

**APPENDIX B1:**  
ATLANTIC RIM EMISSIONS INVENTORY

## **Appendix B1 – Atlantic Rim Emissions Inventory**

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Table B1.1.1  
Atlantic Rim Emissions Inventory  
Well Pad Construction



**605 Skyline Drive**  
**Laramie, WY 82070**  
**Phone: (307) 742-3843**  
**Fax: (307) 745-8317**

Project: Atlantic Rim  
Phase: Road Construction  
Activity: Fugitive Particulate Emissions  
from Well Pad Construction  
Engineer: Cassidy Marshall  
Date: 5/20/2004

Well Pad Area	Construction Activity TSP Emission Factor <sup>1</sup>	Construction Activity Duration	Construction Activity Duration	Construction Activity Duration	Construction Activity Duration <sup>2</sup>	Emission Control Efficiency	PM <sub>10</sub> Emissions (controlled) <sup>3</sup>	PM-2.5 Emissions (controlled) <sup>4</sup>
(acre)	(tons/acre-month)	(days/well pad)	(hours/day)	(days/week)	(months/year)	(%)	(lb/well)	(lb/well)
2.0	1.2	1	10	7	8	0	57.60	15.20
Well Pad Construction Emissions (lb/day/well)							57.60	15.20
Well Pad Construction Emissions (lb/hr/well)							5.76	1.52

<sup>1</sup> AP-42 (EPA, 1995), Section 13.2.3, "Heavy Construction Operations".

<sup>2</sup> Construction occurs 8 months per year, March - October.

<sup>3</sup> AP-42 (EPA, 1998), Section 13.2.2 "Unpaved Roads", Background Document. Assuming that 36% of the TSP is in the PM<sub>10</sub> size range, monthly emissions converted to daily and hourly emissions based on 30-day month.

<sup>4</sup> AP-42 (EPA, 1998), Section 13.2.2 "Unpaved Roads", Background Document. Assuming that 9.5% of the TSP is in the PM<sub>2.5</sub> size range, monthly emissions converted to daily and hourly emissions based on 30-day month.

Table B1.1.2  
Atlantic Rim Emissions Inventory  
Resource Road Construction



**605 Skyline Drive**  
**Laramie, WY 82070**  
**Phone: (307) 742-3843**  
**Fax: (307) 745-8317**

Project: Atlantic Rim  
Phase: Road Construction  
Activity: Fugitive Particulate Emissions from  
Resource Road Construction  
Engineer: Cassidy Marshall  
Date: 5/20/2004

Resource Road Area <sup>1</sup>	Construction Activity TSP Emission Factor <sup>2</sup>	Construction Activity Duration	Construction Activity Duration	Construction Activity Duration	Construction Activity Duration <sup>3</sup>	Emission Control Efficiency	PM-10 Emissions (controlled) <sup>4</sup>	PM-2.5 Emissions (controlled) <sup>5</sup>	
(acres)	(tons/acre-month)	(days/pad)	(hours/day)	(day/week)	(months/year)	(%)	(lb/pad)	(lb/pad)	
1.8182	1.2	1	10	7	8	0	52.36	13.82	
							Resource Road Construction Emissions (lb/day/well)	52.36	13.82
							Resource Road Construction Emissions (lb/hr/well)	5.24	1.38

<sup>1</sup> Construction Area = 1320 ft/well x 60-ft ROW = 1.8182 acres.  
<sup>2</sup> AP-42 (EPA, 1995), Section 13.2.3, "Heavy Construction Operations".  
<sup>3</sup> Construction occurs 8 months per year, March - October.  
<sup>4</sup> AP-42 (EPA, 1998), Section 13.2.2 "Unpaved Roads", Background Document. Assuming that 36% of the TSP is in the PM<sub>10</sub>  
<sup>5</sup> size range, monthly emissions converted to daily and hourly emissions based on 30-day month.  
AP-42 (EPA, 1998), Section 13.2.2 "Unpaved Roads", Background Document. Assuming that 9.5% of the TSP is in the PM<sub>2.5</sub>  
size range, monthly emissions converted to daily and hourly emissions based on 30-day month.

Table B1.1.3  
Atlantic Rim Emissions Inventory  
Well Pad/Resource Road Traffic



**605 Skyline Drive**  
**Laramie, WY 82070**  
**Phone: (307) 742-3843**  
**Fax: (307) 745-8317**

Project: Atlantic Rim  
Phase: Well Pad/Resource Road  
Construction  
Activity: Fugitive Particulate  
Emissions from Traffic  
on Resource Roads  
Engineer: Cassady Marshall  
Date: 6/18/2004

Vehicle Type	Average Vehicle Weight (lb)	Average Vehicle Speed (mph)	Silt Content <sup>1</sup> (%)	Moisture Content <sup>2</sup> (%)	Construction Activity Duration (hours/day)	Construction Activity Duration (day/week)	Construction Activity Duration <sup>3</sup> (month/year)	Construction Activity Duration (days/well)	Vehicle Miles Traveled (VMT) (VMT/day)	Vehicle Miles Traveled (VMT) (VMT/well)	Emission Control Efficiency (%)	PM-10 Emission Factor <sup>4</sup> (lb/VMT)	PM-2.5 Emission Factor <sup>4</sup> (lb/VMT)	PM-10 Emissions <sup>5</sup> (lb/pad)	PM-2.5 Emissions <sup>5</sup> (lb/pad)	
<b>Jolly Rogers</b>																
Light trucks/pickups	7,000	25	8.4	2.4	10	7	8	1	43.4	43.4	0	0.84	0.13	36.46	5.46	
													Total Unpaved Road Traffic Emissions (lb/pad)		36.46	5.46
													Total Unpaved Road Traffic Emissions (lb/hr/pad) <sup>6</sup>		3.65	0.55
<b>Muddy Mountain</b>																
Light trucks/pickups	7,000	25	8.4	2.4	10	7	8	1	29.8	29.8	0	0.84	0.13	25.03	3.75	
													Total Unpaved Road Traffic Emissions (lb/pad)		25.03	3.75
													Total Unpaved Road Traffic Emissions (lb/hr/pad) <sup>6</sup>		2.50	0.37

<sup>1</sup> AP-42 (EPA, 1998), Table 13.2.2-1, "Typical Silt Content Values of Surface Material on Industrial and Rural Unpaved Roads."  
<sup>2</sup> AP-42 (EPA, 1998), Table 11.9-3, "Typical Values for Correction Factors Applicable to the Predictive Emission Factor Equations."  
<sup>3</sup> Construction occurs 8 months per year, March - October.  
<sup>4</sup> AP-42 (EPA, 2003), Section 13.2.2 "Unpaved Roads", equations 1a and 1b.  
<sup>5</sup> Calculated as lb/VMT x VMT/pad x control efficiency.  
<sup>6</sup> Calculated as lb/well / 1.0 days/well / 10 hours/day.

Table B1.1.4  
Atlantic Rim Emissions Inventory  
Well Pad/Resource Road Heavy Equipment



605 Skyline Drive  
Laramie, WY 82070  
Phone: (307) 742-3843  
Fax: (307) 745-8317

Project: Atlantic Rim  
Phase: Well Pad/Road Construction  
Activity: Diesel Combustion Emissions  
from Heavy Equipment  
Tailpipes  
Engineer: Cassidy Marshall  
Date: 5/20/2004

Heavy Equipment	Engine Horsepower (hp)	Number Required	Operating Load Factor	Pollutant Emission Factor <sup>1</sup>					Construction Activity Duration (days/equipment type)	Construction Activity Duration (hours/day)	Construction Activity Duration (day/week)	Construction Activity Duration <sup>3</sup> (months/year)	Pollutant Emissions					Pollutant Emissions <sup>4</sup>				
				CO	NO <sub>x</sub>	SO <sub>2</sub> (g/hp-hr)	VOC	PM <sub>10</sub>					CO	NO <sub>x</sub>	SO <sub>2</sub> (lb/well)	VOC	PM <sub>10</sub> <sup>5</sup>	CO	NO <sub>x</sub>	SO <sub>2</sub> (lb/hr/well)	VOC	PM <sub>10</sub> <sup>5</sup>
D8 Dozer <sup>2</sup>	285	1	0.4	2.15	7.81	0.851	0.75	0.692	2	10	7	8	10.81	39.26	4.28	3.77	3.48	0.54	1.96	0.21	0.19	0.17
Backhoe	128	1	0.4	2.71	8.81	0.857	0.97	0.805	1	10	7	8	3.06	9.94	0.97	1.09	0.91	0.31	0.99	0.10	0.11	0.09
Total Heavy Equipment Tailpipe Emissions												13.87	49.20	5.24	4.86	4.39	0.85	2.96	0.31	0.30	0.26	

<sup>1</sup> AP-42 (EPA, 1985), Volume II Mobile Sources.

<sup>2</sup> Emission factor for track-type tractor.

