operating Scenarios, complete one form for each.  
(All permitted, Insignificant and/or Non-permitted Sources)Facility ID #: **6800043**Permit #: **03069T20**County: **Orange**DAQ Region: **Raleigh**Facility Name: **University of North Carolina at Chapel Hill**

**North Carolina Department of Environment and Natural Resources  
Division of Air Quality  
Air Pollutant Point Source Emissions Inventory - Calendar Year 2007**

**Emissions:** Attach calculations and documentation of emission factors or other estimation methods used.

Emission Source ID No. (same as in permit - Use "U" prefix for non-permitted and "I" for insignificant)

**ES-002-Boiler #7**

Criteria (NAAQS) Pollutants	Pollutant Code	Emissions Criteria (Tons/Year)	Emissions Estimation Method Code (see instructions for code)	Control Efficiency (Net after all controls)
Carbon Monoxide	CO	0.00	8	N/A
NOx	NOx	0.00	1	N/A
PM Total	PM	0.00	8	99.0%
PM-2.5	PM-2.5	0.00	8	99.0%
PM-10	PM-10	0.00	8	99.0%
SO2	SO2	0.00	1	90.00%
VOC	VOC	0.00	8	N/A
HAP/TAP Pollutants (In Alphabetical Order)	CAS # (or other code - see instructions)	Emissions HAP/TAP (Pounds/Year)	Emissions Estimation Method Code (see instructions for code)	Control Efficiency (Net after all controls)
Antimony	ANTIMONYCPDS	0.00E+00	8	99.0%
Arsenic	ARSENICCPDS	0.00E+00	8	99.0%
Benzene	71-43-2	0.00E+00	8	N/A
Beryllium	BERYLCPDS	0.00E+00	8	99.0%
Cadmium	CADMUMCPDS	0.00E+00	8	99.0%
Chromium	CROMCPDS	0.00E+00	8	99.0%
Chromium VI	CHROM6CPDS	0.00E+00	8	99.0%
Cobalt	COBALTCPDS	0.00E+00	8	99.0%
Ethylbenzene	100-41-4	0.00E+00	8	N/A
Fluoride	16984-48-8	0.00	8	N/A
Formaldehyde	50-00-0	0.00	8	N/A
Lead	LEADCPDS	0.00E+00	8	99.0%
Manganese	MANGCPDS	0.00E+00	8	99.0%
Mercury	MERCPDS	0.00E+00	8	99.0%
Methyl chloroform	71-55-6	0.00E+00	8	N/A
Napthalene	91-20-3	0.000	8	N/A
Nickel	NICKCPDS	0.00E+00	8	99.0%
POM	POM	0.00E+00	8	99.0%
Selenium	SEC	0.00E+00	8	99.0%
Toluene	108-88-3	0.00	8	N/A
Xylene	1330-20-7	0.00E+00	8	N/A
Greenhouse Gas Pollutants	Pollutant Code	Emissions Criteria (Tons/Year)	Emissions Estimation Method Code (see instructions for code)	Control Efficiency (Net after all controls)
Carbon Dioxide	CO <sub>2</sub>	0.00	8	N/A
Methane	CH <sub>4</sub>	0.00	8	N/A
Nitrous oxide	N <sub>2</sub> O	0.00	8	N/A

Emissions and data on this form required to report or verify emissions cannot be held confidential.

To review instructions or get a blank copy, go to web page: <http://daq.state.nc.us/Offices/Planning/Attainment/est.html>

Copy and Use additional Sheets as needed.

Emission Source/Operating Scenario Data Page 1 of 3

**Boiler #7 - Operating Scenario #1 - Coal**

If Emission Source has multiple Operating Scenarios, complete one form for each.  
(All permitted, Insignificant and/or Non-permitted Sources)

Facility Name: University of North Carolina at Chapel Hill

Facility ID #: 6800043  
 Permit #: 03069T20  
 County: Orange  
 DAQ Region: Raleigh

**North Carolina Department of Environment and Natural Resources  
 Division of Air Quality  
 Air Pollutant Point Source Emissions Inventory - Calendar Year 2007**

1. Emission Source ID No. (same as in permit - Use "U" prefix for non-permitted and "I" for insignificant)		<b>ES-002-Boiler #7</b>					
2. Emission Source Description		<b>Coal / Natural Gas / No. 2 Fuel Oil Fired Circulating Fluidized Bed Combustion - Steam Generating Unit</b>					
3. Operating Scenario Description		<b>Operating Scenario #1 - Coal</b>					
4. Maximum Permitted Operating Rate With Units (Ex. gal/hr, mmBtu/hr)		<b>323.17 MMBtu/hr</b>					
5. Throughput in CY (e.g. production or fuel use) With Units (Ex. lbs/yr, gal/yr)		<b>49,980</b>				<b>tons/yr</b>	
6. Fuel Information (if fuel used)		% Sulfur	<b>1.46%</b>	% Ash	<b>12.52%</b>	Heat Content (Btu/lb or mmCF)	<b>12669 Btu/lb</b>

If you do not provide annual throughput/fuel use, your inventory will be deemed incomplete and returned to you.

7. Capture Efficiency (% Emissions from Emission Source Vented to Control Device or Stack)	<b>100%</b>
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8. Control Device Information, if none, write "none"

	Control Device ID # (as listed in permit)	Control Device Description
i. (nearest stack)	<b>CD-004</b>	<b>Bagfilter with Calcium Carbonate (CaCO<sub>3</sub>) Sorbent Injection</b>
ii.	N/A	N/A
iii.	N/A	N/A
iv.	N/A	N/A

9. Stack Information (sources vented to more than one stack use additional entry lines)

Stack ID #	Height (in whole feet)	Diameter (feet) Circle (enter #), Rectangle (L#, W#) (in 0.1 feet)	Temperature (F)	Velocity (feet/sec)	Volume Flow Rate (acfm)	Release Point Description (Fugitive, Vertical, Vertical w/ cap, Horizontal, Downward - see instructions)
EP-14-136	<b>220</b>	<b>9</b>	<b>305</b>	<b>56.1</b>	<b>214,000</b>	<b>Vertical</b>
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10. Operating Schedule (Source/Operating Scenario that best characterizes calendar year)

Hours/Day	<b>24</b>	Days/Week	<b>7</b>	Weeks/Year	<b>50</b>	Hours/Year	<b>8,154 Total</b>
Typical Start & End Times in CY:				Start:	N/A	End:	N/A

11. Seasonal Periods Percent Annual Throughput (for Emission Source in CY, MUST total 100%)

Jan-Feb, 2002 + Dec, 2002	<b>34.46%</b>	Mar-May	<b>15.94%</b>	June-Aug	<b>27.42%</b>	Sept-Nov	<b>22.19%</b>
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To review instructions or get a blank copy, go to web page: <http://daq.state.nc.us/Offices/Planning/Attainment/est.html>

Copy and Use additional Sheets as needed

**Boiler #7 - Operating Scenario #1 - Coal**

If Emission Source has multiple Operating Scenarios, complete one form for each.  
(All permitted, Insignificant and/or Non-permitted Sources)

Facility Name: University of North Carolina at Chapel HillFacility ID #: 6800043Permit #: 03069T20County: OrangeDAQ Region: Raleigh

**North Carolina Department of Environment and Natural Resources  
Division of Air Quality**

**Air Pollutant Point Source Emissions Inventory - Calendar Year 2007**

**Emissions:** Attach calculations and documentation of emission factors or other estimation methods used.

Emission Source ID No. (same as in permit - Use "U" prefix for non-permitted and "I" for insignificant)

ES-002-Boiler #7

Criteria (NAAQS) Pollutants	Pollutant Code	Emissions Criteria (Tons/Year)	Emissions Estimation Method Code (see instructions for code)	Control Efficiency (Net after all controls)
Carbon Monoxide	CO	449.82	8	N/A
NOx	NOx	200.20	1	N/A
PM Total	PM	1.24	8	99.80%
PM-2.5	PM-2.5	0.73	8	97.90%
PM-10	PM-10	1.24	8	99.60%
SO2	SO2	114.54	1	90.00%
VOC	VOC	1.25	8	N/A
HAP/TAP Pollutants (In Alphabetical Order)	CAS # (or other code - see instructions)	Emissions HAP/TAP (Pounds/Year)	Emissions Estimation Method Code (see instructions for code)	Control Efficiency (Net after all controls)
Acetaldehyde	750-07-0	28.49	8	N/A
Acetophenone	98-86-2	0.75	8	N/A
Acrolein	107-02-8	14.49	8	N/A
Arsenic	ARSENICPDS	0.51	8	99.60%
Benzene	71-43-2	64.97	8	N/A
Benzo(a)pyrene	50-32-8	1.90E-03	8	N/A
Benzyl chloride	100-44-7	34.99	8	N/A
Beryllium	BERYLCPDS	23.81	8	N/A
Biphenyl	92-52-4	8.50E-02	8	N/A
Bis(2-ethylhexyl)phthalate (DEHP)	117-81-7	3.65	8	N/A
Bromine	7726-95-6	10.38	8	99.60%
Bromoform	75-25-2	1.95	8	N/A
Cadmium	CADMIUMCPDS	2.09E-02	8	99.60%
Carbon disulfide	75-10-0	6.50	8	N/A
2-Chloroacetophenone	532-27-4	0.35	8	N/A
Chlorobenzene	108-90-7	1.10	8	N/A
Chloroform	67-66-3	2.95	8	N/A
Chromium	CROMCPDS	0.82	8	99.60%
Chromium (VI)	CHROM6CPDS	0.82	8	99.60%
Cumene	98-82-8	0.26	8	N/A
Cyanide	CNC	124.95	8	N/A
Dibenzofurans	132-64-9	1.00E-02	8	N/A
Dimethyl sulfate	77-78-1	2.40	8	N/A
2,4-Dinitrotoluene	121-14-2	1.40E-02	8	N/A
Ethyl benzene	100-41-4	4.70	8	N/A
Ethyl chloride	75-00-3	2.10	8	N/A
Ethylene dibromide	106-93-4	6.00E-02	8	N/A
Ethylene dichloride	107-06-2	2.00	8	N/A

**Emissions and data on this form required to report or verify emissions cannot be held confidential.**

To review instructions or get a blank copy, go to web page: <http://daq.state.nc.us/Offices/Planning/Attainment/est.html>

Copy and Use additional Sheets as needed.

## Boiler #7 - Operating Scenario #1 - Coal

If Emission Source has multiple Operating Scenarios, complete one form for each.  
(All permitted, Insignificant and/or Non-permitted Sources)

Facility ID #: 6800043

Permit #: 03069T20

County: Orange

DAQ Region: Raleigh

Facility Name: University of North Carolina at Chapel Hill

## North Carolina Department of Environment and Natural Resources

## Division of Air Quality

## Air Pollutant Point Source Emissions Inventory - Calendar Year 2007

**Emissions:** Attach calculations and documentation of emission factors or other estimation methods used.

Emission Source ID No. (same as in permit - Use "U" prefix for non-permitted and "I" for insignificant)

ES-002-Boiler #7

Criteria (NAAQS) Pollutants	Pollutant Code	Emissions Criteria (Tons/Year)	Emissions Estimation Method Code (see instructions for code)	Control Efficiency (Net after all controls)
Carbon Monoxide	CO	N/A	N/A	N/A
NOx	NOx	N/A	N/A	N/A
PM Total	PM	N/A	N/A	N/A
PM-2.5	PM-2.5	N/A	N/A	N/A
PM-10	PM-10	N/A	N/A	N/A
SO2	SO2	N/A	N/A	N/A
VOC	VOC	N/A	N/A	N/A
HAP/TAP Pollutants (In Alphabetical Order)	CAS # (or other code - see instructions)	Emissions HAP/TAP (Pounds/Year)	Emissions Estimation Method Code (see instructions for code)	Control Efficiency (Net after all controls)
Formaldehyde	50-00-00	12.00	8	N/A
Hexane	HEXANEISO	3.35	8	N/A
Hydrogen Chloride ***	7647-01-0	49579.93	8	N/A
Hydrogen Fluoride ***	7664-39-3	2199.11	8	90% Control with CaCO <sub>3</sub>
Isophorone	78-59-1	28.99	8	N/A
Lead	LEADCPDS	0.33	8	99.60%
Manganese	MANGCPDS	1.42	8	99.60%
Mercury***	MERCCPDS	1.86	8	N/A
Methyl bromide	74-83-9	8.00	8	N/A
Methyl chloride	74-87-3	26.49	8	N/A
Methyl ethyl ketone	78-93-3	19.49	8	N/A
Methyl hydrazine	60-34-4	8.50	8	N/A
Methyl methacrylate	80-62-6	1.00	8	N/A
Methyl tert butyl ether	1634-04-4	1.75	8	N/A
Methylene chloride	75-09-2	14.49	8	N/A
Naphthalene	91-20-3	0.65	8	N/A
Nickel	NICKCPDS	0.67	8	99.60%
Phenol	108-95-2	0.80	8	N/A
POM	POM	2.84	8	N/A
Propionaldehyde	123-38-6	18.99	8	N/A
Styrene	100-42-5	1.25	8	N/A
2,3,7,8-TCDD	1746-01-6	7.15E-07	8	N/A
Tetrachloroethylene	79-34-5	2.15	8	N/A
Toluene	108-88-3	12.00	8	N/A
1,1,1-Trichloroethane	79-00-5	1.00	8	N/A
Vinyl acetate	108-05-4	0.38	8	N/A
Xylenes	1330-20-7	1.85	8	N/A
Greenhouse Gas Pollutants	Pollutant Code	Emissions Criteria (Tons/Year)	Emissions Estimation Method Code (see instructions for code)	Control Efficiency (Net after all controls)
Carbon Dioxide	CO <sub>2</sub>	141,109.36	8	N/A
Methane	CH <sub>4</sub>	1.50	8	N/A
Nitrous oxide	N <sub>2</sub> O	87.46	8	N/A