<sup>3</sup> Construction occurs 8 months per year, March - October.

<sup>4</sup> Calculated as lb/well / days/equipment type / 10 hours/day.

<sup>5</sup> PM-2.5 assumed equivalent to PM-10 for combustion sources.

Table 1.1.5  
Atlantic Rim Emissions Inventory  
Rig-up and Rig-down Traffic



605 Skyline Drive  
Laramie, WY 82070  
Phone: (307) 742-3843  
Fax: (307) 745-8317

Project: Atlantic Rim  
Phase: Rig-up and Rig-down  
Activity: Fugitive Particulate Emissions from  
Traffic on Unpaved Roads  
Engineer: Cassady Marshall  
Date: 6/18/2004

Vehicle Type	Average Vehicle Weight (lb)	Average Vehicle Speed (mph)	Silt Content <sup>1</sup> (%)	Moisture Content <sup>2</sup> (%)	Construction Activity Duration (hours/day)	Construction Activity Duration (day/week)	Construction Activity Duration (days/year)	Construction Activity Duration <sup>3</sup> (days/well)	Vehicle Miles Traveled (VMT) (VMT/day/well)	Total VMT (VMT/well)	Emission Control Efficiency (%)	PM-10 Emission Factor <sup>4</sup> (lb/VMT)	PM-2.5 Emission Factor <sup>4</sup> (lb/VMT)	PM-10 Emissions <sup>5</sup> (lb/well)	PM-2.5 Emissions <sup>5</sup> (lb/well)
<b>Jolly Rogers</b>															
Semi-Trucks	40,000	20	8.4	2.4	24	7	350	4	5	20	0	2.56	0.39	51.11	7.84
Light trucks/pickups	7,000	25	8.4	2.4	24	7	350	4	86.8	347	0	0.84	0.13	291.65	43.65
Total Resource Road Traffic Emissions (lb/pad)														342.76	51.48
Total Resource Road Emissions (lb/hr/well) <sup>6</sup>														3.57	0.54
<b>Muddy Mountain</b>															
Semi-Trucks	40,000	20	8.4	2.4	24	7	350	4	5	20	0	2.56	0.39	51.11	7.84
Light trucks/pickups	7,000	25	8.4	2.4	24	7	350	4	59.6	238	0	0.84	0.13	200.26	29.97
Total Resource Road Traffic Emissions (lb/pad)														251.37	37.81
Total Resource Road Emissions (lb/hr/well) <sup>6</sup>														2.62	0.39

<sup>1</sup> AP-42 (EPA, 1998), Table 13.2.2-1, "Typical Silt Content Values of Surface Material on Industrial and Rural Unpaved Roads."  
<sup>2</sup> AP-42 (EPA, 1998), Table 11.9-3, "Typical Values for Correction Factors Applicable to the Predictive Emission Factor Equations."  
<sup>3</sup> 4 days/well = 2 days for rig-up and 2 days for rig-down.  
<sup>4</sup> AP-42 (EPA, 2003), Section 13.2.2 "Unpaved Roads", equations 1a and 1b.  
<sup>5</sup> Calculated as lb/VMT x VMT/pad x control efficiency.  
<sup>6</sup> Calculated as (lb/well) / 4 days/well / 24 hours/day.

Table B1.1.6  
Atlantic Rim Emissions Inventory  
Drilling Traffic



605 Skyline Drive  
Laramie, WY 82070  
Phone: (307) 742-3843  
Fax: (307) 745-8317

Project: Atlantic Rim  
Phase: Drilling  
Activity: Fugitive Particulate Emissions from  
Traffic on Unpaved Roads  
Engineer: Cassidy Marshall  
Date: 6/18/2004

Vehicle Type	Average Vehicle Weight (lb)	Average Vehicle Speed (mph)	Silt Content <sup>1</sup> (%)	Moisture Content <sup>2</sup> (%)	Construction Activity Duration (hours/day)	Construction Activity Duration (day/week)	Construction Activity Duration (days/year)	Construction Activity Duration (days/well)	Vehicle Miles Traveled (VMT) (VMT/day)	Vehicle Miles Traveled (VMT) (VMT/well)	Emission Control Efficiency (%)	PM-10 Emission Factor <sup>3</sup> (lb/VMT)	PM-2.5 Emission Factor <sup>3</sup> (lb/VMT)	PM-10 Emissions <sup>4</sup> (lb/well) (controlled)	PM-2.5 Emissions <sup>4</sup> (lb/well) (controlled)
<b>Jolly Rogers</b>															
Fuel Truck	40,000	20	8.4	2.4	24	7	350	4	43.4	173.6	0	2.56	0.39	443.60	68.02
Mud Truck	40,000	20	8.4	2.4	24	7	350	4	10	40	0	2.56	0.39	102.21	15.67
Water Truck	40,000	20	8.4	2.4	24	7	350	4	10	40	0	2.56	0.39	102.21	15.67
Light trucks/pickups	7,000	25	8.4	2.4	24	7	350	4	183.6	734.4	0	0.84	0.13	616.91	92.32
Total Resource Road Traffic Emissions (lb/well)														1,264.93	191.69
Total Resource Road Emissions (lb/hr/well) <sup>5</sup>														13.18	2.00
<b>Doty Mountain</b>															
Fuel Truck	40,000	20	8.4	2.4	24	7	350	4	36.8	147.2	0	2.56	0.39	376.14	57.67
Mud Truck	40,000	20	8.4	2.4	24	7	350	4	10	40	0	2.56	0.39	102.21	15.67
Water Truck	40,000	20	8.4	2.4	24	7	350	4	10	40	0	2.56	0.39	102.21	15.67
Light trucks/pickups	7,000	25	8.4	2.4	24	7	350	4	163.2	652.8	0	0.84	0.13	548.36	82.07
Total Resource Road Traffic Emissions (lb/well)														1,128.92	171.08
Total Resource Road Emissions (lb/hr/well) <sup>5</sup>														11.76	1.78
<b>Cow Creek</b>															
Fuel Truck	40,000	20	8.4	2.4	24	7	350	4	9.9	39.6	0	2.56	0.39	101.19	15.52
Mud Truck	40,000	20	8.4	2.4	24	7	350	4	10	40	0	2.56	0.39	102.21	15.67
Water Truck	40,000	20	8.4	2.4	24	7	350	4	10	40	0	2.56	0.39	102.21	15.67
Light trucks/pickups	7,000	25	8.4	2.4	24	7	350	4	49.6	198.4	0	0.84	0.13	166.66	24.94
Total Resource Road Traffic Emissions (lb/well)														472.27	71.80
Total Resource Road Emissions (lb/hr/well) <sup>5</sup>														4.92	0.75
<b>Blue Sky</b>															
Fuel Truck	40,000	20	8.4	2.4	24	7	350	4	22.2	88.8	0	2.56	0.39	226.91	34.79
Mud Truck	40,000	20	8.4	2.4	24	7	350	4	10	40	0	2.56	0.39	102.21	15.67
Water Truck	40,000	20	8.4	2.4	24	7	350	4	10	40	0	2.56	0.39	102.21	15.67
Light trucks/pickups	7,000	25	8.4	2.4	24	7	350	4	98.8	395.2	0	0.84	0.13	331.98	49.68
Total Resource Road Traffic Emissions (lb/well)														763.31	115.82
Total Resource Road Emissions (lb/hr/well) <sup>5</sup>														7.95	1.21
<b>Wild Horse</b>															
Fuel Truck	40,000	20	8.4	2.4	24	7	350	4	12.1	48.4	0	2.56	0.39	123.68	18.96
Mud Truck	40,000	20	8.4	2.4	24	7	350	4	10	40	0	2.56	0.39	102.21	15.67
Water Truck	40,000	20	8.4	2.4	24	7	350	4	10	40	0	2.56	0.39	102.21	15.67
Light trucks/pickups	7,000	25	8.4	2.4	24	7	350	4	58.5	234	0	0.84	0.13	196.56	29.42
Total Resource Road Traffic Emissions (lb/well)														524.66	79.73
Total Resource Road Emissions (lb/hr/well) <sup>5</sup>														5.47	0.83
<b>Muddy Mountain</b>															
Fuel Truck	40,000	20	8.4	2.4	24	7	350	4	28.9	115.6	0	2.56	0.39	295.39	45.29
Mud Truck	40,000	20	8.4	2.4	24	7	350	4	10	40	0	2.56	0.39	102.21	15.67
Water Truck	40,000	20	8.4	2.4	24	7	350	4	10	40	0	2.56	0.39	102.21	15.67
Light trucks/pickups	7,000	25	8.4	2.4	24	7	350	4	127.4	509.6	0	0.84	0.13	428.07	64.06
Total Resource Road Traffic Emissions (lb/well)														927.89	140.70
Total Resource Road Emissions (lb/hr/well) <sup>5</sup>														9.67	1.47

<sup>1</sup>AP-42 (EPA, 1998), Table 13.2.2-1, "Typical Silt Content Values of Surface Material on Industrial and Rural Unpaved Roads."  
<sup>2</sup>AP-42 (EPA, 1998), Table 11.9-3, "Typical Values for Correction Factors Applicable to the Predictive Emission Factor Equations."  
<sup>3</sup>AP-42 (EPA, 2003), Section 13.2.2 "Unpaved Roads", equations 1a and 1b.  
<sup>4</sup> Calculated as lb/VMT x VMT/pad x control efficiency.  
<sup>5</sup> Calculated as (lb/well) / 4 days/well / 24 hours/day.

Table B1.1.7  
Atlantic Rim Emissions Inventory  
Rig-up, Drilling Heavy, and Rig-down Equipment



**605 Skyline Drive**  
**Laramie, WY 82070**  
**Phone: (307) 742-3843**  
**Fax: (307) 745-8317**

Project: Atlantic Rim  
Phase: Rig-up, Drilling, Rig-down  
Activity: Diesel Combustion Emissions  
from Haul Truck Tailpipes  
Engineer: Cassady Marshall  
Date: 5/20/2004

Pollutant	Pollutant Emission Factor <sup>1</sup>	Vehicle Miles Traveled (VMT)	Haul Activity Duration	Haul Activity Duration	Haul Activity Duration	Emissions	Emissions <sup>4</sup>
	(grams/mile)	(VMT/well)	(days/well)	(hours/day)	(days/year)	(lb/well)	(lb/hr/well)
CO	14.74	202	4	24	350	6.57	6.84E-02
NO <sub>x</sub>	11.44	202	4	24	350	5.10	5.31E-02
SO <sub>2</sub> <sup>3</sup>	0.32	202	4	24	350	0.14	1.47E-03
VOC	5.69	202	4	24	350	2.54	2.64E-02

<sup>1</sup> AP-42 (EPA, 1985), Volume II Mobile Sources. Heavy duty diesel engine powered trucks, high altitude, 20 mph, "aged" with 50,000 miles, 1997+ model.

<sup>3</sup> The SO<sub>2</sub> emission factor is calculated assuming 10 mpg fuel consumption, with 0.05% sulfur content of #2 diesel fuel, and fuel density of 7.001 lb/gal.

<sup>4</sup> Calculated as (lb/well) / 4 days/well / 24 hours/day.

Table B1.1.8  
Atlantic Rim Emissions Inventory  
Drilling Engines



**605 Skyline Drive**  
**Laramie, WY 82070**  
**Phone: (307) 742-3843**  
**Fax: (307) 745-8317**

Project: Atlantic Rim  
Phase: Drilling  
Activity: Diesel Combustion  
Emissions from Drilling  
Engines - Manufacturer's  
Data  
Engineer: Cassady Marshall  
Date: 6/18/2004

Pollutant	Pollutant Emission Factor <sup>1</sup>	Total Horsepower All Engines <sup>2</sup>	Overall Load Factor <sup>3</sup>	Drilling Activity Duration	Drilling Activity Duration	Emissions	Emissions
	(lb/hp-hr)	(hp)		(days/well)	(hours/day)	(lb/well)	(lb/hr/well)
CO	0.00331	2,550	0.42	4	24	342.02	3.56
NOx	0.019	2,550	0.42	4	24	1,995.14	20.78
SO <sub>2</sub>	0.00205	2,550	0.42	4	24	212.03	2.21
VOC	0.0006	2,550	0.42	4	24	57.00	0.59
PM <sub>10</sub> <sup>5</sup>	0.0022	2,550	0.42	4	24	227.54	2.37

<sup>1</sup> Emission factors for NOx, CO, and VOC based on manufacturer's data. PM10 and SO2 emissions factors AP-42 (EPA, 1996), Section 3.3, "Gasoline and Diesel Industrial Engines. Table 3.3-1.

<sup>2</sup> Drilling engine horsepower based on three 850 hp engines.

<sup>3</sup> The overall load factor is calculated based on average throttle setting of 65% and a load factor of 65%.  
Therefore, the overall load factor = 0.65 \* 0.65 = 0.42.

<sup>5</sup> PM2.5 assumed equivalent to PM10 for drilling engines.

Table B1.1.9  
Atlantic Rim Emissions Inventory  
Completion Traffic



605 Skyline Drive  
Laramie, WY 82070  
Phone: (307) 742-3843  
Fax: (307) 745-8317

Project: Atlantic Rim  
Phase: Completion  
Activity: Fugitive Particulate Emissions from  
Traffic on Unpaved Roads  
Engineer: Cassidy Marshall  
Date: 6/18/2004

Vehicle Type	Average Vehicle Weight	Average Vehicle Speed	Silt Content <sup>1</sup>	Moisture Content <sup>2</sup>	Completion Activity Duration	Completion Activity Duration	Vehicle Miles Traveled (VMT)	Vehicle Miles Traveled (VMT)	Emission Control Efficiency	PM-10 Emission Factor <sup>3</sup>	PM-2.5 Emission Factor <sup>3</sup>	PM-10 Emissions <sup>4</sup> (controlled)	PM-2.5 Emissions <sup>4</sup> (controlled)
	(lb)	(mph)	(%)	(%)	(hours/day)	(day/well)	(VMT/day)	(VMT/well)	(%)	(lb/VMT)	(lb/VMT)	(lb/well)	(lb/well)
<b>Jolly Rogers</b>													
Water Truck	40,000	20	8.40	2.40	12.00	2.00	10.00	20.00	0.00	2.56	0.39	51.11	7.84
Cement Delivery	40,000	20	8.40	2.40	12.00	2.00	10.00	20.00	0.00	2.56	0.39	51.11	7.84
Light Pick-ups	7,000	25	8.40	2.40	12.00	2.00	43.40	86.80	0.00	0.84	0.126	72.91	10.91
Total Resource Road Emissions (lb/well)												175.12	26.58
Total Resource Road Emissions (lb/hr/well) <sup>5</sup>												7.30	1.108
<b>Muddy Mountain</b>													
Water Truck	40,000	20	8.40	2.40	12.00	2.00	10.00	20.00	0.00	2.56	0.39	51.11	7.84
Cement Delivery	40,000	20	8.40	2.40	12.00	2.00	10.00	20.00	0.00	2.56	0.39	51.11	7.84
Light Pick-ups	7,000	25	8.40	2.40	12.00	2.00	29.80	59.60	0.00	0.84	0.126	50.07	7.49
Total Resource Road Emissions (lb/well)												152.28	23.16
Total Resource Road Emissions (lb/hr/well) <sup>5</sup>												6.34	0.965

<sup>1</sup> AP-42 (EPA, 1998), Table 13.2.2-1, "Typical Silt Content Values of Surface Material on Industrial and Rural Unpaved Roads."

<sup>2</sup> AP-42 (EPA, 1998), Table 11.9-3, "Typical Values for Correction Factors Applicable to the Predictive Emission Factor Equations."

<sup>3</sup> AP-42 (EPA, 2003), Section 13.2.2 "Unpaved Roads", equations 1a and 1b.

<sup>4</sup> Calculated as lb/VMT x VMT/pad x control efficiency.

<sup>5</sup> Calculated as (lb/well) / 2 days/well / 12 hours/day.

Table B1.1.10  
 Atlantic Rim Emissions Inventory  
 Completion Heavy Equipment



605 Skyline Drive  
 Laramie, WY 82070  
 Phone: (307) 742-3843  
 Fax: (307) 745-8317

Project: Atlantic Rim  
 Phase: Completion  
 Activity: Diesel Combustion  
 Emissions from Haul  
 Truck Tailpipes  
 Engineer: Cassidy Marshall  
 Date: 5/20/2004

Pollutant	Pollutant Emission Factor <sup>1</sup>	Vehicle Miles Traveled	Haul Activity Duration	Haul Activity Duration	Emissions	Emissions <sup>2</sup>
	(grams/mile)	(VMT/well)	(days/well)	(hours/day)	(lb/well)	(lb/hr/well)
CO	14.74	20	2	12	0.65	2.71E-02
NO <sub>x</sub>	11.44	20	2	12	0.50	2.10E-02
SO <sub>2</sub> <sup>3</sup>	0.32	20	2	12	0.01	5.83E-04
VOC	5.69	20	2	12	0.25	1.05E-02

<sup>1</sup> AP-42 (EPA, 1985), Volume II Mobile Sources. Heavy duty diesel engine powered trucks, high altitude, 20 mph, "aged" with 50,000 miles, 1997+ model.

<sup>2</sup> Calculated as lb/well / 2 days/well / 12 hours/day.

<sup>3</sup> The SO<sub>2</sub> emission factor is calculated assuming 10 mpg fuel consumption, with 0.05% sulfur content of #2 diesel fuel, and fuel density of 7.001 lb/gal.