<b>Emission Source/Operating Scenario Data</b> Page 1 of 2		<b>Facility ID #:</b> 6800043					
<i>Boiler #7 - Operating Scenario #2 - Natural Gas</i> <small>If Emission Source has multiple Operating Scenarios, complete one form for each. (All permitted, Insignificant and/or Non-permitted Sources)</small>		<b>Permit #:</b> 03069T20					
<b>Facility Name:</b> University of North Carolina at Chapel Hill		<b>County:</b> Orange					
		<b>DAQ Region:</b> Raleigh					
<b>North Carolina Department of Environment and Natural Resources</b> <b>Division of Air Quality</b> <b>Air Pollutant Point Source Emissions Inventory - Calendar Year 2007</b>							
<b>1. Emission Source ID No.</b> (same as in permit - Use "U" prefix for non-permitted and "I" for insignificant)		ES-002-Boiler #7					
<b>2. Emission Source Description</b>		Coal / Natural Gas / No. 2 Fuel Oil Fired Circulating Fluidized Bed Combustion - Steam Generating Unit					
<b>3. Operating Scenario Description</b>		Operating Scenario #2 - Natural Gas					
<b>4. Maximum Permitted Operating Rate</b> <small>With Units (Ex. gal/hr, mmBtu/hr)</small>		323.17 MMBtu/hr					
<b>5. Throughput in CY</b> (e.g. production or fuel use) <small>With Units (Ex. lbs/yr, gal/yr)</small>		104,963	1,000 ft <sup>3</sup> /yr				
<b>6. Fuel Information</b> (if fuel used)	% Sulfur	N/A	% Ash				
		N/A	Heat Content (Btu/lb or mmCF)				
			1,030 Btu/ft <sup>3</sup>				
If you do not provide annual throughput/fuel use, your inventory will be deemed incomplete and returned to you.							
<b>7. Capture Efficiency</b> (% Emissions from Emission Source Vented to Control Device or Stack)		100%					
<b>8. Control Device Information</b> , if none, write "none"							
	<b>Control Device ID #</b> <small>(as listed in permit)</small>	<b>Control Device Description</b>					
i. (nearest stack)	CD-004	Bagfilter with Calcium Carbonate (CaCO <sub>3</sub> ) Sorbent Injection					
ii.	N/A	N/A					
iii.	N/A	N/A					
iv.	N/A	N/A					
<b>9. Stack Information</b> (sources vented to more than one stack use additional entry lines)							
Stack ID #	Height <small>(in whole feet)</small>	Diameter (feet) <small>Circle (enter #), Rectangle (L#, W#) (in 0.1 feet)</small>	Temperature <small>(F)</small>	Velocity <small>(feet/sec)</small>	Volume Flow Rate <small>(acfm)</small>	Release Point Description <small>(Fugitive, Vertical, Vertical w/ cap, Horizontal, Downward - see instructions)</small>	
EP-14-136	220	9	305	56.1	214,000	Vertical	
--	--	--	--	--	--	--	
--	--	--	--	--	--	--	
<b>10. Operating Schedule</b> (Source/Operating Scenario that best characterizes calendar year)							
Hours/Day	24	Days/Week	7	Weeks/Year	50	Hours/Year	7,848 Total
Typical Start & End Times in CY:				Start:	N/A	End:	N/A
<b>11. Seasonal Periods Percent Annual Throughput</b> (for Emission Source in CY, MUST total 100%)							
Jan-Feb, 2002 + Dec, 2002	0.24%	Mar-May	2.09%	June-Aug	10.04%	Sept-Nov	87.62%



Facility ID #: **6800043**  
 Permit #: **03069T20**  
 County: **Orange**  
 DAQ Region: **Raleigh**

Facility Name: University of North Carolina at Chapel Hill

**North Carolina Department of Environment and Natural Resources  
 Division of Air Quality  
 Air Pollutant Point Source Emissions Inventory - Calendar Year 2007**

**Emissions:** Attach calculations and documentation of emission factors or other estimation methods used.

Emission Source ID No. (same as in permit - Use "U" prefix for non-permitted and "I" for insignificant) ES-002-Boiler #7

Criteria (NAAQS) Pollutants	Pollutant Code	Emissions Criteria (Tons/Year)	Emissions Estimation Method Code (see instructions for code)	Control Efficiency (Net after all controls)
Carbon Monoxide	CO	4.41	8	N/A
NOx	NOx	17.09	1	N/A
PM Total	PM	0.40	8	N/A
PM-2.5	PM-2.5	0.40	8	N/A
PM-10	PM-10	0.40	8	N/A
SO2	SO2	0.00	1	N/A
VOC	VOC	0.29	8	N/A
HAP/TAP Pollutants (In Alphabetical Order)	CAS # (or other code - see instructions)	Emissions HAP/TAP (Pounds/Year)	Emissions Estimation Method Code (see instructions for code)	Control Efficiency (Net after all controls)
Arsenic	ARSENICPDS	2.10E-02	8	N/A
Benzene	71-43-2	0.22	8	N/A
Cadmium	CADMIUMCPDS	1.15E-01	8	N/A
Chromium	CROMCPDS	1.47E-01	8	N/A
Chromium VI	CHROM6CPDS	1.47E-01	8	N/A
Dichlorobenzene	106-46-7	1.26E-01	8	N/A
Formaldehyde	50-00-0	7.87	8	N/A
Hexane	HEXANEISO	1.89E+02	8	N/A
Lead	LEADCPDS	5.25E-02	8	N/A
Manganese	MANGCPDS	3.99E-02	8	N/A
Mercury	MERCPDS	2.73E-02	8	N/A
Napthalene	91-20-3	6.40E-02	8	N/A
Nickel	NICKCPDS	0.22	8	N/A
POM	POM	6.95E-02	8	N/A
Toluene	108-88-3	0.36	8	N/A
Greenhouse Gas Pollutants	Pollutant Code	Emissions Criteria (Tons/Year)	Emissions Estimation Method Code (see instructions for code)	Control Efficiency (Net after all controls)
Carbon Dioxide	CO <sub>2</sub>	6,316.54	8	N/A
Methane	CH <sub>4</sub>	0.121	8	N/A
Nitrous oxide	N <sub>2</sub> O	0.115	8	N/A

# **University of North Carolina at Chapel Hill**

Chapel Hill, North Carolina

*Orange County*

Facility ID # 6800043

Permit # 03069T20

## **2007 Annual Emissions Inventory**

**Boiler #7**

**(ES-002-Boiler #7)**

***Emissions Calculations***

SO<sub>2</sub> and NO<sub>x</sub> Emissions are Taken from CEMs data

HCl, HF, Hg emissions are based on stack test data

All other estimates are from DAQ Spreadsheets

**Fuel Oil Combustion Emissions Calculator FO2000 Revision A**  
**2007 Annual Emissions Inventory**  
**Boiler #7**  
**(ES-002-Boiler #7)**  
**Facility ID # 6800043**  
**Permit # 03069T20**

Operating Scenario #4 - No.2 Fuel Oil

<b>User Input</b>	
Company Name:	University of North Carolina at
Plant County:	Chapel Hill
Plant City:	Orange County
Permit Number:	Chapel Hill
User:	03069T20
Heat Input Capacity (mmBtu/hr):	RST Engineering
Fuel Input Capacity (10 <sup>3</sup> gal/hr):	323.17
Annual Fuel Throughput (1000 gal):	2.31
Maximum fuel sulfur content (%):	0.000
Latest Construction/Modification Date:	0.5
	N/A
<b>Enter the boiler type below</b> ▾	
	15

<b>Boilers =&gt;100 mmBtu/hr</b> 1 = No. 6 oil fired, normal firing (U) 2 = No. 6 oil fired, normal firing (I) 3 = No. 6 oil fired, normal firing (C) 4 = No. 6 oil fired, normal firing, low NOx burner (U) 5 = No. 6 oil fired, normal firing, low NOx burner (I) 6 = No. 6 oil fired, normal firing, low NOx burner (C) 7 = No. 6 oil fired, tangential firing (U) 8 = No. 6 oil fired, tangential firing, low NOx burner (U) 9 = No. 5 oil fired, normal firing (U) 10 = No. 5 oil fired, normal firing (I) 11 = No. 5 oil fired, tangential firing (U) 12 = No. 4 oil fired, normal firing (U) 13 = No. 4 oil fired, normal firing (I) 14 = No. 4 oil fired, tangential firing (U) 15 = No. 2 oil fired (U,I)	<b>Boilers =&gt;100 mmBtu/hr (cont'd)</b> 16 = No. 2 oil fired (C) 17 = No. 2 oil fired, LNB/FGR (U,I) 18 = No. 2 oil fired, LNB/FGR (C)
	19 = Vertical fired utility boiler
	<b>Small Boilers (&lt;100 mmBtu/hr)</b> 20 = No. 6 oil fired (I) 21 = No. 6 oil fired (C) 22 = No. 5 oil fired (C) 23 = No. 4 oil fired (C) 24 = No. 2 oil fired (I) 25 = No. 2 oil fired (C)
	26 = Residential Furnace

**Emission Controls**

Particulate controls

<b>Enter the control type below</b> ▾	Message Area	Or enter a PM control efficiency below to override built in values.														
	3															
<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 80%;">Control Device</th> <th style="width: 20%;">Avg. Cont. Effic.</th> </tr> </thead> <tbody> <tr> <td>0 = None/other</td> <td></td> </tr> <tr> <td>1 = ESP</td> <td></td> </tr> <tr> <td>2 = Scrubber</td> <td></td> </tr> <tr> <td>3 = Bagfilter</td> <td style="text-align: center;">99.0</td> </tr> <tr> <td>4 = Multiple cyclone</td> <td></td> </tr> </tbody> </table>	Control Device	Avg. Cont. Effic.	0 = None/other		1 = ESP		2 = Scrubber		3 = Bagfilter	99.0	4 = Multiple cyclone			<table border="1" style="width: 100%; border-collapse: collapse;"> <tbody> <tr> <td style="padding: 5px;">User Input PM Cont. Effic.</td> </tr> <tr> <td style="padding: 5px;">Message Area</td> </tr> </tbody> </table>	User Input PM Cont. Effic.	Message Area
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User Input PM Cont. Effic.																
Message Area																

Postcombustion SO<sub>2</sub> controls

<b>Enter the control type below</b> ▾	Message Area	Or enter an SO <sub>2</sub> control efficiency
---------------------------------------	--------------	--

0	below to override built in values.
<b>Control Technology/Process</b>	<b>User Input SO<sub>2</sub> Cont. Effic.</b>
0 = None/other	90.0
1 = Wet scrubber, Lime/limestone	<b>User entered control efficiency may be overestimated and should be documented.</b>
2 = Wet scrubber, Sodium carbonate	<b>Avg. Cont. Effic.</b>
3 = Wet scrubber, Magnesium oxide/hydroxide	0.0
4 = Wet scrubber, Dual alkali	<b>Remarks</b>
5 = Spray drying, calcium hydroxide slurry, vap. in spray vessel	NA
6 = Furnace injection, Dry calcium carbonate/hydrate inj. in upper furn. cavity	
7 = Duct injection, Dry sorbent injection into duct, sometimes combined with water spray	

NO<sub>x</sub> controls

<b>Enter the control type below</b> ▾	Message Area	Or enter a NO <sub>x</sub> control efficiency below to override built in values.
0		
<b>Control Technology/Process</b>		<b>User Input NO<sub>x</sub> Cont. Effic.</b>
0 = None/other		0.0
1 = Low excess air (LEA)	<b>Avg. Cont. Effic.</b>	Message Area
2 = Staged combustion (SC)	0.0	
3 = Burners out of service (BOOS)	<b>Remarks</b>	
4 = Flue gas recirculation (FGR)	NA	
5 = Flue gas recirculation plus staged combustion		
6 = Low NO <sub>x</sub> burners (LNB)		
7 = Reduced air preheat (RAP)		
8 = Selective noncatalytic reduction (SNCR)		
9 = Conventional selective catalytic reduction (SCR)		

**Emissions Output (for operation 6.79 hr/yr)**

<b>Criteria Pollutants</b>				<b>Emission Factor<sup>1</sup></b>
Pollutant	lb/hr <sup>2</sup>	tpy	lb/yr <sup>3</sup>	(lb/10 <sup>3</sup> gal)
Total PM (FPM + CPM)	3.0	0.0000	0	3.30E+00
Filterable PM (FPM) rates @ 99% control	0.0	0.0000	0	2.00E+00
Condensable PM (CPM) <sup>4</sup>	3.0	0.0000	0	1.30E+00
Filterable PM-10 <sup>5</sup>	0.0	0.0000	0	1.00E+00
Filterable PM-2.5 <sup>5</sup>	0.0	0.0000	0	2.50E-01
NO <sub>x</sub> rates uncontrolled	see attached CEMs-based calculations			2.40E+01
NMTOC	0	0.0000	0	2.00E-01
CO	12	0.0000	0	5.00E+00
SO <sub>2</sub> rates @ 90% control	see attached CEMs-based calculations			2.98E+02
Total HAP <sup>6</sup>	4.17E-01	0.0000	0	1.81E-01
Largest HAP <sup>6</sup>	1.84E-01	0.0000	0	7.97E-02

<b>Toxic/Hazardous Air Pollutants.</b>				<b>Emission Factor<sup>1</sup></b>
Pollutant	lb/hr <sup>2</sup>	lb/day <sup>7</sup>	lb/yr <sup>3</sup>	(lb/10 <sup>3</sup> gal)
Antimony rates @ 99% control	0.00E+00	NA	0.00E+00	0.00E+00
Arsenic rates @ 99% control	1.29E-05	NA	0.00E+00	5.60E-04
Benzene	6.35E-03	NA	0.00E+00	2.75E-03
Beryllium rates @ 99% control	9.70E-06	NA	0.00E+00	4.20E-04
Cadmium rates @ 99% control	9.70E-06	NA	0.00E+00	4.20E-04
Chromium rates @ 99% control	9.70E-06	NA	0.00E+00	4.20E-04
Chromium VI rates @ 99% control	2.85E-06	NA	0.00E+00	1.23E-04
Cobalt rates @ 99% control	0.00E+00	NA	0.00E+00	0.00E+00
Ethylbenzene	1.89E-03	NA	0.00E+00	8.17E-04
Fluoride	8.61E-02	2.07E+00	0.00E+00	3.73E-02
Formaldehyde	1.11E-01	2.66E+00	0.00E+00	4.80E-02
Lead rates @ 99% control	2.91E-05	NA	0.00E+00	1.26E-03
Manganese rates @ 99% control	1.94E-05	4.65E-04	0.00E+00	8.40E-04
Mercury	9.70E-04	2.33E-02	0.00E+00	4.20E-04
Methyl chloroform (1,1,1-Trichloroethane)	5.45E-04	1.31E-02	0.00E+00	2.36E-04
Napthalene	7.69E-04	NA	0.00E+00	3.33E-04
Nickel rates @ 99% control	9.70E-06	2.33E-04	0.00E+00	4.20E-04
POM rates @ 99% control	7.62E-05	NA	0.00E+00	3.30E-03
Selenium rates @ 99% control	4.85E-05	NA	0.00E+00	2.10E-03

Toluene	1.84E-01	4.41E+00	0.00E+00	7.97E-02
Xylene	3.23E-03	7.76E-02	0.00E+00	1.40E-03

Greenhouse Gases				Emission Factor (lb/10 <sup>3</sup> gal)
Pollutant	lb/hr <sup>2</sup>	tpy	lb/yr <sup>3</sup>	
Carbon dioxide	50,491	0.0	0	21873.00
Methane	4.99E-01	0.00E+00	0.00E+00	0.216
Nitrous Oxide	2.54E-01	0.00E+00	0.00E+00	0.11

<sup>1</sup>Emission factors represent AP-42 uncontrolled values. Emission rates are reflective of controls where applicable.