Table B1.1.11  
Atlantic Rim Emissions Inventory  
Completion Engines



**605 Skyline Drive**  
**Laramie, WY 82070**  
**Phone: (307) 742-3843**  
**Fax: (307) 745-8317**

Project: Atlantic Rim  
Phase: Completion  
Activity: Diesel Combustion Emissions  
from Completion Engines  
Engineer: Cassady Marshall  
Date: 5/20/2004

Pollutant	Pollutant Emission Factor <sup>1</sup> (lb/hp-hr)	Total Horsepower All Engines (hp)	Overall Load Factor <sup>2</sup>	Drilling Activity Duration (days/well)	Drilling Activity Duration (hours/day)	Emissions (lb/well)	Emissions (lb/hr/well)
CO	0.00668	350	0.42	2	12	23.71	0.99
NOx	0.031	350	0.42	2	12	110.02	4.58
SO <sub>2</sub>	0.00205	350	0.42	2	12	7.28	0.30
VOC	0.0025	350	0.42	2	12	8.87	0.37
PM <sub>10</sub> <sup>3</sup>	0.0022	350	0.42	2	12	7.81	0.33

<sup>1</sup> AP-42 (EPA, 1996), Section 3.3, "Gasoline and Diesel Industrial Engines. Table 3.3-1, "Emission Factors for Uncontrolled Gasoline and Diesel Industrial Engines."

<sup>2</sup> The overall load factor is calculated based on average throttle setting of 65% and a load factor of 65%.

Therefore, the overall load factor = 0.65 \* 0.65 = 0.42.

<sup>3</sup> PM2.5 assumed equivalent to PM10 for drilling engines.



605 Skyline Drive  
Laramie, WY 82070  
Phone: (307) 742-3843  
Fax: (307) 745-8317

Project: Atlantic Rim  
Phase: Completion  
Activity: Completion Flaring  
Engineer: Cassidy Marshall  
Date: 5/20/2004

**Flaring Specifications<sup>1</sup>:**

Total Volume of Gas Emitted	35000	mcf
Total Volume of Condensate Emitted	250	bbls
Average Heat Content	1092.9	BTU/scf
Flaring/Flowback Activity Duration	120	hrs/well
Flaring Duration	80	hr/well
Pre-ignition Flow-back Duration	40	hr/well
Pre-ignition Flow-back Time Involving a Gas Stream	10	%
Actual Hours Gas is Vented	4	hrs
Total Hours in which Gas is Vented or Flared <sup>2</sup>	84	hrs
Average Flowrate of Gas <sup>3</sup>	416.67	mcf/hr
Total Volume of Gas Vented <sup>4</sup>	1,666.67	mcf
Total Volume of Flared Gas <sup>5</sup>	33,333.33	mcf
Average Flowrate of Condensate	2.98	bbls/hr
Pre-flare Volume of Condensate	11.90	bbls
Volume of Condensate Flared	238.10	bbls

Activity	Volume	Volume Units	Pollutant	Emission Factor	Emission Factor Units	Emission Factor Source <sup>7</sup>	Total Emissions (tons)	Duration (hours)	Hourly Emissions (lb/hr)
Venting - Natural Gas <sup>6</sup>	1,666.67	mcf	VOC	4.70	lb / 1000 scf	Gas Constituent Analysis	3.91	4	1,956.87
			HAP (total)	0.37	lb / 1000 scf	Gas Constituent Analysis	0.31	4	155.91
			n-Hexane	0.08	lb / 1000 scf	Gas Constituent Analysis	0.070	4	35.13
			Benzene	0.026	lb / 1000 scf	Gas Constituent Analysis	0.022	4	10.75
			Toluene	0.041	lb / 1000 scf	Gas Constituent Analysis	0.034	4	17.02
			Ethylbenzene	0.0019	lb / 1000 scf	Gas Constituent Analysis	0.0016	4	0.80
			Xylenes	0.018	lb / 1000 scf	Gas Constituent Analysis	0.015	4	7.67
			Flaring - Natural Gas	33,333.33	mcf	NOx	0.068	lb / 10 <sup>6</sup> BTU	AP-42 Section 13.5
CO	0.37	lb / 10 <sup>6</sup> BTU	AP-42 Section 13.5			6.74	80	168.49	
VOC	2.35	lb / 1000 scf	Gas Constituent Analysis			39.14	80	978.43	
HAP (total)	0.19	lb / 1000 scf	Gas Constituent Analysis			3.12	80	77.95	
n-Hexane	0.042	lb / 1000 scf	Gas Constituent Analysis			0.70	80	17.57	
Benzene	0.013	lb / 1000 scf	Gas Constituent Analysis			0.22	80	5.38	
Toluene	0.020	lb / 1000 scf	Gas Constituent Analysis			0.34	80	8.51	
Ethylbenzene	0.001	lb / 1000 scf	Gas Constituent Analysis			0.016	80	0.40	
Xylenes	0.009	lb / 1000 scf	Gas Constituent Analysis	0.15	80	3.83			
Flaring - Condensate	238.10	bbls	VOC	121.98	lb/bbl	Condensate Constituent Analysis	14.52	80	363.03
			HAP (total)	26.27	lb/bbl	Condensate Constituent Analysis	3.13	80	78.19
			n-hexane	4.59	lb/bbl	Condensate Constituent Analysis	0.55	80	13.67
			Benzene	1.42	lb/bbl	Condensate Constituent Analysis	0.17	80	4.22
			Toluene	6.11	lb/bbl	Condensate Constituent Analysis	0.73	80	18.19
			Ethylbenzene	0.74	lb/bbl	Condensate Constituent Analysis	0.09	80	2.19
			Xylenes	12.99	lb/bbl	Condensate Constituent Analysis	1.55	80	38.66

<sup>1</sup>These are estimates for the Atlantic Rim Project from Encanna for the Jonah Infill Drilling Project.

<sup>2</sup>Calculated as 10% \* 40 hrs of pre-ignition flowback + 80 hrs of flaring.

<sup>3</sup>Calculated as 3500 mcf / 84 hrs.

<sup>4</sup>Calculated as 416.67 mcf/hr \* 4 hrs.

<sup>5</sup>Calculated as 416.67 mcf/hr \* 80 hrs.

<sup>6</sup>An estimated 11.9 bbl of condensate are captured prior to flare ignition. Flaring from this condensate is not analyzed.

<sup>7</sup>For all emission factors that used the constituent analysis, a 50% destruction rate was assumed.

Table B1.1.13  
Atlantic Rim Emissions Inventory  
Pipeline Installation



605 Skyline Drive  
Laramie, WY 82070  
Phone: (307) 742-3843  
Fax: (307) 745-8317

Project: Atlantic Rim  
Phase: Pipeline Installation  
Activity: Fugitive Particulate Emissions from  
Pipeline Installation  
Engineer: Cassady Marshall  
Date: 5/20/2004

Pipeline Area <sup>1</sup>	Construction Activity TSP Emission Factor <sup>2</sup>	Pipeline Activity Duration	Pipeline Activity Duration	Pipeline Activity Duration	Pipeline Activity Duration <sup>3</sup>	Emission Control Efficiency	PM-10 Emissions (controlled) <sup>4</sup>	PM-2.5 Emissions (controlled) <sup>5</sup>
(acres)	(tons/acre-month)	(days/pad)	(hours/day)	(day/week)	(months/year)	(%)	(lb/pad)	(lb/pad)
2.7548	1.2	1	10	7	8	0	79.34	20.94
Pipeline Installation Construction Emissions (lb/day/well)							79.34	20.94
Pipeline Installation Construction Emissions (lb/hr/well)							7.93	2.09

<sup>1</sup> Pipeline Area = 3960 ft/well x 30' ROW = 2.4992 acres.

<sup>2</sup> AP-42 (EPA, 1995), Section 13.2.3, "Heavy Construction Operations".

<sup>3</sup> Construction occurs 8 months per year, March -October.

<sup>4</sup> AP-42 (EPA, 1998), Section 13.2.2 "Unpaved Roads", Background Document. Assuming that 36% of the TSP is in the PM<sub>10</sub>

<sup>5</sup> size range, monthly emissions converted to daily and hourly emissions based on 30-day month.  
AP-42 (EPA, 1998), Section 13.2.2 "Unpaved Roads", Background Document. Assuming that 9.5% of the TSP is in the PM<sub>2.5</sub>

size range, monthly emissions converted to daily and hourly emissions based on 30-day month.

Table B1.1.14  
Atlantic Rim Emissions Inventory  
Pipeline Installation Traffic



605 Skyline Drive  
Laramie, WY 82070  
Phone: (307) 742-3843  
Fax: (307) 745-8317

Project: Atlantic Rim  
Phase: Pipeline Installation  
Activity: Fugitive Particulate Emissions  
from Traffic on Resource Roads  
Engineer: Cassidy Marshall  
Date: 6/18/2004

Vehicle Type	Average Vehicle Weight	Average Vehicle Speed	Silt Content <sup>1</sup>	Moisture Content <sup>2</sup>	Construction Activity Duration	Construction Activity Duration	Construction Activity Duration <sup>3</sup>	Construction Activity Duration	Vehicle Miles Traveled (VMT)	Vehicle Miles Traveled (VMT)	Emission Control Efficiency	PM-10 Emission Factor <sup>4</sup>	PM-2.5 Emission Factor <sup>4</sup>	PM-10 Emissions <sup>5</sup> (controlled)	PM-2.5 Emissions <sup>5</sup> (controlled)	
	(lb)	(mph)	(%)	(%)	(hours/day)	(day/week)	(months/year)	(days/well)	(VMT/day)	(VMT/well)	(%)	(lb/VMT)	(lb/VMT)	(lb/well)	(lb/well)	
<b>Jolly Rogers</b>																
Semi-truck	40,000	20	8.4	2.4	10	7	8	1	43.4	43.4	0	2.56	0.39	110.90	17.00	
Light trucks/pickups	7,000	25	8.4	2.4	10	7	8	1	10	10	0	0.84	0.13	8.40	1.26	
														Pipeline Installation Construction Emissions (lb/well)	119.30	18.26
														Pipeline Installation Construction Emissions (lb/hr/well) <sup>6</sup>	11.93	1.83
<b>Muddy Mountain</b>																
Semi-truck	40,000	20	8.4	2.4	10	7	8	1	29.8	29.8	0	2.56	0.39	76.15	11.68	
Light trucks/pickups	7,000	25	8.4	2.4	10	7	8	1	10	10	0	0.84	0.13	8.40	1.26	
														Pipeline Installation Construction Emissions (lb/well)	84.55	12.93
														Pipeline Installation Construction Emissions (lb/hr/well) <sup>6</sup>	8.45	1.29

<sup>1</sup> AP-42 (EPA, 1998), Table 13.2.2-1, "Typical Silt Content Values of Surface Material on Industrial and Rural Unpaved Roads."  
<sup>2</sup> AP-42 (EPA, 1998), Table 11.9-3, "Typical Values for Correction Factors Applicable to the Predictive Emission Factor Equations."  
<sup>3</sup> Construction occurs 8 months per year, March - October.  
<sup>4</sup> AP-42 (EPA, 2003), Section 13.2.2 "Unpaved Roads", equations 1a and 1b.  
<sup>5</sup> Calculated as lb/VMT x VMT/pad x control efficiency.  
<sup>6</sup> Calculated as lb/well / 1 days/well / 10 hours/day.

Table 1.1.15  
Atlantic Rim Emissions Inventory  
Pipeline Heavy Equipment

**TRC**  
605 Skyline Drive  
Laramie, WY 82070  
Phone: (307) 742-3843  
Fax: (307) 745-8317

Project: Atlantic Rim  
Phase: Pipeline Installation  
Activity: Diesel Combustion Emissions  
from Heavy Equipment  
Tailpipes  
Engineer: Cassidy Marshall  
Date: 5/20/2004

Heavy Equipment	Engine Horsepower (hp)	Number Required	Operating Load Factor	Pollutant Emission Factor <sup>1</sup>					Construction Activity Duration (days/ equipment type)	Construction Activity Duration (hours/day)	Construction Activity Duration (day/week)	Construction Activity Duration <sup>2</sup> (months/year)	Pollutant Emissions					Pollutant Emissions <sup>3</sup>				
				CO	NO <sub>x</sub>	(g/hp-hr)		PM <sub>10</sub>					CO	NO <sub>x</sub>	(lb/well)		PM <sub>10</sub> <sup>4</sup>	CO	NO <sub>x</sub>	(lb/hr/well)		PM <sub>10</sub> <sup>4</sup>
						SO <sub>2</sub>	VOC								SO <sub>2</sub>	VOC				SO <sub>2</sub>	VOC	
Trencher	128	1	0.4	1.54	7.14	0.874	0.36	0.625	1	10	7	8	1.74	8.06	0.99	0.41	0.71	0.17	0.81	0.10	0.04	0.07
Fuser	128	1	0.4	2.15	7.81	0.851	0.75	0.692	1	10	7	8	2.43	8.82	0.96	0.85	0.78	0.24	0.88	0.10	0.08	0.08
Total Heavy Equipment Tailpipe Emissions												4.17	16.87	1.95	1.25	1.49	0.42	1.69	0.19	0.13	0.15	

<sup>1</sup> AP-42 (EPA, 1985), Volume II Mobile Sources.

<sup>2</sup> Construction occurs 8 months per year, March -October.

<sup>3</sup> Calculated as lb/well / days/equipment type / 10 hours/day.

<sup>4</sup> PM-2.5 assumed equivalent to PM-10 for combustion sources.

Table B1.1.16  
Atlantic Rim Emissions Inventory  
Wind Erosion



**605 Skyline Drive**  
**Laramie, WY 82070**  
**Phone: (307) 742-3843**  
**Fax: (307) 745-8317**

Project: Atlantic Rim  
Phase: Well Pad, Resource Road,  
and Pipeline Construction  
Activity: Wind Erosion  
Engineer: Cassidy Marshall  
Date: 5/20/2004

Emission Factor : 0.3534 lb/hr/100m<sup>2</sup> Based on AP-42 Chapter 13.2.5, Industrial Wind Erosion  
using Rawlins, Wyoming meteorological data.

Control Efficiency: 0 %

**Disturbed Area:**

Well Pad Construction: 2.00 acres 8094.00 m<sup>2</sup>

Resource Road Construction: 1.82 acres 7358.18 m<sup>2</sup> (based on 60' ROW road width, 1320 feet section per well)

Pipeline Installation 2.75 acres 11148.76 m<sup>2</sup> (based on 30' ROW road width, 3960 feet section per well)

**PM-10 Emissions Calculations:**

	PM-10 Emission Factor (lb/hr/100 m <sup>2</sup> )	PM-2.5 Emission Factor (lb/hr/100 m <sup>2</sup> )	Area/100 (100 m <sup>2</sup> )	Control Efficiency (%)	PM-10 Emissions (lb/hr)	PM-2.5 Emissions (lb/hr)	PM-10 Emissions (g/sec)	PM-2.5 Emissions (g/sec)
Well Pad Construction	0.3534	0.1414	80.94	0	28.60	11.44	3.60	1.44
Resource Road Construction	0.3534	0.1414	73.58	0	26.00	10.40	3.28	1.31
Pipeline Installation	0.3534	0.1414	111.49	0	39.40	15.76	4.96	1.99

Table B1.1.17  
Atlantic Rim Emissions Inventory  
Wind Erosion Output

rawl2003

COMPUTATION OF WIND EROSION EMISSIONS (version 93037)  
BASED ON AP-42 SECTION 13.2.5 INDUSTRIAL WIND EROSION

EXAMINE COMPUTED EMISSIONS FOR DISTURBANCE FREQUENCY --  
COMPUTATION ASSUMES DISTURBANCE EVERY HOUR

Particle Size (1=TSP, 2=PM10): 2  
Anemometer Ht (m): 10.00  
Threshold Friction Velocity (m/sec): 1.02  
Stockpile or Exposed Surface Area (m2): 100.  
Surface Type (1=Flat, 2=Stockpile): 1  
Correction Factor: 1.000