<sup>2</sup>Hourly emission rates for all pollutants are based on hourly rated capacity.

<sup>3</sup>Annual emission rates for all pollutants are based on maximum annual fuel throughput.

<sup>4</sup>Wet scrubbers are assumed to control CPM whereas other PM control devices are assumed to only control FPM.

<sup>5</sup>AP-42 assumes PM-10 and PM-2.5 assumes these pollutants are controlled with the same efficiency as total PM.

<sup>6</sup>Total and largest HAP factors and emission rates do not reflect control of metals. Individual metal emission rates are reflective of particulate matter controls where applicable.

<sup>7</sup>Daily emission rates are based on operation 24 hours per day at rated capacity.

# Bituminous Coal Combustion

2007 Annual Emissions Inventory

Facility **University of North Carolina at Chapel Hill**  
 City **Chapel Hill**  
 County **Orange County**

APP #/Fac ID **6800043**  
 Input By **RST Engineering**  
 Source ID **Boiler #7**

Operating Scenario #1

(ES-002-Boiler #7)

## Data Input

Maximum Heat Input  mmBtu/hr

Boiler Size/Type

Actual Fuel Usage  ton/yr  
 or  
 Hours of Operation  hr/yr  
 and  
 Heating Value  Btu/lb  
 ton/yr

Sulfur Content  %

Ash Content :  %

(B)ituminous or (S)ubbituminous?  (B/S)

Calcium to Sulfur Ratio

### Boiler Type:

- |                          |                       |
|--------------------------|-----------------------|
| 1) Pulverized/Dry Bottom | 6) Underfeed Stoker   |
| 2) Pulverized/Wet Bottom | 7) Fluidized Bed Cir. |
| 3) Cyclone Furnace       | 8) Fluidized Bed Bub. |
| 4) Spreader Stoker       | 9) Hand Fed           |
| 5) Overfeed Stoker       |                       |

### Control Device Efficiencies:

PM	<input type="text" value="99.80"/>	%
PM-10	<input type="text" value="99.60"/>	%
PM-2.5	<input type="text" value="97.90"/>	%
SOx*	<input type="text" value="90.00"/>	%
NOx*	<input type="text" value="0.00"/>	%

*\*SOx and NOx emission estimates were calculated using CEMS data. Please refer to the SOx and NOx emissions data presented in the following CEMs spreadsheets.  
 HCl, HF, and Hg emissions based on stack test data.*

# Bituminous Coal Combustion

2007 Annual Emissions Inventory

Facility **University of North Carolina at Chapel Hill**  
 City **Chapel Hill**  
 County **Orange County**

APP #/Fac ID **6800043**  
 Input By **RST Engineering**  
 Source ID **Boiler #7**

Operating Scenario #1

(ES-002-Boiler #7)

## ACTUAL CRITERIA EMISSIONS

Pollutant	Factor		Emission Rates	
	(lb poll./ton coal)	(lb/hr)	(lb/yr)	(tpy)
PM	17	0.63	2,479	1.24
PM-10	12.4	0.63	2,479	1.24
PM-2.5*	1.4	0.37	1,469	0.73
SO2	12.71	**	**	**
SO3*	0.09	**	**	**
NOx	3.90	**	**	**
VOC	0.05	0.64	2,499	1.25
CO	18	229.58	899,636	449.82

## ACTUAL TOXIC EMISSIONS

Pollutant	Factor		Emission Rates	
	(lb poll./ton coal)	(lb/hr)	(lb/yr)	(tpy)
Acetaldehyde	5.70E-04	7.27E-03	2.85E+01	1.42E-02
Acetophenone	1.50E-05	1.91E-04	7.50E-01	3.75E-04
Acrolein	2.90E-04	3.70E-03	1.45E+01	7.25E-03
Arsenic	5.13E-03	1.31E-04	5.13E-01	2.56E-04
Benzene	1.30E-03	1.66E-02	6.50E+01	3.25E-02
Benzo(a)pyrene	3.80E-08	4.85E-07	1.90E-03	9.50E-07
Benzyl chloride	7.00E-04	8.93E-03	3.50E+01	1.75E-02
Beryllium	4.76E-04	6.08E-03	2.38E+01	1.19E-02
Biphenyl	1.70E-06	2.17E-05	8.50E-02	4.25E-05
Bis(2-ethylhexyl)phthalate (DEHP)	7.30E-05	9.31E-04	3.65E+00	1.82E-03
Bromine	1.04E-01	2.65E-03	1.04E+01	5.19E-03
Bromoform	3.90E-05	4.97E-04	1.95E+00	9.75E-04
Cadmium	2.09E-04	5.33E-06	2.09E-02	1.04E-05
Carbon disulfide	1.30E-04	1.66E-03	6.50E+00	3.25E-03
2-Chloroacetophenone	7.00E-06	8.93E-05	3.50E-01	1.75E-04
Chlorobenzene	2.20E-05	2.81E-04	1.10E+00	5.50E-04
Chloroform	5.90E-05	7.53E-04	2.95E+00	1.47E-03
Chromium	8.20E-03	2.09E-04	8.19E-01	4.10E-04
Chromium (VI)	8.20E-03	2.09E-04	8.19E-01	4.10E-04
Cumene	5.30E-06	6.76E-05	2.65E-01	1.32E-04
Cyanide	2.50E-03	3.19E-02	1.25E+02	6.25E-02
Dibenzofurans	2.01E-07	2.56E-06	1.00E-02	5.02E-06
Dimethyl sulfate	4.80E-05	6.12E-04	2.40E+00	1.20E-03
2,4-Dinitrotoluene	2.80E-07	3.57E-06	1.40E-02	7.00E-06
Ethyl benzene	9.40E-05	1.20E-03	4.70E+00	2.35E-03
Ethyl chloride	4.20E-05	5.36E-04	2.10E+00	1.05E-03
Ethylene dibromide	1.20E-06	1.53E-05	6.00E-02	3.00E-05
Ethylene dichloride	4.00E-05	5.10E-04	2.00E+00	1.00E-03
Formaldehyde	2.40E-04	3.06E-03	1.20E+01	6.00E-03
Hexane	6.70E-05	8.55E-04	3.35E+00	1.67E-03
Hydrogen Chloride ***	<b>9.92E-01</b>	1.27E+01	4.96E+04	2.48E+01
Hydrogen Fluoride ***	<b>4.40E-02</b>	5.61E-01	2.20E+03	1.10E+00
Isophorone	5.80E-04	7.40E-03	2.90E+01	1.45E-02
Lead	3.31E-03	8.44E-05	3.31E-01	1.65E-04

\*\*SO<sub>2</sub> and NOx emissions were estimated using CEMS data, please refer to the attached data sheets entitled "Sulfur Dioxide Emissions from Boiler #7" and Nitrogen Dioxide Emissions from Boiler #7".

\*\*\* HCl, HF, and Hg emissions based on stack test data.

# Bituminous Coal Combustion

2007 Annual Emissions Inventory

Facility **University of North Carolina at Chapel Hill**  
 City **Chapel Hill**  
 County **Orange County**

APP #/Fac ID **6800043**  
 Input By **RST Engineering**  
 Source ID **Boiler #7**

Operating Scenario #1

(ES-002-Boiler #7)

## Actual Toxic Emissions (cont...)

Pollutant	Factor		Emission Rates	
	(lb poll./ton coal)	(lb/hr)	(lb/yr)	(tpy)
Manganese	1.42E-02	3.61E-04	1.42E+00	7.08E-04
Mercury***	<b>3.73E-05</b>	4.75E-04	1.86E+00	9.31E-04
Methyl bromide	1.60E-04	2.04E-03	8.00E+00	4.00E-03
Methyl chloride	5.30E-04	6.76E-03	2.65E+01	1.32E-02
Methyl ethyl ketone	3.90E-04	4.97E-03	1.95E+01	9.75E-03
Methyl hydrazine	1.70E-04	2.17E-03	8.50E+00	4.25E-03
Methyl methacrylate	2.00E-05	2.55E-04	1.00E+00	5.00E-04
Methyl tert butyl ether	3.50E-05	4.46E-04	1.75E+00	8.75E-04
Methylene chloride	2.90E-04	3.70E-03	1.45E+01	7.25E-03
Naphthalene	1.30E-05	1.66E-04	6.50E-01	3.25E-04
Nickel	6.74E-03	1.72E-04	6.74E-01	3.37E-04
Phenol	1.60E-05	2.04E-04	8.00E-01	4.00E-04
POM	5.68E-05	7.24E-04	2.84E+00	1.42E-03
Propionaldehyde	3.80E-04	4.85E-03	1.90E+01	9.50E-03
Styrene	2.50E-05	3.19E-04	1.25E+00	6.25E-04
2,3,7,8-TCDD	1.43E-11	1.82E-10	7.15E-07	3.57E-10
Tetrachloroethylene	4.30E-05	5.48E-04	2.15E+00	1.07E-03
Toluene	2.40E-04	3.06E-03	1.20E+01	6.00E-03
1,1,1-Trichloroethane	2.00E-05	2.55E-04	1.00E+00	5.00E-04
Vinyl acetate	7.60E-06	9.69E-05	3.80E-01	1.90E-04
Xylenes	3.70E-05	4.72E-04	1.85E+00	9.25E-04
Total HAPs		13.34	52,271.20	26.14

## Greenhouse Gases

Pollutant	Factor		Emission Rates	
	(lb poll./ton coal)	(lb/hr)	(lb/yr)	(tpy)
Carbon dioxide	5494.70	70081.39	274,623,842	137,311.92
Methane	0.06	0.77	2,999	1.50
Nitrous Oxide	3.50	44.64	174,929	87.46

### Notes :

- 1) Emission factors are from Supplement B to the 5th edition of AP-42, unless otherwise noted
- 2) Emission calculations will be based on the hours of operation only when actual fuel usage is not supplied
- 3) Particulate controls affect PM, PM-10, PM-2.5, and all toxics that are regulated as particulates except Mercury
- 4) VOC = NMTOC = TOC \* (1-%METHANE)
- 5) PM-2.5 and SO3 do not currently need to be reported
- 6) Dibenzofurans = Polychlorinated dibenzo-p-furans
- 7) The Br emission factor is based on a mass balance generated from a 3 year coal analysis for Duke Power (1990-1992,



**Natural Gas Combustion Emissions Calculator NG2000 Revision C**  
**2007 Annual Emissions Inventory**  
**Boiler #7**  
*(ES-002-Boiler #7)*

Facility ID # 6800043  
 Permit # 03069T20

**Operating Scenario #2**

<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th colspan="2" style="text-align: left; background-color: #f2f2f2;">User Input</th> </tr> <tr> <td style="width: 35%;">Company Name:</td> <td style="text-align: center;">University of North Carolina at Chapel Hill</td> </tr> <tr> <td>Plant County:</td> <td style="text-align: center;">Orange County</td> </tr> <tr> <td>Plant City:</td> <td style="text-align: center;">Chapel Hill</td> </tr> <tr> <td>Permit Number:</td> <td style="text-align: center;">03069T20</td> </tr> <tr> <td>User:</td> <td style="text-align: center;">RST Engineering</td> </tr> <tr> <td>Heat Input Capacity (mmBtu/hr):</td> <td style="text-align: center;">323.17</td> </tr> <tr> <td>Fuel Input Capacity (10<sup>6</sup> scf/hr):</td> <td style="text-align: center;">0.32</td> </tr> <tr> <td>Annual Fuel Throughput (10<sup>6</sup> scf):</td> <td style="text-align: center;">104.96</td> </tr> <tr> <td>Latest Construction/Modification Date:</td> <td style="text-align: center;">N/A</td> </tr> </table> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="background-color: #f2f2f2;">Enter the boiler type below ▾</td> <td style="text-align: center;">2</td> </tr> </table> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="background-color: #f2f2f2;">Other NOx Control</td> <td style="text-align: center;">4</td> </tr> </table> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="background-color: #f2f2f2;">Large Wall-Fired Boilers (=&gt;100 mmBtu/hr)</td> </tr> <tr> <td>1 = Uncontrolled (Pre-NSPS)</td> </tr> <tr> <td>2 = Uncontrolled (Post-NSPS)</td> </tr> <tr> <td>3 = Controlled - Low NOx burners</td> </tr> <tr> <td>4 = Controlled - Flue gas recirculation (FGR)</td> </tr> </table> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="background-color: #f2f2f2;">Small Boilers (&lt;100 mmBtu/hr)</td> </tr> <tr> <td>5 = Uncontrolled</td> </tr> <tr> <td>6 = Controlled - Low NOx burners</td> </tr> <tr> <td>7 = Controlled - Low NOx burners/FGR</td> </tr> </table> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="background-color: #f2f2f2;">Tangential-Fired Boilers (All Sizes)</td> </tr> <tr> <td>8 = Uncontrolled</td> </tr> <tr> <td>9 = Controlled - FGR</td> </tr> </table> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="background-color: #f2f2f2;">Residential Furnaces (&lt;0.3 mmBtu/hr)</td> </tr> <tr> <td>10 = Uncontrolled</td> </tr> </table>	User Input		Company Name:	University of North Carolina at Chapel Hill	Plant County:	Orange County	Plant City:	Chapel Hill	Permit Number:	03069T20	User:	RST Engineering	Heat Input Capacity (mmBtu/hr):	323.17	Fuel Input Capacity (10 <sup>6</sup> scf/hr):	0.32	Annual Fuel Throughput (10 <sup>6</sup> scf):	104.96	Latest Construction/Modification Date:	N/A	Enter the boiler type below ▾	2	Other NOx Control	4	Large Wall-Fired Boilers (=>100 mmBtu/hr)	1 = Uncontrolled (Pre-NSPS)	2 = Uncontrolled (Post-NSPS)	3 = Controlled - Low NOx burners	4 = Controlled - Flue gas recirculation (FGR)	Small Boilers (<100 mmBtu/hr)	5 = Uncontrolled	6 = Controlled - Low NOx burners	7 = Controlled - Low NOx burners/FGR	Tangential-Fired Boilers (All Sizes)	8 = Uncontrolled	9 = Controlled - FGR	Residential Furnaces (<0.3 mmBtu/hr)	10 = Uncontrolled	<table border="1" style="width: 100%; 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# University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

Orange County

Facility ID # 6800043

Permit # 03069T20

## 2007 Annual Emissions Inventory

### Sulfur Dioxide Emissions from Boiler #7

#### (ES-002-Boiler #7)

The exhaust duct at Boiler #7 is equipped with a continuous emissions monitor (CEMs) for SO<sub>2</sub> emissions.

For the 2007 calendar year, 30 day facility averages for the SO<sub>2</sub> emission rate measured by the CEM are as follows:

Month	30 day average CEM reading (lb/MMBtu)
January 2007	0.170
February 2007	0.170
March 2007	0.163
April 2007	0.157
May 2007	0.170
June 2007	0.170
July 2007	0.170
August 2007	0.170
September 2007	0.170
October 2007	0.170
November 2007	0.160
December 2007	0.160
<b>Annual Average</b>	<b>0.167</b>

This average includes SO<sub>2</sub> emissions from coal, fuel oil, and natural gas from Boiler #7 over the entire year, representing a composite average for all fuels combusted.

#### Fuel Inputs to Boiler #7 for 2007

Boiler #7		
Coal Tons/yr	Gas 1,000cf/yr	No. 2 Oil Gallons/yr
<b>49,980</b>	<b>104,963</b>	<b>0</b>
Coal (12,669 btu/lb)	Nat. Gas (1,030 btu/cf)	Oil (137,006 btu/gal)
MMBtu/yr		
1.27E+06	1.08E+05	0.00E+00

Total for Boiler #7 (MMBtu/yr)	1.37E+06
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Total SO <sub>2</sub> Emissions from Boiler #7 (lb/yr)	229,074
<b>Total SO<sub>2</sub> Emissions from Boiler #7 (ton/yr)</b>	<b>114.537</b>

SO <sub>2</sub> Emissions Associated with Coal Combustion (ton/yr)	<b>114.54</b>
SO <sub>2</sub> Emissions Associated with No. 2 Fuel Oil Combustion (ton/yr)	<b>0.00000</b>

# University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

Orange County

Facility ID # 6800043

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## 2007 Annual Emissions Inventory

### Nitrogen Dioxide Emissions from Boiler #7

#### (ES-002-Boiler #7)

The exhaust duct at Boiler #7 is equipped with a continuous emissions monitor (CEMs) for NOx emissions. For the 2007 calendar year, 30 day facility averages for the NOx emission rate measured by the CEM are as follows:

Month	30 day average CEM reading (lb/MMBtu)
January 2007	0.42
February 2007	0.46
March 2007	0.37
April 2007	0.24
May 2007	0.27
June 2007	0.27
July 2007	0.26
August 2007	0.32
September 2007	0.22
October 2007	0.25
November 2007	0.35
December 2007	0.36
<b>Annual Average</b>	<b>0.32</b>

This average includes NOx emissions from coal, fuel oil, and natural gas within Boiler #7 over the entire year, representing a composite average for all fuels combusted.

#### Fuel Inputs to Boiler #7 for 2007

Boiler #7		
Coal Tons/yr	Gas 1,000cf/yr	No. 2 Oil Gallons/yr
<b>49,980</b>	<b>104,963</b>	<b>0</b>
Coal (12,669 btu/lb)	Nat. Gas (1,030 btu/cf)	Oil (137,006 btu/gal)
MMBtu/yr		
1.27E+06	1.08E+05	0.00E+00

Total for Boiler #7 (MMBtu/yr)	1.37E+06
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NOx Emissions from Boiler #7 (lb/yr)	434,585
<b>NOx Emissions from Boiler #7 (ton/yr)</b>	<b>217.29</b>

<b>NOx Emissions Associated with Coal Combustion (ton/yr)</b>	<b>200.20</b>
<b>NOx Emissions Associated with Fuel Oil No. 2 Combustion (ton/yr)</b>	<b>0.0000</b>
<b>NOx Emissions Associated with Natural Gas Combustion (ton/yr)</b>	<b>17.09</b>

# University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

Orange County

Facility ID # 6800043

Permit # 03069T20

## 2007 Annual Emissions Inventory

### Boiler No.7

### CO<sub>2</sub> Emissions from Limestone.

(ES-3)

Assume that the amount of total limestone distributed between boilers is proportional to percentage of total coal burned in each boiler.

Boiler #6	51,331	Tons/yr	50.7%
Boiler #7	49,980	Tons/yr	49.3%
Total	101,311	Tons/yr	100.0%

Total Limestone Used                      **19,238**    Tons/yr

Limestone Used in Boiler No.7            **9,491**    Tons/yr

85.0% CaCO<sub>3</sub>

100.09 MW, CaCO<sub>3</sub>

44.01 MW, CO<sub>2</sub>

5.00% MgCO<sub>3</sub>

83.43 MW, MgCO<sub>3</sub>

44.01 MW, CO<sub>2</sub>

CO<sub>2</sub> emission rate                              800.2    lb/ton

Boiler No.7                      3,797    tons/yr, CO<sub>2</sub>

# **University of North Carolina at Chapel Hill**

Chapel Hill, North Carolina

*Orange County*

Facility ID # 6800043

Permit # 03069T20

## **2007 Annual Emissions Inventory**

**Boiler #8**

**(ES-003-Boiler #8)**

*Operating Scenario #1 - Natural Gas Firing*  
*Operating Scenario #2 - No. 2 Fuel Oil Firing*

Emission Source/Operating Scenario Data Page 1 of 1

**Boiler #8 - Operating Scenario #1 - Natural Gas**  
 If Emission Source has multiple Operating Scenarios, complete one form for each.  
 (All permitted, Insignificant and/or Non-permitted Sources)

Facility ID #: **6800043**  
 Permit #: **03069T20**  
 County: **Orange**  
 DAQ Region: **Raleigh**

Facility Name: University of North Carolina at Chapel Hill

**North Carolina Department of Environment and Natural Resources**  
**Division of Air Quality**  
**Air Pollutant Point Source Emissions Inventory - Calendar Year 2007**

1. Emission Source ID No. (same as in permit - Use "U" prefix for non-permitted and "I" for insignificant)		ES-003-Boiler #8					
2. Emission Source Description		Natural Gas / No. 2 Fuel Oil Fired Boiler					
3. Operating Scenario Description		Operating Scenario #1 - Natural Gas					
4. Maximum Permitted Operating Rate With Units (Ex. gal/hr, mmBtu/hr)		338.0 MMBtu/hr					
5. Throughput in CY (e.g. production or fuel use) With Units (Ex. lbs/yr, gal/yr)		90,271			1,000 ft <sup>3</sup> /yr		
6. Fuel Information (if fuel used)		% Sulfur	N/A	% Ash	N/A	Heat Content (Btu/lb or mmCF)	1,030 Btu/ft <sup>3</sup>

If you do not provide annual throughput/fuel use, your inventory will be deemed incomplete and returned to you.

7. Capture Efficiency (% Emissions from Emission Source Vented to Control Device or Stack)	N/A
--	-----

8. Control Device Information, if none, write "none"

	Control Device ID # (as listed in permit)	Control Device Description
i. (nearest stack)	None	None
ii.	None	None
iii.	None	None
iv.	None	None

9. Stack Information (sources vented to more than one stack use additional entry lines)

Stack ID #	Height (in whole feet)	Diameter (feet) Circle (enter #), Rectangle (L#, W#) (in 0.1 feet)	Temperature (F)	Velocity (feet/sec)	Volume Flow Rate (acfm)	Release Point Description (Fugitive, Vertical, Vertical w/ cap, Horizontal, Downward - see instructions)
N/A	N/A	N/A	N/A	N/A	N/A	N/A
--	--	--	--	--	--	--
--	--	--	--	--	--	--

10. Operating Schedule (Source/Operating Scenario that best characterizes calendar year)

Hours/Day	Standby	Days/Week	Standby	Weeks/Year	Standby	Hours/Year	1,833 Total
Typical Start & End Times in CY:				Start:	N/A	End:	N/A

11. Seasonal Periods Percent Annual Throughput (for Emission Source in CY, MUST total 100%)

Jan-Feb, 2002 + Dec, 2002	30%	Mar-May	7%	June-Aug	2%	Sept-Nov	62%
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To review instructions or get a blank copy, go to web page: <http://daq.state.nc.us/Offices/Planning/Attainment/est.html>

Copy and Use additional Sheets as needed

Facility ID #: **6800043**  
 Permit #: **03069T20**  
 County: **Orange**  
 DAQ Region: **Raleigh**

Facility Name: University of North Carolina at Chapel Hill

**North Carolina Department of Environment and Natural Resources  
 Division of Air Quality  
 Air Pollutant Point Source Emissions Inventory - Calendar Year 2007**

**Emissions:** Attach calculations and documentation of emission factors or other estimation methods used.

Emission Source ID No. (same as in permit - Use "U" prefix for non-permitted and "I" for insignificant) ES-003-Boiler #8

Criteria (NAAQS) Pollutants	Pollutant Code	Emissions Criteria (Tons/Year)	Emissions Estimation Method Code (see instructions for code)	Control Efficiency (Net after all controls)
Carbon Monoxide	CO	3.79	8	N/A
NOx	NOx	3.92	8	N/A
PM Total	PM	0.34	8	N/A
PM-2.5	PM-2.5	0.34	8	N/A
PM-10	PM-10	0.34	8	N/A
SO2	SO2	0.03	8	N/A
VOC	VOC	0.25	8	N/A
HAP/TAP Pollutants (In Alphabetical Order)	CAS # (or other code - see instructions)	Emissions HAP/TAP (Pounds/Year)	Emissions Estimation Method Code (see instructions for code)	Control Efficiency (Net after all controls)
Arsenic	ARSENICPDS	1.81E-02	8	N/A
Benzene	71-43-2	0.19	8	N/A
Cadmium	CADMIUMCPDS	9.93E-02	8	N/A
Chromium	CROMCPDS	1.26E-01	8	N/A
Chromium VI	CHROM6CPDS	1.26E-01	8	N/A
Dichlorobenzene	106-46-7	1.08E-01	8	N/A
Formaldehyde	50-00-0	6.77	8	N/A
Hexane	HEXANEISO	1.62E+02	8	N/A
Lead	LEADCPDS	4.51E-02	8	N/A
Manganese	MANGCPDS	3.43E-02	8	N/A
Mercury	MERCPDS	2.35E-02	8	N/A
Napthalene	91-20-3	5.51E-02	8	N/A
Nickel	NICKCPDS	0.19	8	N/A
POM	POM	5.97E-02	8	N/A
Toluene	108-88-3	0.31	8	N/A
Greenhouse Gas Pollutants	Pollutant Code	Emissions Criteria (Tons/Year)	Emissions Estimation Method Code (see instructions for code)	Control Efficiency (Net after all controls)
Carbon Dioxide	CO <sub>2</sub>	5,432.37	8	N/A
Methane	CH <sub>4</sub>	0.104	8	N/A
Nitrous oxide	N <sub>2</sub> O	0.099	8	N/A

Emission Source/Operating Scenario Data Page 1 of 1

**Boiler #8 - Operating Scenario #2 - No. 2 Fuel Oil**  
 If Emission Source has multiple Operating Scenarios, complete one form for each.  
 (All permitted, Insignificant and/or Non-permitted Sources)

Facility ID #: **6800043**  
 Permit #: **03069T20**  
 County: **Orange**  
 DAQ Region: **Raleigh**

Facility Name: University of North Carolina at Chapel Hill

**North Carolina Department of Environment and Natural Resources**  
**Division of Air Quality**  
**Air Pollutant Point Source Emissions Inventory - Calendar Year 2007**

1. Emission Source ID No. (same as in permit - Use "U" prefix for non-permitted and "I" for insignificant)		ES-003-Boiler #8					
2. Emission Source Description		Natural Gas / No. 2 Fuel Oil Fired Boiler					
3. Operating Scenario Description		Operating Scenario #2 - No. 2 Fuel Oil					
4. Maximum Permitted Operating Rate With Units (Ex. gal/hr, mmBtu/hr)		338.0 MMBtu/hr					
5. Throughput in CY (e.g. production or fuel use) With Units (Ex. lbs/yr, gal/yr)		0 gallons/year					
6. Fuel Information (if fuel used)		% Sulfur	0.50%	% Ash		Heat Content (Btu/lb or mmCF)	135,344 Btu/gal

If you do not provide annual throughput/fuel use, your inventory will be deemed incomplete and returned to you.