YR	MO	DAY	HR	ANEM WIND SPEED (m/sec)	THRESHOLD FRICTION VELOCITY (m/sec)	FRICTION VELOCITY @SURFACE (m/sec)	POTENTIAL EMISSION (lb)	POTENTIAL EMISSIONS (g/sec)
3	2	10	6	17	1.02	1.0812	0.1926	0.0243
3	2	16	19	19	1.02	1.2084	0.7461	0.094
3	3	5	18	17.5	1.02	1.113	0.3116	0.0393
3	3	5	19	17	1.02	1.0812	0.1926	0.0243
3	3	5	20	17	1.02	1.0812	0.1926	0.0243
3	3	5	21	17.5	1.02	1.113	0.3116	0.0393
3	3	5	22	16.5	1.02	1.0494	0.0865	0.0109
3	3	6	4	16.5	1.02	1.0494	0.0865	0.0109
3	3	6	5	17.5	1.02	1.113	0.3116	0.0393
3	3	6	14	18.5	1.02	1.1766	0.5883	0.0741
3	3	6	15	16.5	1.02	1.0494	0.0865	0.0109
3	3	6	16	16.5	1.02	1.0494	0.0865	0.0109
3	3	8	13	16.5	1.02	1.0494	0.0865	0.0109
3	3	8	14	17	1.02	1.0812	0.1926	0.0243
3	3	8	17	17.5	1.02	1.113	0.3116	0.0393
3	3	10	18	16.5	1.02	1.0494	0.0865	0.0109
3	4	1	12	18.5	1.02	1.1766	0.5883	0.0741
3	4	1	13	16.5	1.02	1.0494	0.0865	0.0109
3	4	1	16	17.5	1.02	1.113	0.3116	0.0393
3	4	2	12	18	1.02	1.1448	0.4435	0.0559
3	4	2	16	17	1.02	1.0812	0.1926	0.0243
3	9	12	16	17	1.02	1.0812	0.1926	0.0243
3	9	16	14	17.5	1.02	1.113	0.3116	0.0393
3	10	27	10	16.5	1.02	1.0494	0.0865	0.0109
3	10	28	18	17	1.02	1.0812	0.1926	0.0243
3	10	28	19	20.6	1.02	1.3102	1.3379	0.1686
3	10	28	21	20.6	1.02	1.3102	1.3379	0.1686
3	10	28	22	18	1.02	1.1448	0.4435	0.0559
3	10	28	23	20.1	1.02	1.2784	1.1387	0.1435
3	10	28	24	16.5	1.02	1.0494	0.0865	0.0109
3	10	29	2	18.5	1.02	1.1766	0.5883	0.0741
3	10	29	9	17.5	1.02	1.113	0.3116	0.0393
3	10	29	11	18.5	1.02	1.1766	0.5883	0.0741
3	11	11	10	16.5	1.02	1.0494	0.0865	0.0109
3	11	11	11	18	1.02	1.1448	0.4435	0.0559

Table B1.1.17  
Atlantic Rim Emissions Inventory  
Wind Erosion Output

3	11	11	12	18.5	1.02	1.1766	0.5883	0.0741
3	11	18	12	18.5	1.02	1.1766	0.5883	0.0741
3	11	18	13	17	1.02	1.0812	0.1926	0.0243
3	12	13	20	16.5	1.02	1.0494	0.0865	0.0109
3	12	17	8	16.5	1.02	1.0494	0.0865	0.0109
3	12	17	9	18	1.02	1.1448	0.4435	0.0559
3	12	26	20	17	1.02	1.0812	0.1926	0.0243
3	12	30	1	18	1.02	1.1448	0.4435	0.0559
3	12	30	2	18.5	1.02	1.1766	0.5883	0.0741
3	12	30	3	18.5	1.02	1.1766	0.5883	0.0741
3	12	30	4	16.5	1.02	1.0494	0.0865	0.0109
3	12	30	5	16.5	1.02	1.0494	0.0865	0.0109

16.5

16.6101 total/hr  
0.353406 average lb/hr

when ws>16.5 mph

Table B1.1.18  
Atlantic Rim Emissions Inventory  
Reclamation Traffic



605 Skyline Drive  
Laramie, WY 82070  
Phone: (307) 742-3843  
Fax: (307) 745-8317

Project: Atlantic Rim  
Phase: Pad and Pipeline Reclamation  
Activity: Fugitive Particulate Emissions from  
Traffic on Resource Roads  
Engineer: Cassidy Marshall  
Date: 5/20/2004

Vehicle Type	Average Vehicle Weight	Average Vehicle Speed	Silt Content <sup>1</sup>	Moisture Content <sup>2</sup>	Vehicle Miles Traveled	Construction Activity Duration	Construction Activity Duration	Construction Activity Duration <sup>3</sup>	Emission Control Efficiency	PM-10 Emission Factor <sup>4</sup>	PM-2.5 Emission Factor <sup>4</sup>	PM-10 Emissions <sup>5</sup> (controlled)	PM-2.5 Emissions <sup>5</sup> (controlled)
	(lb)	(mph)	(%)	(%)	(VMT/well)	(hours/day)	(day/week)	(months/year)	(%)	(lb/VMT)	(lb/VMT)	(lb/well)	(lb/well)
Semi-truck	40,000	20	8.4	2.4	20	10	7	8	0	2.56	0.39	51.11	7.84
Pipeline Installation Construction Emissions (lb/well)												51.11	7.84
Pipeline Installation Construction Emissions (lb/hr/well) <sup>6</sup>												5.11	0.78

<sup>1</sup> AP-42 (EPA, 1998), Table 13.2.2-1, "Typical Silt Content Values of Surface Material on Industrial and Rural Unpaved Roads."

<sup>2</sup> AP-42 (EPA, 1998), Table 11.9-3, "Typical Values for Correction Factors Applicable to the Predictive Emission Factor Equations."

<sup>3</sup> Construction occurs 8 months per year, March -October.

<sup>4</sup> AP-42 (EPA, 2003), Section 13.2.2 "Unpaved Roads", equations 1a and 1b.

<sup>5</sup> Calculated as lb/VMT x VMT/pad x control efficiency.

<sup>6</sup> Calculated as lb/well / 1 days/well / 10 hours/day.

Table 1.1.19  
Atlantic Rim Emissions Inventory  
Reclamation Heavy Equipment



605 Skyline Drive  
Laramie, WY 82070  
Phone: (307) 742-3843  
Fax: (307) 745-8317

Project: Atlantic Rim  
Phase: Pad and Pipeline  
Reclamation  
Activity: Diesel Combustion  
Emissions from Heavy  
Equipment Tailpipes  
Engineer: Cassidy Marshall  
Date: 5/20/2004

Heavy Equipment	Engine Horsepower (hp)	Number Required	Operating Load Factor	Pollutant Emission Factor <sup>1</sup>					Construction Activity Duration (days/equipment type)	Construction Activity Duration (hours/day)	Construction Activity Duration (day/week)	Construction Activity Duration <sup>2</sup> (months/year)	Pollutant Emissions					Pollutant Emissions <sup>3</sup>				
				(g/hp-hr)									(lb/well)					(lb/hr/well)				
				CO	NO <sub>x</sub>	SO <sub>2</sub>	VOC	PM <sub>10</sub>					CO	NO <sub>x</sub>	SO <sub>2</sub>	VOC	PM <sub>10</sub> <sup>4</sup>	CO	NO <sub>x</sub>	SO <sub>2</sub>	VOC	PM <sub>10</sub> <sup>4</sup>
Dozer	128	1	0.4	1.54	7.14	0.874	0.36	0.625	1	10	7	8	1.74	8.06	0.99	0.41	0.71	0.17	0.81	0.10	0.04	0.07
Tractor with disc.	128	1	0.4	2.15	7.81	0.851	0.75	0.692	1	10	7	8	2.43	8.82	0.96	0.85	0.78	0.24	0.88	0.10	0.08	0.08
Total Heavy Equipment Tailpipe Emissions												4.17	16.87	1.95	1.25	1.49	0.42	1.69	0.19	0.13	0.15	

<sup>1</sup> AP-42 (EPA, 1985), Volume II Mobile Sources.

<sup>2</sup> Construction occurs 8 months per year, March -October.

<sup>3</sup> Calculated as lb/well / days/equipment type / 10 hours/day.

<sup>4</sup> PM-2.5 assumed equivalent to PM-10 for combustion sources.

Table B1.2.1  
Atlantic Rim Emissions Inventory  
Production Traffic



605 Skyline Drive  
Laramie, WY 82070  
Phone: (307) 742-3843  
Fax: (307) 745-8317

Project: Atlantic Rim  
Phase: Production Traffic  
Activity: Fugitive Particulate  
Emissions from  
Production Traffic  
Engineer: Cassidy Marshall  
Date: 6/18/2004

Vehicle Type	Average Vehicle Weight	Average Vehicle Speed	Silt Content <sup>1</sup>	Moisture Content <sup>2</sup>	Vehicle Miles Traveled	Gathering System Inspection VMTs	Duration	Total VMTs per Pod	Emission Control Efficiency	PM-10 Emission Factor <sup>3</sup>	PM-2.5 Emission Factor <sup>3</sup>	PM-10 Emissions <sup>4</sup> (controlled)	PM-2.5 Emissions <sup>4</sup> (controlled)	
	(lb)	(mph)	(%)	(%)	(miles/day/pod)	(VMT/pod/day)	(days/year)	(VMT/pod)	(%)	(lb/VMT)	(lb/VMT)	(lb/pod/yr)	(lb/pod/yr)	
<b>TW20NR89W</b>														
Light trucks/ pickups	7,000	20	8.4	2.4	10.8	221.6	365	84,826.0	0	0.75	0.11	63,728.55	9,534.73	
												Total Resource Road Emissions (lb/pod/yr)	63,728.55	9,534.73
												Total Resource Road Emissions (lb/well/yr) <sup>5</sup>	381.61	57.09
<b>Red Rim</b>														
Light trucks/ pickups	7,000	20	8.4	2.4	20.2	240.4	365	95,119.0	0	0.75	0.11	71,461.53	10,691.69	
												Total Resource Road Emissions (lb/pod/yr)	71,461.53	10,691.69
												Total Resource Road Emissions (lb/well/yr) <sup>5</sup>	427.91	64.02
<b>T19NR90W</b>														
Light trucks/ pickups	7,000	20	8.4	2.4	32.6	265.2	365	108,697.0	0	0.75	0.11	81,662.49	12,217.91	
												Total Resource Road Emissions (lb/pod/yr)	81,662.49	12,217.91
												Total Resource Road Emissions (lb/well/yr) <sup>5</sup>	489.00	73.16
<b>Jolly Rogers</b>														
Light trucks/ pickups	7,000	20	8.4	2.4	43.4	286.8	365	120,523.0	0	0.75	0.11	90,547.19	13,547.19	
												Total Resource Road Emissions (lb/pod/yr)	90,547.19	13,547.19
												Total Resource Road Emissions (lb/well/yr) <sup>5</sup>	542.20	81.12
<b>Doty Mountain</b>														
Light trucks/ pickups	7,000	20	8.4	2.4	36.8	273.6	365	113,296.0	0	0.75	0.11	85,117.65	12,734.85	
												Total Resource Road Emissions (lb/pod/yr)	85,117.65	12,734.85
												Total Resource Road Emissions (lb/well/yr) <sup>5</sup>	509.69	76.26
<b>Cow Creek</b>														
Light trucks/ pickups	7,000	20	8.4	2.4	9.9	219.8	365	83,840.5	0	0.75	0.11	62,988.16	9,423.95	
												Total Resource Road Emissions (lb/pod/yr)	62,988.16	9,423.95
												Total Resource Road Emissions (lb/well/yr) <sup>5</sup>	377.17	56.43
<b>Sun Dog</b>														
Light trucks/ pickups	7,000	20	8.4	2.4	13.0	226.0	365	87,235.0	0	0.75	0.11	65,538.40	9,805.51	
												Total Resource Road Emissions (lb/pod/yr)	65,538.40	9,805.51
												Total Resource Road Emissions (lb/well/yr) <sup>5</sup>	392.45	58.72
<b>Blue Sky</b>														
Light trucks/ pickups	7,000	20	8.4	2.4	22.2	244.4	365	97,309.0	0	0.75	0.11	73,106.85	10,937.86	
												Total Resource Road Emissions (lb/pod/yr)	73,106.85	10,937.86
												Total Resource Road Emissions (lb/well/yr) <sup>5</sup>	437.77	65.50
<b>Blue Sky 2</b>														
Light trucks/ pickups	7,000	20	8.4	2.4	30.0	260.0	365	105,850.0	0	0.75	0.11	79,523.58	11,897.89	
												Total Resource Road Emissions (lb/pod/yr)	79,523.58	11,897.89
												Total Resource Road Emissions (lb/well/yr) <sup>5</sup>	476.19	71.24
<b>Wildhorse</b>														
Light trucks/ pickups	7,000	20	8.4	2.4	12.1	224.2	365	86,249.5	0	0.75	0.11	64,798.01	9,694.73	
												Total Resource Road Emissions (lb/pod/yr)	64,798.01	9,694.73
												Total Resource Road Emissions (lb/well/yr) <sup>5</sup>	388.01	58.05
<b>Muddy Mountain 1</b>														
Light trucks/ pickups	7,000	20	8.4	2.4	20.0	240.0	365	94,900.0	0	0.75	0.11	71,297.00	10,667.08	
												Total Resource Road Emissions (lb/pod/yr)	71,297.00	10,667.08
												Total Resource Road Emissions (lb/well/yr) <sup>5</sup>	426.93	63.87
<b>Muddy Mountain 2</b>														
Light trucks/ pickups	7,000	20	8.4	2.4	28.9	257.8	365	104,645.5	0	0.75	0.11	78,618.66	11,762.50	
												Total Resource Road Emissions (lb/pod/yr)	78,618.66	11,762.50
												Total Resource Road Emissions (lb/well/yr) <sup>5</sup>	470.77	70.43

<sup>1</sup> AP-42 (EPA, 1998), Table 13.2.2-1, "Typical Silt Content Values of Surface Material on Industrial and Rural Unpaved Roads."

<sup>2</sup> AP-42 (EPA, 1998), Table 11.9-3, "Typical Values for Correction Factors Applicable to the Predictive Emission Factor Equations."

<sup>3</sup> AP-42 (EPA, 2003), Section 13.2.2 "Unpaved Roads", equations 1a and 1b.

<sup>4</sup> Calculated as lb/VMT x VMT/well x control efficiency.

<sup>5</sup> Calculated assuming 167 wells per pod.

888,388.08 132,915.88  
444,194038 66,4579403

Table B1.2.2  
Atlantic Rim Emissions Inventory  
Production Heavy Equipment



**605 Skyline Drive**  
**Laramie, WY 82070**  
**Phone: (307) 742-3843**  
**Fax: (307) 745-8317**

Project: Atlantic Rim  
Phase: Production Traffic  
Activity: Diesel Combustion  
Emissions from Haul Truck  
Tailpipes  
Engineer: Cassady Marshall  
Date: 5/20/2004

Pollutant	Pollutant Emission Factor <sup>1</sup>	Annual Well VMT	Hourly Emissions Single Well	Annual Emissions Single Well
	(grams/mi)	(VMT/well/yr)	(lb/hr)	(tpy)
CO	14.74	249.60	9.26E-04	4.06E-03
NO <sub>x</sub>	11.44	249.60	7.19E-04	3.15E-03
SO <sub>2</sub> <sup>2</sup>	0.32	249.60	2.02E-05	8.84E-05
VOC	5.69	249.60	3.57E-04	1.57E-03

<sup>1</sup>AP-42 (EPA, 1985), Table 2.7.1 "Volume II Mobile Sources." Heavy duty diesel engine powered trucks, high altitude, 20 mph, "aged" with 50,000 miles, 1997+ model.

<sup>2</sup> The SO<sub>2</sub> emission factor is calculated assuming 10 mpg fuel consumption, with 0.05% sulfur content of #2 diesel fuel, and fuel density of 7.08 lb/gal.

Table B1.2.3  
Atlantic Rim Emissions Inventory  
Condensate Truck Traffic



**605 Skyline Drive**  
**Laramie, WY 82070**  
**Phone: (307) 742-3843**  
**Fax: (307) 745-8317**

Project: Atlantic Rim  
Phase: Production Traffic  
Activity: Fugitive Particulate  
Emissions from  
Production Traffic  
Engineer: Cassady Marshall  
Date: 6/18/2004

Vehicle Type	Average Vehicle Weight	Average Vehicle Speed	Silt Content <sup>1</sup>	Moisture Content <sup>2</sup>	Vehicle Miles Traveled	Emission Control Efficiency	PM-10 Emission Factor <sup>4</sup>	PM-2.5 Emission Factor <sup>4</sup>	PM-10 Emissions <sup>5</sup> (controlled)	PM-2.5 Emissions <sup>5</sup> (controlled)
	(lb)	(mph)	(%)	(%)	(VMT/well/yr)	(%)	(lb/VMT)	(lb/VMT)	(lb/well/yr)	(lb/well/yr)

**Condensate Truck mileage for the 200 traditional gas wells only.**

Condensate Trucks <sup>3</sup>	40,000	25	8.4	2.4	249.6	0	2.56	0.39	637.80	97.80
--------------------------------	--------	----	-----	-----	-------	---	------	------	--------	-------

<sup>1</sup> AP-42 (EPA, 1998), Table 13.2.2-1, "Typical Silt Content Values of Surface Material on Industrial and Rural Unpaved Roads."

<sup>2</sup> AP-42 (EPA, 1998), Table 11.9-3, "Typical Values for Correction Factors Applicable to the Predictive Emission Factor Equations."

<sup>3</sup> VMT/well/year for condensate trucks based on 2 trucks operating each day, each truck visits 10 wells, and the trucks operate 5 days/week, year round.

Table B1.2.4  
Atlantic Rim Emissions Inventory  
Condensate Storage Tank



**605 Skyline Drive**  
**Laramie, WY 82070**  
**Phone: (307) 742-3843**  
**Fax: (307) 745-8317**

Project: Atlantic Rim  
Phase: Production  
Activity: Condensate Storage  
Tank  
Engineer: Cassady Marshall  
Date: 8/30/2004

Condensate storage tanks located only at traditional gas wells.  
Condensate storage tank flashing emissions for one storage tank.