7. Capture Efficiency (% Emissions from Emission Source Vented to Control Device or Stack)	N/A
--	-----

8. Control Device Information, if none, write "none"

	Control Device ID # (as listed in permit)	Control Device Description
i. (nearest stack)	N/A	N/A
ii.	N/A	N/A
iii.	N/A	N/A
iv.	N/A	N/A

9. Stack Information (sources vented to more than one stack use additional entry lines)

Stack ID #	Height (in whole feet)	Diameter (feet) Circle (enter #), Rectangle (L#, W#) (in 0.1 feet)	Temperature (F)	Velocity (feet/sec)	Volume Flow Rate (acfm)	Release Point Description (Fugitive, Vertical, Vertical w/ cap, Horizontal, Downward - see instructions)
N/A	N/A	N/A	N/A	N/A	N/A	N/A
--	--	--	--	--	--	--
--	--	--	--	--	--	--

10. Operating Schedule (Source/Operating Scenario that best characterizes calendar year)

Hours/Day	Standby	Days/Week	Standby	Weeks/Year	Standby	Hours/Year	1,833 Total
Typical Start & End Times in CY:				Start:	N/A	End:	N/A

11. Seasonal Periods Percent Annual Throughput (for Emission Source in CY, MUST total 100%)

Jan-Feb, 2002 + Dec, 2002	#DIV/0!	Mar-May	#DIV/0!	June-Aug	#DIV/0!	Sept-Nov	#DIV/0!
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Copy and Use additional Sheets as needed



**Boiler #8 - Operating Scenario #2 - No. 2 Fuel Oil**  
 If Emission Source has multiple Operating Scenarios, complete one form for each.  
 (All permitted, Insignificant and/or Non-permitted Sources)

Facility ID #: 6800043

Permit #: 03069T20

County: Orange

DAQ Region: Raleigh

Facility Name: University of North Carolina at Chapel Hill

**North Carolina Department of Environment and Natural Resources**  
**Division of Air Quality**  
**Air Pollutant Point Source Emissions Inventory - Calendar Year 2007**

**Emissions:** Attach calculations and documentation of emission factors or other estimation methods used.

Emission Source ID No. (same as in permit - Use "U" prefix for non-permitted and "I" for insignificant)

ES-003-Boiler #8

Criteria (NAAQS) Pollutants	Pollutant Code	Emissions Criteria (Tons/Year)	Emissions Estimation Method Code (see instructions for code)	Control Efficiency (Net after all controls)
Carbon Monoxide	CO	0.00	8	N/A
NOx	NOx	0.00	8	N/A
PM Total	PM	0.00	8	N/A
PM-2.5	PM-2.5	0.00	8	N/A
PM-10	PM-10	0.00	8	N/A
SO2	SO2	0.00	8	N/A
VOC	VOC	0.00	8	N/A
HAP/TAP Pollutants (In Alphabetical Order)	CAS # (or other code - see instructions)	Emissions HAP/TAP (Pounds/Year)	Emissions Estimation Method Code (see instructions for code)	Control Efficiency (Net after all controls)
Arsenic	ARSENICPDS	0.00E+00	8	N/A
Benzene	71-43-2	0.00E+00	8	N/A
Beryllium	BERYLCPDS	0.00E+00	8	N/A
Cadmium	CADMIUMCPDS	0.00E+00	8	N/A
Chromium	CROMCPDS	0.00E+00	8	N/A
Chromium VI	CHROM6CPDS	0.00E+00	8	N/A
Ethylbenzene	100-41-4	0.00E+00	8	N/A
Fluoride	16984-48-8	0.00	8	N/A
Formaldehyde	50-00-0	0.00	8	N/A
Lead	LEADCPDS	0.00E+00	8	N/A
Manganese	MANGCPDS	0.00E+00	8	N/A
Mercury	MERCPDS	0.00E+00	8	N/A
Methyl chloroform	71-55-6	0.00E+00	8	N/A
Napthalene	91-20-3	0.0000	8	N/A
Nickel	NICKCPDS	0.00E+00	8	N/A
POM	POM	0.00E+00	8	N/A
Selenium	SEC	0.00E+00	8	N/A
Toluene	108-88-3	0.00	8	N/A
Xylene	1330-20-7	0.00E+00	8	N/A
Greenhouse Gas Pollutants	Pollutant Code	Emissions Criteria (Tons/Year)	Emissions Estimation Method Code (see instructions for code)	Control Efficiency (Net after all controls)
Carbon Dioxide	CO <sub>2</sub>	0.00	8	N/A
Methane	CH <sub>4</sub>	0.00	8	N/A
Nitrous oxide	N <sub>2</sub> O	0.00	8	N/A

Emissions and data on this form required to report or verify emissions cannot be held confidential.

To review instructions or get a blank copy, go to web page: <http://daq.state.nc.us/Offices/Planning/Attainment/est.html>

Copy and Use additional Sheets as needed.

**Natural Gas Combustion Emissions Calculator NG2000 Revision C**  
**2007 Annual Emissions Inventory**

**Boiler #8**  
*(ES-003-Boiler #8)*

Facility ID # 6800043  
 Permit # 03069T20

**Operating Scenario #1**

<b>User Input</b>	
Company Name:	<b>University of North Carolina at Chapel Hill</b>
Plant County:	<b>Orange County</b>
Plant City:	<b>Chapel Hill</b>
Permit Number:	<b>03069T20</b>
User:	<b>RST Engineering</b>
Heat Input Capacity (mmBtu/hr):	<b>338</b>
Fuel Input Capacity (10 <sup>6</sup> scf/hr):	0.33
Annual Fuel Throughput (10 <sup>6</sup> scf):	<b>90.27</b>
Latest Construction/Modification Date:	<b>N/A</b>

<b>Enter the boiler type below</b> ▾	
	<b>3 + 4</b>

<b>Other NOx Control</b>
Enter 1 below if SNCR is applied to the boiler.
<b>0</b>

<b>Large Wall-Fired Boilers (=&gt;100 mmBtu/hr)</b>
1 = Uncontrolled (Pre-NSPS)
2 = Uncontrolled (Post-NSPS)
3 = Controlled - Low NOx burners
4 = Controlled - Flue gas recirculation (FGR)

<b>Small Boilers (&lt;100 mmBtu/hr)</b>
5 = Uncontrolled
6 = Controlled - Low NOx burners
7 = Controlled - Low NOx burners/FGR

<b>Tangential-Fired Boilers (All Sizes)</b>
8 = Uncontrolled
9 = Controlled - FGR

<b>Residential Furnaces (&lt;0.3 mmBtu/hr)</b>
10 = Uncontrolled

<b>Emissions Output</b>				<b>Emission</b>
<b>Criteria Pollutants</b>				<b>Factor</b>
Pollutant	lb/hr	lb/yr	tpy	(lb/mmscf)
PM	2.5E+00	6.9E+02	3.4E-01	7.6E+00
PM-10	2.5E+00	6.9E+02	3.4E-01	7.6E+00
PM-2.5	2.5E+00	6.9E+02	3.4E-01	7.6E+00
NOx	**	**	**	1.9E+02
VOC	1.8E+00	5.0E+02	2.5E-01	5.5E+00
CO	2.8E+01	7.6E+03	3.8E+00	8.4E+01
SO2	2.0E-01	5.4E+01	2.7E-02	6.0E-01
Total HAP	6.3E-01	1.7E+02	8.5E-02	1.9E+00
Largest HAP	6.0E-01	1.6E+02	8.1E-02	1.8E+00

<b>Toxic/Hazardous Air Pollutants</b>				
Pollutant	lb/hr	lb/day	lb/yr	
Arsenic	6.6E-05	NA	1.8E-02	2.0E-04
Benzene	7.0E-04	NA	1.9E-01	2.1E-03
Cadmium	3.6E-04	NA	9.9E-02	1.1E-03
<b>Chromium</b>	<b>4.6E-04</b>	<b>NA</b>	<b>1.3E-01</b>	<b>1.4E-03</b>
<b>Chromium VI</b>	<b>4.6E-04</b>	<b>NA</b>	<b>1.3E-01</b>	<b>1.4E-03</b>
Dichlorobenzene	4.0E-04	NA	1.1E-01	1.2E-03
Formaldehyde	2.5E-02	NA	6.8E+00	7.5E-02
Hexane	6.0E-01	1.4E+01	1.6E+02	1.8E+00
<b>Lead</b>	<b>1.7E-04</b>	<b>NA</b>	<b>4.5E-02</b>	<b>5.0E-04</b>
Manganese	1.3E-04	3.0E-03	3.4E-02	3.8E-04
Mercury	8.6E-05	2.1E-03	2.3E-02	2.6E-04
<b>Naphthalene</b>	<b>2.0E-04</b>	<b>NA</b>	<b>5.5E-02</b>	<b>6.1E-04</b>
Nickel	7.0E-04	1.7E-02	1.9E-01	2.1E-03
<b>POM</b>	<b>2.2E-04</b>	<b>NA</b>	<b>6.0E-02</b>	<b>6.6E-04</b>
Toluene	1.1E-03	2.7E-02	3.1E-01	3.4E-03

<b>Greenhouse Gas Pollutants</b>				<b>Em. Factor</b>
Pollutant	lb/hr	lb/yr	tpy	(lb/mmscf)
Carbon dioxide	39,883	10,864,735	5432.37	120,357
Methane	0.76	207.62	0.104	2.3
Nitrous Oxide	0.73	198.60	0.099	2.2

**Fuel Oil Combustion Emissions Calculator FO2000 Revision A**

**Boiler #8**

**2007 Annual Emissions Inventory**

**(ES-003-Boiler #8)**

**Facility ID # 6800043**

**Permit # 03069T20**

**Operating Scenario #2**

<b>User Input</b>	
Company Name:	<b>University of North Carolina at Chapel Hill</b>
Plant County:	<b>Orange County</b>
Plant City:	<b>Chapel Hill</b>
Permit Number:	<b>03069T20</b>
User:	<b>RST Engineering</b>
Heat Input Capacity (mmBtu/hr):	<b>338</b>
Fuel Input Capacity (10 <sup>3</sup> gal/hr):	2.41
Annual Fuel Throughput (1000 gal):	<b>0.00</b>
Maximum fuel sulfur content (%):	<b>0.50</b>
Latest Construction/Modification Date:	<b>N/A</b>

<b>Enter the boiler type below ▾</b>	
	<b>17</b>

<p><b>Boilers =&gt;100 mmBtu/hr</b></p> <p>1 = No. 6 oil fired, normal firing (U)                  2 = No. 6 oil fired, normal firing (I)                  3 = No. 6 oil fired, normal firing (C)                  4 = No. 6 oil fired, normal firing, low NOx burner (U)                  5 = No. 6 oil fired, normal firing, low NOx burner (I)                  6 = No. 6 oil fired, normal firing, low NOx burner (C)                  7 = No. 6 oil fired, tangential firing (U)                  8 = No. 6 oil fired, tangential firing, low NOx burner (U)                  9 = No. 5 oil fired, normal firing (U)                  10 = No. 5 oil fired, normal firing (I)                  11 = No. 5 oil fired, tangential firing (U)                  12 = No. 4 oil fired, normal firing (U)                  13 = No. 4 oil fired, normal firing (I)                  14 = No. 4 oil fired, tangential firing (U)                  15 = No. 2 oil fired (U,I)</p>	<p><b>Boilers =&gt;100 mmBtu/hr (cont'd)</b></p> <p>16 = No. 2 oil fired (C)  <b>17 = No. 2 oil fired, LNB/FGR (U,I)</b>                  18 = No. 2 oil fired, LNB/FGR (C)</p> <hr/> <p>19 = Vertical fired utility boiler</p> <hr/> <p><b>Small Boilers (&lt;100 mmBtu/hr)</b></p> <p>20 = No. 6 oil fired (I)                  21 = No. 6 oil fired (C)                  22 = No. 5 oil fired (C)                  23 = No. 4 oil fired (C)                  24 = No. 2 oil fired (I)                  25 = No. 2 oil fired (C)</p> <hr/> <p>26 = Residential Furnace</p>
--	--

**Fuel Oil Combustion Emissions Calculator FO2000 Revision A**

**Boiler #8**

**2007 Annual Emissions Inventory**

**(ES-003-Boiler #8)**

**Facility ID # 6800043**

**Permit # 03069T20**

**Operating Scenario #2**

<b>User Input</b>	
Company Name:	<b>University of North Carolina at Chapel Hill</b>
Plant County:	<b>Orange County</b>
Plant City:	<b>Chapel Hill</b>
Permit Number:	<b>03069T20</b>
User:	<b>RST Engineering</b>
Heat Input Capacity (mmBtu/hr):	<b>338</b>
Fuel Input Capacity (10 <sup>3</sup> gal/hr):	2.41
Annual Fuel Throughput (1000 gal):	<b>0.00</b>
Maximum fuel sulfur content (%):	<b>0.50</b>
Latest Construction/Modification Date:	<b>N/A</b>

**Emission Controls**

Particulate controls

<b>Enter the control type below</b> ▾	Message Area	Or enter a PM control efficiency below to override built in values.
<b>0</b>		
<u>Control Device</u>	<u>Avg. Cont. Effic.</u>	<u>User Input PM Cont. Effic.</u>
0 = None/other	0.0	<b>0.0</b>
1 = ESP		Message Area
2 = Scrubber		
3 = Bagfilter	0.0	
4 = Multiple cyclone		

Postcombustion SO<sub>2</sub> controls

<b>Enter the control type below</b> ▾	Message Area	Or enter an SO <sub>2</sub> control efficiency below to override built in values.
<b>0</b>		
<u>Control Technology/Process</u>	<u>Avg. Cont. Effic.</u>	<u>User Input SO<sub>2</sub> Cont. Effic.</u>
0 = None/other		<b>0.0</b>
1 = Wet scrubber, Lime/limestone	0.0	Message Area
2 = Wet scrubber, Sodium carbonate		
3 = Wet scrubber, Magnesium oxide/hydroxide		
4 = Wet scrubber, Dual alkali		
5 = Spray drying, calcium hydroxide slurry, vap. in spray vessel	<u>Remarks</u>	
6 = Furnace injection, Dry calcium carbonate/hydrate inj. in upper furn. cavity	NA	
7 = Duct injection, Dry sorbent injection into duct, sometimes combined with water spray		

NO<sub>x</sub> controls

<b>Enter the control type below</b> ▾		Or enter a NO <sub>x</sub> control efficiency below to override built in values.
<b>5 + 6</b>		
<u>Control Technology/Process</u>	<u>Avg. Cont. Effic.</u>	<u>User Input NO<sub>x</sub> Cont. Effic.</u>
0 = None/other		<b>0.0</b>
1 = Low excess air (LEA)	0.0	Message Area
2 = Staged combustion (SC)		
3 = Burners out of service (BOOS)		
4 = Flue gas recirculation (FGR)	<u>Remarks</u>	
5 = Flue gas recirculation plus staged combustion	NA	
6 = Low NO <sub>x</sub> burners (LNB)		
7 = Reduced air preheat (RAP)		
8 = Selective noncatalytic reduction (SNCR)		
9 = Conventional selective catalytic reduction (SCR)		

**Fuel Oil Combustion Emissions Calculator FO2000 Revision A**

**Boiler #8**

**2007 Annual Emissions Inventory**

**(ES-003-Boiler #8)**

**Facility ID # 6800043**

**Permit # 03069T20**

**Operating Scenario #2**

<b>User Input</b>	
Company Name:	<b>University of North Carolina at Chapel Hill</b>
Plant County:	<b>Orange County</b>
Plant City:	<b>Chapel Hill</b>
Permit Number:	<b>03069T20</b>
User:	<b>RST Engineering</b>
Heat Input Capacity (mmBtu/hr):	<b>338</b>
Fuel Input Capacity (10 <sup>3</sup> gal/hr):	2.41
Annual Fuel Throughput (1000 gal):	<b>0.00</b>
Maximum fuel sulfur content (%):	<b>0.50</b>
Latest Construction/Modification Date:	<b>N/A</b>

**Emissions Output**

**Criteria Pollutants**

Pollutant	lb/hr <sup>2</sup>	tpy	lb/yr <sup>3</sup>	Emission Factor <sup>1</sup> (lb/10 <sup>3</sup> gal)
Total PM (FPM + CPM)	8.0	0.0000	0	3.30E+00
Filterable PM (FPM) rates uncontrolled	4.8	0.0000	0	2.00E+00
Condensable PM (CPM) <sup>4</sup>	3.1	0.0000	0	1.30E+00
Filterable PM-10 <sup>5</sup>	2.4	0.0000	0	1.00E+00
Filterable PM-2.5 <sup>5</sup>	0.6	0.0000	0	2.50E-01
NOx rates uncontrolled	**	**	**	2.40E+01
NMTOC	0	0.0000	0	2.00E-01
CO	12	0.0000	0	5.00E+00
SO2 rates uncontrolled	59.2	0.0000	0	2.45E+01
Total HAP <sup>6</sup>	4.36E-01	0.0000	0	1.81E-01
Largest HAP <sup>6</sup>	1.92E-01	0.0000	0	7.97E-02

*\*\*NOx emissions based on CEMs data.*

**Toxic/Hazardous Air Pollutants.**

Pollutant	lb/hr <sup>2</sup>	lb/day <sup>7</sup>	lb/yr <sup>3</sup>	Emission Factor <sup>1</sup> (lb/10 <sup>3</sup> gal)
<b>Antimony rates uncontrolled</b>	<b>0.00E+00</b>	<b>NA</b>	<b>0.00E+00</b>	0.00E+00
Arsenic rates uncontrolled	1.35E-03	NA	0.00E+00	5.60E-04
Benzene	6.64E-03	NA	0.00E+00	2.75E-03
Beryllium rates uncontrolled	1.01E-03	NA	0.00E+00	4.20E-04
Cadmium rates uncontrolled	1.01E-03	NA	0.00E+00	4.20E-04
<b>Chromium rates uncontrolled</b>	<b>1.01E-03</b>	<b>NA</b>	<b>0.00E+00</b>	4.20E-04
Chromium VI rates uncontrolled	2.98E-04	NA	0.00E+00	1.23E-04
<b>Cobalt rates uncontrolled</b>	<b>0.00E+00</b>	<b>NA</b>	<b>0.00E+00</b>	0.00E+00
<b>Ethylbenzene</b>	<b>1.97E-03</b>	<b>NA</b>	<b>0.00E+00</b>	8.17E-04
Fluoride	9.01E-02	2.16E+00	0.00E+00	3.73E-02
Formaldehyde	1.16E-01	2.78E+00	0.00E+00	4.80E-02
<b>Lead rates uncontrolled</b>	<b>3.04E-03</b>	<b>NA</b>	<b>0.00E+00</b>	1.26E-03
Manganese rates uncontrolled	2.03E-03	4.87E-02	0.00E+00	8.40E-04
Mercury	1.01E-03	2.43E-02	0.00E+00	4.20E-04
Methyl chloroform (1,1,1-Trichloroethane)	5.70E-04	1.37E-02	0.00E+00	2.36E-04
<b>Naphthalene</b>	<b>8.04E-04</b>	<b>NA</b>	<b>0.00E+00</b>	3.33E-04
Nickel rates uncontrolled	1.01E-03	2.43E-02	0.00E+00	4.20E-04
<b>POM rates uncontrolled</b>	<b>7.97E-03</b>	<b>NA</b>	<b>0.00E+00</b>	3.30E-03
<b>Selenium rates uncontrolled</b>	<b>5.07E-03</b>	<b>NA</b>	<b>0.00E+00</b>	2.10E-03
Toluene	1.92E-01	4.62E+00	0.00E+00	7.97E-02
Xylene	3.38E-03	8.12E-02	0.00E+00	1.40E-03

**Greenhouse Gases**

Pollutant	lb/hr <sup>2</sup>	tpy	lb/yr <sup>3</sup>	Emission Factor (lb/10 <sup>3</sup> gal)
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**Fuel Oil Combustion Emissions Calculator FO2000 Revision A**

**Boiler #8**

**2007 Annual Emissions Inventory**

**(ES-003-Boiler #8)**

**Facility ID # 6800043**

**Permit # 03069T20**

**Operating Scenario #2**

<b>User Input</b>				
Company Name:	<b>University of North Carolina at Chapel Hill</b>			
Plant County:	<b>Orange County</b>			
Plant City:	<b>Chapel Hill</b>			
Permit Number:	<b>03069T20</b>			
User:	<b>RST Engineering</b>			
Heat Input Capacity (mmBtu/hr):	<b>338</b>			
Fuel Input Capacity (10 <sup>3</sup> gal/hr):	<b>2.41</b>			
Annual Fuel Throughput (1000 gal):	<b>0.00</b>			
Maximum fuel sulfur content (%):	<b>0.50</b>			
Latest Construction/Modification Date:	<b>N/A</b>			
Carbon dioxide	52,808	0.0	0	21873.00
Methane	5.21E-01	0.00E+00	0.00E+00	0.216
Nitrous Oxide	2.66E-01	0.00E+00	0.00E+00	0.11

<sup>1</sup>Emission factors represent AP-42 uncontrolled values. Emission rates are reflective of controls where applicable.

<sup>2</sup>Hourly emission rates for all pollutants are based on hourly rated capacity.

<sup>3</sup>Annual emission rates for all pollutants are based on maximum annual fuel throughput.

<sup>4</sup>Wet scrubbers are assumed to control CPM whereas other PM control devices are assumed to only control FPM.

<sup>5</sup>AP-42 assumes PM-10 and PM-2.5 assumes these pollutants are controlled with the same efficiency as total PM.

<sup>6</sup>Total and largest HAP factors and emission rates do not reflect control of metals. Individual metal emission rates are reflective of particulate matter controls where applicable.

<sup>7</sup>Daily emission rates are based on operation 24 hours per day at rated capacity.

\*\*SO<sub>2</sub> and NO<sub>x</sub> emissions were estimated using CEMS data, please refer to the attached spreadsheets.

FO2000 Revision A dated March 9, 2000

# University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

Orange County

Facility ID # 6800043

Permit # 03069T20

## 2007 Annual Emissions Inventory

### Nitrogen Dioxide Emissions from Boiler #8 (ES-003-Boiler #8)

The exhaust duct at Boiler #8 is equipped with a continuous emissions monitor (CEMs) for NOx emissions. For the 2007 calendar year, 30 day facility averages for the NOx emission rate measured by the CEM are as follows:

Month	30 day average CEM reading (lb/MMBtu)	
January 2007	0.08	
February 2007	0.08	
March 2007		Not Operated
April 2007	0.08	
May 2007		Not Operated
June 2007		Not Operated
July 2007		Not Operated
August 2007	0.05	
September 2007	0.06	
October 2007	0.07	
November 2007	0.09	
December 2007		Not Operated
<b>Annual Average</b>	<b>0.08</b>	

This average includes NOx emissions from coal, fuel oil, and natural gas from Boiler #8 over the entire year, representing a composite average for all fuels combusted.

### Fuel Inputs to Boiler #8 for 2007

Boiler #8	
Gas 1,000cf/yr	Oil Gallons/yr
90,271	0
Nat. Gas (1,030 btu/cf)	Oil (137,006 btu/gal)
MMBtu/yr	
9.30E+04	0.00E+00

Total for Boiler #8 (MMBtu/yr)	9.30E+04
--------------------------------	----------

NOx Emissions from Boiler #8 (lb/yr)	7,836
NOx Emissions from Boiler #8 (ton/yr)	3.9

NOx Emissions Associated with Fuel Oil Combustion (ton/yr)	0.00
NOx Emissions Associated with Natural Gas Combustion (ton/yr)	3.92

**University of North Carolina at Chapel Hill**

Chapel Hill, North Carolina

*Orange County*

Facility ID # 6800043

Permit # 03069T20

**2007 Annual Emissions Inventory**

**Coal Crusher/Conveyor Building  
(ES-010A)**



<b>Emission Source/Operating Scenario Data</b> Page 1 of 2		<b>Facility ID #:</b> 6800043					
<i>Coal Crusher/Conveyor Building</i> <small>If Emission Source has multiple Operating Scenarios, complete one form for each. (All permitted, Insignificant and/or Non-permitted Sources)</small>		<b>Permit #:</b> 03069T20					
<b>Facility Name:</b> University of North Carolina at Chapel Hill		<b>County:</b> Orange					
		<b>DAQ Region:</b> Raleigh					
<b>North Carolina Department of Environment and Natural Resources</b> <b>Division of Air Quality</b> <b>Air Pollutant Point Source Emissions Inventory - Calendar Year 2007</b>							
<b>1. Emission Source ID No.</b> (same as in permit - Use "U" prefix for non-permitted and "I" for insignificant)			<b>ES-010A</b>				
<b>2. Emission Source Description</b>		<b>Coal Crusher / Conveyor Building</b>					
<b>3. Operating Scenario Description</b>		N/A					
<b>4. Maximum Permitted Operating Rate</b> <small>With Units (Ex. gal/hr, mmBtu/hr)</small>		<b>60 tons/hr</b>					
<b>5. Throughput in CY</b> (e.g. production or fuel use) <small>With Units (Ex. lbs/yr, gal/yr)</small>		<b>101,311</b>	<b>tons/yr</b>				
<b>6. Fuel Information</b> (if fuel used)		<b>% Sulfur</b>	N/A				
		<b>% Ash</b>	N/A				
		<b>Heat Content</b> (Btu/lb or mmCF)	N/A				
<small>If you do not provide annual throughput/fuel use, your inventory will be deemed incomplete and returned to you.</small>							
<b>7. Capture Efficiency</b> (% Emissions from Emission Source Vented to Control Device or Stack)			<b>100%</b>				
<b>8. Control Device Information</b> , if none, write "none"							
	<b>Control Device ID #</b> <small>(as listed in permit)</small>	<b>Control Device Description</b>					
<i>i. (nearest stack)</i>	<b>CD-013</b>	<b>Bagfilter</b>					
<i>ii.</i>	N/A	N/A					
<i>iii.</i>	N/A	N/A					
<i>iv.</i>	N/A	N/A					
<b>9. Stack Information</b> (sources vented to more than one stack use additional entry lines)							
Stack ID #	Height <small>(in whole feet)</small>	Diameter (feet) <small>Circle (enter #), Rectangle (L#, W#) (in 0.1 feet)</small>	Temperature  (F)	Velocity  (feet/sec)	Volume Flow Rate  (acfm)	Release Point Description  <small>(Fugitive, Vertical, Vertical w/ cap, Horizontal, Downward - see instructions)</small>	
EP-12-053	47	1.8	Ambient	44	6,500	Vertical	
--	--	--	--	--	--	--	
--	--	--	--	--	--	--	
<b>10. Operating Schedule</b> (Source/Operating Scenario that best characterizes calendar year)							
Hours/Day	6	Days/Week	7	Weeks/Year	52	Hours/Year	1,689
Typical Start & End Times in CY:				Start:	N/A	End:	N/A
<b>11. Seasonal Periods Percent Annual Throughput</b> (for Emission Source in CY, MUST total 100%)							
Jan-Feb, 2002 + Dec, 2002	<b>34.44%</b>	Mar-May	<b>19.91%</b>	June-Aug	<b>28.13%</b>	Sept-Nov	<b>17.51%</b>

To review instructions or get a blank copy, go to web page: <http://daq.state.nc.us/Offices/Planning/Attainment/est.html>

Copy and Use additional Sheets as needed



# University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

Orange County

Facility ID # 6800043

Permit # 03069T20

## 2007 Annual Emissions Inventory

### Emissions from the Conveyor/Crusher Building

(ES-010A)

Assume that the total amount of coal conveyed to the crusher is equal to the total amount of coal combusted in 2006.

Boiler #6	51,331	Tons/yr
Boiler #7	49,980	Tons/yr
Total	101,311	Tons/yr

The conveyor transfer points and crushers in the Coal Crusher Building are controlled by a vacuum dust pick-up system ducted to a baghouse. The air flow rate through the baghouse is 6,650 acfm. Emissions from the baghouse are conservatively estimated at 0.015 gr/acfm.

60 ton/hr, conveying rate  
1,688.5 hrs/yr, conveying time

$\text{lb/yr} = (6,650 \text{ acfm}) (60 \text{ min/hr}) (\text{hr/yr}) (0.015 \text{ gr/acfm}) (1/7000 \text{ lb/gr})$

<b>Total Emissions from the Crusher</b>	<b>10,105,794</b>	<b>gr/yr</b>
	<b>1,444</b>	<b>lb/yr</b>
	<b>0.72</b>	<b>ton/yr</b>

100% of these emissions are PM-10

95% of these emissions are PM-2.5

# **University of North Carolina at Chapel Hill**

Chapel Hill, North Carolina

*Orange County*

Facility ID # 6800043

Permit # 03069T20

## **2007 Annual Emissions Inventory**

**Ash Silo with Loadout  
(ES-030)**

**Ash Silo with Loadout**

If Emission Source has multiple Operating Scenarios, complete one form for each.  
(All permitted, Insignificant and/or Non-permitted Sources)

Facility Name: University of North Carolina at Chapel Hill

Facility ID #:	6800043
Permit #:	03069T20
County:	Orange
DAQ Region:	Raleigh

**North Carolina Department of Environment and Natural Resources  
Division of Air Quality  
Air Pollutant Point Source Emissions Inventory - Calendar Year 2007**

1. Emission Source ID No. (same as in permit - Use "U" prefix for non-permitted and "I" for insignificant)		ES-030					
2. Emission Source Description		Ash Silo with Loadout					
3. Operating Scenario Description		N/A					
4. Maximum Permitted Operating Rate With Units (Ex. gal/hr, mmBtu/hr)		16 tons/hr					
5. Throughput in CY (e.g. production or fuel use) With Units (Ex. lbs/yr, gal/yr)		27,259			tons/yr		
6. Fuel Information (if fuel used)	% Sulfur	N/A	% Ash	N/A	Heat Content (Btu/lb or mmCF)	N/A	

If you do not provide annual throughput/fuel use, your inventory will be deemed incomplete and returned to you.

7. Capture Efficiency (% Emissions from Emission Source Vented to Control Device or Stack)	100%
--	------

8. Control Device Information, if none, write "none"

	Control Device ID # (as listed in permit)	Control Device Description
i. (nearest stack)	CD-031	Bagfilter
ii.	N/A	N/A
iii.	N/A	N/A
iv.	N/A	N/A

9. Stack Information (sources vented to more than one stack use additional entry lines)

Stack ID #	Height (in whole feet)	Diameter (feet) Circle (enter #), Rectangle (L#, W#) (in 0.1 feet)	Temperature (F)	Velocity (feet/sec)	Volume Flow Rate (acfm)	Release Point Description (Fugitive, Vertical, Vertical w/ cap, Horizontal, Downward - see instructions)
Fugitive						
--	--	--	--	--	--	--
--	--	--	--	--	--	--

10. Operating Schedule (Source/Operating Scenario that best characterizes calendar year)

Hours/Day	10	Days/Week	7	Weeks/Year	52	Hours/Year	5,094
Typical Start & End Times in CY:				Start:	N/A	End:	N/A

11. Seasonal Periods Percent Annual Throughput (for Emission Source in CY, MUST total 100%)

Jan-Feb, 2002 + Dec, 2002	34.44%	Mar-May	19.91%	June-Aug	28.13%	Sept-Nov	17.51%
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# University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

Orange County

Facility ID # 6800043

Permit # 03069T20

## 2007 Annual Emissions Inventory

### Ash Silo with Loadout

(ES-030)

Ash is conveyed to the silo and loaded into trucks for off-site transport. The ash is pneumatically conveyed to the silo with the conveying air filtered through a baghouse (CD-031) prior to discharge. The ash loadout to the transfer trucks is via a pipe within a pipe configuration. The annular space between the internal and external pipes is under a vacuum. This vacuum system collects the dust generated during truck loading and ducts it to the baghouse (CD-031). Ash is composed of coal flyash and  $\text{CaCO}_3$  /  $\text{CaSO}_3$  from desulfurization. Ash is similar to flyash used in concrete batching operations.

27,259.12 ton/yr, ash loaded in 2007

#### 1. Uncaptured Truck Loading Fugitives

Truck loading operations are in an enclosure with discharge into an enclosed truck bed. The vacuum at the ash discharge point and enclosures should insure a minimum of 95% capture. Uncontrolled emissions based on conservatively high estimated 0.5 lb/ton emission factor (0.02 lb/ton AP-42 for batch truck loading at concrete plants).

27,259	ton/yr, Ash Generated
0.5	lb/ton, Emission Factor
95%	Capture Efficiency
681.5	lb/yr, Emissions
0.34	ton/yr, Emissions

Fugitives from the Enclosure:

0.018	ton/yr, Emissions
-------	-------------------

#### 2. Baghouse Emissions

The air flow rate through the baghouse is 4,490 acfm. Emissions from the baghouse are conservatively estimated at 0.015 gr/acfm.

lb/yr = (4,490 acfm) (60 min/hr) (hr/yr) (0.015 gr/acfm) (1/7000 lb/gr)

4,490	acfm, Baghouse Flow Rate
5,094	hrs/yr, Operating Hours
0.015	gr/acfm, Emission Factor from Baghouse
2,941	lb/yr, Emissions
1.47	ton/yr, Emissions

#### 3. Total Emissions

0.34	ton/yr, Emissions Truck Loading
0.018	ton/yr, Emissions, Truck Fugitives
1.47	ton/yr, Emissions, Baghouse
1.83	ton/yr, Total Emissions PM
1.83	ton/yr, Total Emissions PM-10
1.74	ton/yr, Total Emissions PM-2.5

100% as PM-10

95% as PM-2.5

**University of North Carolina at Chapel Hill**

Chapel Hill, North Carolina

*Orange County*

Facility ID # 6800043

Permit # 03069T20

**2007 Annual Emissions Inventory**

**Wet Ash Loadout  
(ES-030A)**

*(This unit was not in operation during CY 2005)*



**Wet Ash Loadout**

If Emission Source has multiple Operating Scenarios, complete one form for each.  
(All permitted, Insignificant and/or Non-permitted Sources)

Facility Name: University of North Carolina at Chapel Hill

Facility ID #: 6800043

Permit #: 03069T20

County: Orange

DAQ Region: Raleigh

**North Carolina Department of Environment and Natural Resources**

**Division of Air Quality**

**Air Pollutant Point Source Emissions Inventory - Calendar Year 2007**

1. Emission Source ID No. (same as in permit - Use "U" prefix for non-permitted and "I" for insignificant)		ES-030A					
2. Emission Source Description		Wet Ash Loadout					
3. Operating Scenario Description		N/A					
4. Maximum Permitted Operating Rate With Units (Ex. gal/hr, mmBtu/hr)		N/A					
5. Throughput in CY (e.g. production or fuel use) With Units (Ex. lbs/yr, gal/yr)		0		ton/yr			
6. Fuel Information (if fuel used)		% Sulfur	N/A	% Ash	N/A	Heat Content (Btu/lb or mmCF)	N/A

If you do not provide annual throughput/fuel use, your inventory will be deemed incomplete and returned to you.

7. Capture Efficiency (% Emissions from Emission Source Vented to Control Device or Stack)	N/A
--	-----

8. Control Device Information, if none, write "none"

	Control Device ID # (as listed in permit)	Control Device Description
i. (nearest stack)	None	None
ii.	None	None
iii.	None	None
iv.	None	None

9. Stack Information (sources vented to more than one stack use additional entry lines)

Stack ID #	Height (in whole feet)	Diameter (feet) Circle (enter #), Rectangle (L#, W#) (in 0.1 feet)	Temperature (F)	Velocity (feet/sec)	Volume Flow Rate (acfm)	Release Point Description (Fugitive, Vertical, Vertical w/ cap, Horizontal, Downward - see instructions)
N/A	N/A	N/A	N/A	N/A	N/A	N/A
--	--	--	--	--	--	--
--	--	--	--	--	--	--

10. Operating Schedule (Source/Operating Scenario that best characterizes calendar year)

Hours/Day	N/A	Days/Week	N/A	Weeks/Year	N/A	Hours/Year	N/A
Typical Start & End Times in CY:				Start:	N/A	End:	N/A

11. Seasonal Periods Percent Annual Throughput (for Emission Source in CY, MUST total 100%)

Jan-Feb, 2002 + Dec, 2002	0%	Mar-May	0%	June-Aug	0%	Sept-Nov	0%
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**This Unit Was Not in Operation During CY 2004.**

To review instructions or get a blank copy, go to web page: <http://daq.state.nc.us/Offices/Planning/Attainment/est.html>

Copy and Use additional Sheets as needed

# **University of North Carolina at Chapel Hill**

Chapel Hill, North Carolina

*Orange County*

Facility ID # 6800043

Permit # 03069T20

## **2006 Annual Emissions Inventory**

### **Enclosed Sorbent Railcar Dump Pit (Insignificant Source)**

**IS-53**

13,929 tons of sorbent delivered by rail in 2007. The remainder of the sorbent used was delivered by truck. There are no emission sources associated with truck delivery.

<b>Emission Source/Operating Scenario Data</b> Page 1 of 2		<b>Facility ID #:</b> 6800043					
<b>Enclosed Sorbent Railcar Dump Pit</b> <small>If Emission Source has multiple Operating Scenarios, complete one form for each. (All permitted, Insignificant and/or Non-permitted Sources)</small>		<b>Permit #:</b> 03069T20					
<b>Facility Name:</b> University of North Carolina at Chapel Hill		<b>County:</b> Orange					
		<b>DAQ Region:</b> Raleigh					
<b>North Carolina Department of Environment and Natural Resources</b> <b>Division of Air Quality</b> <b>Air Pollutant Point Source Emissions Inventory - Calendar Year 2007</b>							
<b>1. Emission Source ID No.</b> (same as in permit - Use "U" prefix for non-permitted and "I" for insignificant)		<b>"I" Insignificant - ID No. 020</b>					
<b>2. Emission Source Description</b>		Enclosed Sorbent Railcar Dump Pit					
<b>3. Operating Scenario Description</b>		N/A					
<b>4. Maximum Permitted Operating Rate</b> <small>With Units (Ex. gal/hr, mmBtu/hr)</small>		50 ton/hr					
<b>5. Throughput in CY</b> (e.g. production or fuel use) <small>With Units (Ex. lbs/yr, gal/yr)</small>		13,929 tons/yr					
<b>6. Fuel Information</b> (if fuel used)		% Sulfur	N/A				
		% Ash	N/A				
		Heat Content (Btu/lb or mmCF)	N/A				
If you do not provide annual throughput/fuel use, your inventory will be deemed incomplete and returned to you.							
<b>7. Capture Efficiency</b> (% Emissions from Emission Source Vented to Control Device or Stack)		N/A					
<b>8. Control Device Information</b> , if none, write "none"							
	<b>Control Device ID #</b> <small>(as listed in permit)</small>	<b>Control Device Description</b>					
i. (nearest stack)	None	None					
ii.	None	None					
iii.	None	None					
iv.	None	None					
<b>9. Stack Information</b> (sources vented to more than one stack use additional entry lines)							
Stack ID #	Height <small>(in whole feet)</small>	Diameter (feet) <small>Circle (enter #), Rectangle (L#, W#) (in 0.1 feet)</small>	Temperature <small>(F)</small>	Velocity <small>(feet/sec)</small>	Volume Flow Rate <small>(acfm)</small>	Release Point Description <small>(Fugitive, Vertical, Vertical w/ cap, Horizontal, Downward - see instructions)</small>	
<b>Fugitive</b>							
--	--	--	--	--	--	--	
--	--	--	--	--	--	--	
<b>10. Operating Schedule</b> (Source/Operating Scenario that best characterizes calendar year)							
Hours/Day	1	Days/Week	3	Weeks/Year	52	Hours/Year	156
Typical Start & End Times in CY:				Start:	N/A	End:	N/A
<b>11. Seasonal Periods Percent Annual Throughput</b> (for Emission Source in CY, MUST total 100%)							
Jan-Feb, 2002 + Dec, 2002	34.44%	Mar-May	19.91%	June-Aug	28.13%	Sept-Nov	17.51%

To review instructions or get a blank copy, go to web page: <http://daq.state.nc.us/Offices/Planning/Attainment/est.html>

Copy and Use additional Sheets as needed



# University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

Orange County

Facility ID # 6800043

Permit # 03069T20

## 2007 Annual Emissions Inventory

### Enclosed Sorbent (Lime) Railcar Dump Pit

(Insignificant Source - ID No. 020)

Sorbent is transported from the railcar dump pit in enclosed conveyors to the storage area. Emissions can be best estimated using the drop equation.

From section 13.2.4 of the AP-42: The following equation represents the particulate emissions generated by the dropping of sorbent into the dump pit.

$$E = k (0.0032) \frac{\left(\frac{u}{5}\right)^{1.3}}{\left(\frac{m}{2}\right)^{1.4}}$$

E = Emission Factor (lb/ton)

k = Particle Size Multiplier

u = Mean Wind Speed (mph)

m = Material Moisture Content (%)

k Value	Particulate Size	Emission Factor (lb/ton)
0.74	PM	1.787E-03
0.35	PM-10	8.45E-04
0.11	PM-2.5	2.66E-04

Average moisture content of sorbent is 0.7%

The dump area is fully enclosed, therefore the minimum wind speed of 1.3 mph was used.

**Total Sorbent 13,929 tons/yr**

*Emissions from the unloading of sorbent into the dump pit:*

	Emission Factor (lb/ton)	Emissions (lb/yr)	Emissions (ton/yr)
PM	1.32E-04	24.89	1.24E-02
PM-10	6.25E-05	11.77	5.89E-03
PM-2.5	1.96E-05	3.70	1.85E-03

# **University of North Carolina at Chapel Hill**

Chapel Hill, North Carolina

*Orange County*

Facility ID # 6800043

Permit # 03069T20

## **2007 Annual Emissions Inventory**

**Four Coal Bunkers  
(ES-01, 02, 03 and 04)**

*(These units do not discharge to the ambient air.)*

<b>Emission Source/Operating Scenario Data</b> Page 1 of 2		<b>Facility ID #:</b> 6800043					
<i>Coal Storage Bunkers</i> <small>If Emission Source has multiple Operating Scenarios, complete one form for each. (All permitted, Insignificant and/or Non-permitted Sources)</small>		<b>Permit #:</b> 03069T20					
<b>Facility Name:</b> University of North Carolina at Chapel Hill		<b>County:</b> Orange					
		<b>DAQ Region:</b> Raleigh					
<b>North Carolina Department of Environment and Natural Resources</b> <b>Division of Air Quality</b> <b>Air Pollutant Point Source Emissions Inventory - Calendar Year 2007</b>							
<b>1. Emission Source ID No.</b> (same as in permit - Use "U" prefix for non-permitted and "I" for insignificant)		<b>ES-01, 02, 03, 04</b>					
<b>2. Emission Source Description</b>		<b>Four Coal Storage Bunkers</b>					
<b>3. Operating Scenario Description</b>		<b>N/A</b>					
<b>4. Maximum Permitted Operating Rate</b> <small>With Units (Ex. gal/hr, mmBtu/hr)</small>		<b>60 tons/hr (each)</b>					
<b>5. Throughput in CY</b> (e.g. production or fuel use) <small>With Units (Ex. lbs/yr, gal/yr)</small>		<b>101,311 tons/yr</b>					
<b>6. Fuel Information</b> (if fuel used)		<b>% Sulfur</b> N/A	<b>% Ash</b> N/A				
		<b>Heat Content</b> (Btu/lb or mmCF)	N/A				
<small>If you do not provide annual throughput/fuel use, your inventory will be deemed incomplete and returned to you.</small>							
<b>7. Capture Efficiency</b> (% Emissions from Emission Source Vented to Control Device or Stack)		<b>100%</b>					
<b>8. Control Device Information</b> , if none, write "none"							
	<b>Control Device ID #</b> <small>(as listed in permit)</small>	<b>Control Device Description</b>					
<i>i. (nearest stack)</i>	<b>CD-014</b>	<b>Bagfilter on Bunker ES-01</b>					
<i>ii.</i>	<b>CD-015</b>	<b>Bagfilter on Bunker ES-02</b>					
<i>iii.</i>	<b>CD-016</b>	<b>Bagfilter on Bunker ES-03</b>					
<i>iv.</i>	<b>CD-017</b>	<b>Bagfilter on Bunker ES-04</b>					
<b>9. Stack Information</b> (sources vented to more than one stack use additional entry lines)							
<b>Stack ID #</b>	<b>Height</b> <small>(in whole feet)</small>	<b>Diameter (feet)</b> <small>Circle (enter #), Rectangle (L#, W#) (in 0.1 feet)</small>	<b>Temperature</b> <small>(F)</small>	<b>Velocity</b> <small>(feet/sec)</small>	<b>Volume Flow Rate</b> <small>(acfm)</small>	<b>Release Point Description</b> <small>(Fugitive, Vertical, Vertical w/ cap, Horizontal, Downward - see instructions)</small>	
EP-14-054	137	0.52	Ambient	78	1,000	Horizontal	
EP-14-056	137	0.52	Ambient	78	1,000	Horizontal	
EP-15-054	137	0.52	Ambient	78	1,000	Horizontal	
EP-15-056	137	0.52	Ambient	78	1,000	Horizontal	
<b>10. Operating Schedule</b> (Source/Operating Scenario that best characterizes calendar year)							
Hours/Day	1.5	Days/Week	7	Weeks/Year	52	Hours/Year	546
Typical Start & End Times in CY:				Start:	N/A	End:	N/A
Jan-Feb, 2002 + Dec, 2002							
Jan-Feb, 2002 + Dec, 2002	34.44%	Mar-May	19.91%	June-Aug	28.13%	Sept-Nov	17.51%

**These Sources are Vented Inside the Boiler Building. There is NO Discharge to the Ambient Air.**

To review instructions or get a blank copy, go to web page: <http://daq.state.nc.us/Offices/Planning/Attainment/est.html>

Copy and Use additional Sheets as needed





# University of North Carolina at Chapel Hill

Chapel Hill, North Carolina

Orange County

Facility ID # 6800043

Permit # 03069T20

## 2007 Annual Emissions Inventory

### 4 Coal Bunker Storage Areas

**(ES-01, 02, 03, 04)**

Coal is transported from the coal crusher building in enclosed conveyors to the boiler building. Inside the boiler building the coal is stored in four coal bunkers.

Assume that the total amount of coal fed to the bunkers is equal to the total amount of coal combusted in 2007.

Boiler #6	51,331	Tons/yr
Boiler #7	49,980	Tons/yr
Total	101,311	Tons/yr

The bulk density of coal is 47 lb/ft<sup>3</sup>

Total volume of coal combusted is = 4,311,116 ft<sup>3</sup>/yr  
(Volume of coal combusted = volume of displaced air through bin filter)

These emissions are routed through bin filters (baghouses). Emissions from the bin filters are conservatively estimated at 0.015 gr/acfm (displaced air through bin filters).

$$\text{lb/yr} = (\text{ft}^3/\text{yr}) (0.015 \text{ gr/acfm}) (1/7000 \text{ lb/gr})$$

<b>Total Emissions from the bunkers</b>	<b>64,667</b>	<b>gr/yr</b>
	<b>9.238</b>	<b>lb/yr</b>
	<b>0.005</b>	<b>ton/yr</b>

*This baghouse is vented inside the Boiler Building, therefore there are no emissions to the ambient air.*

**University of North Carolina at Chapel Hill**

Chapel Hill, North Carolina

*Orange County*

Facility ID # 6800043

Permit # 03069T20

**2007 Annual Emissions Inventory**

**DG No.1 and No.2 - Two 2,000 kW Generators  
Cogeneration Facility**

**(ES-007 & ES-008)**

<b>Emission Source/Operating Scenario Data</b> Page 1 of 2		Facility ID #: <b>6800043</b>					
<i>Emergency Generators Classified as Insignificant Sources</i>		Permit #: <b>03069T20</b>					
Facility Name: <b>University of North Carolina at Chapel Hill</b>		County: <b>Orange</b>					
		DAQ Region: <b>Raleigh</b>					
<b>North Carolina Department of Environment and Natural Resources</b> <b>Division of Air Quality</b> <b>Air Pollutant Point Source Emissions Inventory - Calendar Year 2007</b>							
1. Emission Source ID No. (same as in permit - Use "U" prefix for non-permitted and "I" for insignificant)		<b>ES-007 &amp; ES-008</b>					
2. Emission Source Description		<b>Two Blackstart Generators located at Cogeneration Facility</b>					
3. Operating Scenario Description		<b>Operating Scenario #1 - No. 2 Fuel Oil</b>					
4. Maximum Permitted Operating Rate With Units (Ex. gal/hr, mmBtu/hr)		<b>270 gal/hr - 2 units</b>					
5. Throughput in CY (e.g. production or fuel use) With Units (Ex. lbs/yr, gal/yr)		<b>53,289</b>					
		<b>gallons/year, Total No. 2 Fuel Oil</b>					
6. Fuel Information (if fuel used)		% Sulfur	<b>50.00%</b>				
		% Ash	<b>N/A</b>				
		Heat Content (Btu/lb or mmCF)	<b>137,006 Btu/gallon</b>				
If you do not provide annual throughput/fuel use, your inventory will be deemed incomplete and returned to you.							
7. Capture Efficiency (% Emissions from Emission Source Vented to Control Device or Stack)		<b>N/A</b>					
8. Control Device Information, if none, write "none"							
	<b>Control Device ID #</b> (as listed in permit)	<b>Control Device Description</b>					
i. (nearest stack)	<b>None</b>	<b>None</b>					
ii.	<b>None</b>	<b>None</b>					
iii.	<b>None</b>	<b>None</b>					
iv.	<b>None</b>	<b>None</b>					
9. Stack Information (sources vented to more than one stack use additional entry lines)							
Stack ID #	Height (in whole feet)	Diameter (feet) Circle (enter #), Rectangle (L#, W#) (in 0.1 feet)	Temperature (F)	Velocity (feet/sec)	Volume Flow Rate (acfm)	Release Point Description (Fugitive, Vertical, Vertical w/ cap, Horizontal, Downward - see instructions)	
<b>Common Stack Parameters with 2-generators and Boiler No. 8 operating concurrently</b>							
Stk No.4	<b>208</b>	<b>6</b>	<b>400</b>	<b>70</b>	<b>118,752</b>	<b>Vertical</b>	
--	--	--	--	--	--	--	
10. Operating Schedule (Source/Operating Scenario that best characterizes calendar year)							
Hours/Day	<b>N/A</b>	Days/Week	<b>N/A</b>	Weeks/Year	<b>N/A</b>	Hours/Year	<b>N/A</b>
Typical Start & End Times in CY:				Start:	<b>N/A</b>	End:	<b>N/A</b>
11. Seasonal Periods Percent Annual Throughput (for Emission Source in CY, MUST total 100%)							
Jan-Feb, 2007 + Dec, 2007	<b>1.3%</b>	Mar-May	<b>3.0%</b>	June-Aug	<b>94.4%</b>	Sept-Nov	<b>1.3%</b>

Two-2,000 kW No.2 oil-fired generators

Facility Name: University of North Carolina at Chapel Hill

**North Carolina Department of Environment and Natural Resources  
Division of Air Quality  
Air Pollutant Point Source Emissions Inventory - Calendar Year 2007**

**Emissions:** Attach calculations and documentation of emission factors or other estimation methods used.

Emission Source ID No. (same as in permit - Use "U" prefix for non-permitted and "I" for insignificant)

ES-007 & ES-008

Criteria (NAAQS) Pollutants	Pollutant Code	Emissions Criteria (Tons/Year)	Emissions Estimation Method Code (see instructions for code)	Control Efficiency (Net after all controls)
Carbon Monoxide	CO	3.10	8	N/A
NOx	NOx	6.94	8	N/A
PM Total	PM	0.37	8	N/A
PM-2.5	PM-2.5	0.37	8	N/A
PM-10	PM-10	0.37	8	N/A
SO2	SO2	1.84	8	N/A
VOC	VOC	0.30	8	N/A
HAP/TAP Pollutants (In Alphabetical Order)	CAS # (or other code - see instructions)	Emissions HAP/TAP (Pounds/Year)	Emissions Estimation Method Code (see instructions for code)	Control Efficiency (Net after all controls)
Acetaldehyde	75-07-0	0.18	8	N/A
Acrolein	107-02-8	0.06	8	N/A
Benzene	71-43-2	5.67	8	N/A
Formaldehyde	50-00-0	0.58	8	N/A
Napthalene	91-20-3	0.95	8	N/A
Propylene	115-07-1	20.37	8	N/A
Toluene	108-88-3	2.05	8	N/A
Xylene	1330-20-7	1.41	8	N/A
Greenhouse Gas Pollutants	Pollutant Code	Emissions Criteria (Tons/Year)	Emissions Estimation Method Code (see instructions for code)	Control Efficiency (Net after all controls)
Carbon Dioxide	CO <sub>2</sub>	602.32	8	N/A
Methane	CH <sub>4</sub>	3.22E-02	8	N/A

**University of North Carolina at Chapel Hill**

Chapel Hill, North Carolina

Orange County

Facility ID # 6800043

Permit # 03069T20

2007 Annual Emissions Inventory

**Blackstart Generators G1 & G2**

(ES-007 & ES-008)

<b>Fuel Input Rates</b>	
Hourly Fuel Usage (gallons):	270 (2-units)
Annual Fuel Usage (gallons):	53,289 (2-units)
Fuel Sulfur Content (%)	0.5
<b>Heat Input Rates</b>	
Fuel Heating Values (Btu/gallon)	137,006
Hourly Fuel Usage (mmBtu):	36.99
Annual Fuel Usage (mmBtu):	7,301

<b>Emissions Output</b>				Emission Factor (lb/mmBtu)
<b>Criteria Pollutants</b>				
Pollutant	lb/hr	lb/yr	tpy	
PM	3.7E+00	7.3E+02	3.7E-01	1.00E-01
PM-10	3.7E+00	7.3E+02	3.7E-01	1.00E-01
PM-2.5	3.7E+00	7.3E+02	3.7E-01	1.00E-01
NOx	7.0E+01	1.4E+04	6.9E+00	1.90E+00
NMTOC, Total	3.0E+00	6.0E+02	3.0E-01	8.19E-02
CO	3.1E+01	6.2E+03	3.1E+00	8.50E-01
SO <sub>x</sub>	1.9E+01	3.7E+03	1.8E+00	5.05E-01
<b>Toxic/Hazardous Air Pollutants</b>				
Pollutant	lb/hr	lb/day	lb/yr	
Acetaldehyde	9.3E-04	NA	1.8E-01	2.52E-05
Acrolein	2.9E-04	NA	5.8E-02	7.88E-06
Benzene	2.9E-02	NA	5.7E+00	7.76E-04
Formaldehyde	2.9E-03	NA	5.8E-01	7.89E-05
Naphthalene	4.8E-03	NA	9.5E-01	1.30E-04
Propylene	1.0E-01	NA	2.0E+01	2.79E-03
Toluene	1.0E-02	2.5E-01	2.1E+00	2.81E-04
Xylene	7.1E-03	1.7E-01	1.4E+00	1.93E-04
<b>Greenhouse Gas Pollutants</b>				Em. Factor (lb/mmBtu)
Pollutant	lb/hr	lb/yr	tpy	
Carbon dioxide	6,104	1,204,642	602.32	165
Methane	3.3E-01	6.4E+01	3.2E-02	8.82E-03

Emission factors are from AP-42 Chapter 3, Section 3.4, Large Stationary Diesel Engines, dated October 1996.

Hourly emission rates for all pollutants are based on the hourly engine output. Annual emissions are based on the annual engine output.

Daily emissions are based on operation at the hourly input rate for 24 hours.