Pollutant	Emissions <sup>1</sup>	
	(lb/hr)	(tpy)
VOC	6.85	30.0
Benzene	0.13	0.56
Toluene	0.13	0.56
Ethlybenzene	0.0075	0.033
Xylenes	0.043	0.19
n-hexane	0.70	3.06

<sup>1</sup> Emissions taken from Continental Divide Condensate Tank Emissions

Table B1.2.5  
Atlantic Rim Emissions Inventory  
Separator Heater



**605 Skyline Drive**  
**Laramie, WY 82070**  
**Phone: (307) 742-3843**  
**Fax: (307) 745-8317**

Project: Atlantic Rim  
Phase: Production  
Activity: Separator Heater  
Engineer: Cassady Marshall  
Date: 5/20/2004

**Fuel Combustion Source:**

Unit Description Separator Heater at traditional wells only  
Design Firing Rate (MMBTU/hr) 0.5

**Operating Parameters:**

Operating cycle	7.5	min/hr	September to April			
Operating hours	24	hr/day,	7	days/wk,	213	days/yr.
Annual Operating hours	638.75					
Capacity (%)	100					
Annual Load (%):	Winter	43.75	Spring	12.5		
	Summer	0	Fall	43.75		

**Actual Fuel Combustion for the Year for Unit:**

Volume of Natural Gas Combusted 0.32 MMSCF  
Heat Content 1000 Btu/scf

**Potential Emission Data:**

	Emissions (lb/hr)	Emissions (tpy)	Method of Determination	Emission Factors	Units
Nitrogen oxides	5.00E-02	0.02	AP-42	100.0	lb/MMscf
Carbon monoxide	1.05E-02	0.003	AP-42	21.0	lb/MMscf
Sulfur dioxide	0.00E+00	0.00	Fuel Analysis	0.0	lb/MMscf
Filterable Particulate	2.25E-03	0.001	AP-42	4.5	lb/MMscf
Condensable Particulate	0.00E+00	0.00	AP-42	7.5	lb/MMscf
Total PM	2.25E-03	0.001			
VOC	4.00E-03	0.001	AP-42	8.0	lb/MMscf

Table B1.2.6  
Atlantic Rim Emissions Inventory  
TEG Dehydrator



**605 Skyline Drive**  
**Laramie, WY 82070**  
**Phone: (307) 742-3843**  
**Fax: (307) 745-8317**

Project: Atlantic Rim  
Phase: Production  
Activity: TEG Dehydration  
Engineer: Cassady Marshall  
Date: 8/30/2004

**10.0 MMSCFD TEG Dehydrator**

Emissions calculated using GRI-GLYCalc.

One dehydrator located at each of the 12 compressor stations.

Pollutant	Emissions	
	(lb/hr)	(tpy)
VOC	9.60	42.04
Benzene	0.76	3.31
Toluene	2.23	9.76
Ethylbenzene	0.35	1.52
Xylenes	1.82	7.97
n-hexane	0.18	0.81

Table B1.2.7  
Atlantic Rim Emissions Inventory  
GRI-GLYCalc - Summary of Input Values

GRI-GLYCalc VERSION 4.0 - SUMMARY OF INPUT VALUES

Case Name: Atlantic Rim TEG Dehy  
File Name: C:\Program Files\GRI-GLYCalc4\AR\_10MMSCFD.DDF  
Date: August 30, 2004

DESCRIPTION:

-----  
Description: 10.0 MMSCFD Dehydrator, Max Circulation Rate  
= 90gph (1.5gpm)

Annual Hours of Operation: 8760.0 hours/yr

WET GAS:

-----  
Temperature: 80.00 deg. F  
Pressure: 700.00 psig  
Wet Gas Water Content: Saturated

Component	Conc. (vol %)
Carbon Dioxide	1.2950
Nitrogen	0.8360
Methane	94.3860
Ethane	1.3200
Propane	1.1010
Isobutane	0.1380
n-Butane	0.3750
Isopentane	0.1030
n-Pentane	0.1190
n-Hexane	0.0520
Cyclohexane	0.0240
Other Hexanes	0.0650
Heptanes	0.1020
Methylcyclohexane	0.0300
2,2,4-Trimethylpentane	0.0070
Benzene	0.0060
Toluene	0.0100
Ethylbenzene	0.0010
Xylenes	0.0040
C8+ Heavies	0.0250

Table B1.2.7  
Atlantic Rim Emissions Inventory  
GRI-GLYCalc - Summary of Input Values

DRY GAS:

-----

Flow Rate: 10.0 MMSCF/day  
Water Content: 7.0 lbs. H2O/MMSCF

LEAN GLYCOL:

-----

Glycol Type: TEG  
Water Content: 1.5 wt% H2O  
Flow Rate: 1.5 gpm

PUMP:

-----

Glycol Pump Type: Electric/Pneumatic

Table B1.2.8  
Atlantic Rim Emissions Inventory  
GRI-GLYCalc - Aggregate Calculations Report

GRI-GLYCalc VERSION 4.0 - AGGREGATE CALCULATIONS REPORT

Case Name: Atlantic Rim TEG Dehy  
File Name: C:\Program Files\GRI-GLYCalc4\AR\_10MMSCFD.DDF  
Date: August 30, 2004

DESCRIPTION:

Description: 10.0 MMSCFD Dehydrator, Max Circulation Rate  
= 90gph (1.5gpm)

Annual Hours of Operation: 8760.0 hours/yr

EMISSIONS REPORTS:

UNCONTROLLED REGENERATOR EMISSIONS

Component	lbs/hr	lbs/day	tons/yr
Methane	2.0209	48.502	8.8516
Ethane	0.1846	4.430	0.8085
Propane	0.4012	9.630	1.7575
Isobutane	0.0986	2.367	0.4319
n-Butane	0.3604	8.650	1.5786
Isopentane	0.1310	3.144	0.5737
n-Pentane	0.1984	4.760	0.8688
n-Hexane	0.1838	4.412	0.8052
Cyclohexane	0.3681	8.835	1.6124
Other Hexanes	0.1718	4.124	0.7526
Heptanes	0.8271	19.851	3.6227
Methylcyclohexane	0.6240	14.975	2.7330
2,2,4-Trimethylpentane	0.0273	0.654	0.1194
Benzene	0.7553	18.128	3.3084
Toluene	2.2287	53.489	9.7617
Ethylbenzene	0.3465	8.317	1.5179
Xylenes	1.8200	43.680	7.9716
C8+ Heavies	1.0566	25.359	4.6281
<b>Total Emissions</b>	<b>11.8044</b>	<b>283.306</b>	<b>51.7034</b>
<b>Total Hydrocarbon Emissions</b>	<b>11.8044</b>	<b>283.306</b>	<b>51.7034</b>
Total VOC Emissions	9.5989	230.374	42.0433
Total HAP Emissions	5.3617	128.680	23.4841
Total BTEX Emissions	5.1506	123.614	22.5595

Table B1.2.8  
Atlantic Rim Emissions Inventory  
GRI-GLYCalc - Aggregate Calculations Report

COMBINED REGENERATOR VENT/FLASH GAS EMISSIONS

Component	lbs/hr	lbs/day	tons/yr
Methane	2.0209	48.502	8.8516
Ethane	0.1846	4.430	0.8085
Propane	0.4012	9.630	1.7575
Isobutane	0.0986	2.367	0.4319
n-Butane	0.3604	8.650	1.5786
Isopentane	0.1310	3.144	0.5737
n-Pentane	0.1984	4.760	0.8688
n-Hexane	0.1838	4.412	0.8052
Cyclohexane	0.3681	8.835	1.6124
Other Hexanes	0.1718	4.124	0.7526
Heptanes	0.8271	19.851	3.6227
Methylcyclohexane	0.6240	14.975	2.7330
2,2,4-Trimethylpentane	0.0273	0.654	0.1194
Benzene	0.7553	18.128	3.3084
Toluene	2.2287	53.489	9.7617
Ethylbenzene	0.3465	8.317	1.5179
Xylenes	1.8200	43.680	7.9716
C8+ Heavies	1.0566	25.359	4.6281
Total Emissions	11.8044	283.306	51.7034
Total Hydrocarbon Emissions	11.8044	283.306	51.7034
Total VOC Emissions	9.5989	230.374	42.0433
Total HAP Emissions	5.3617	128.680	23.4841
Total BTEX Emissions	5.1506	123.614	22.5595

COMBINED REGENERATOR VENT/FLASH GAS EMISSION CONTROL REPORT:

Component	Uncontrolled tons/yr	Controlled tons/yr	% Reduction
Methane	8.8516	8.8516	0.00
Ethane	0.8085	0.8085	0.00
Propane	1.7575	1.7575	0.00
Isobutane	0.4319	0.4319	0.00
n-Butane	1.5786	1.5786	0.00

Table B1.2.8  
Atlantic Rim Emissions Inventory  
GRI-GLYCalc - Aggregate Calculations Report

Isopentane	0.5737	0.5737	0.00
n-Pentane	0.8688	0.8688	0.00
n-Hexane	0.8052	0.8052	0.00
Cyclohexane	1.6124	1.6124	0.00
Other Hexanes	0.7526	0.7526	0.00
Heptanes	3.6227	3.6227	0.00
Methylcyclohexane	2.7330	2.7330	0.00
2,2,4-Trimethylpentane	0.1194	0.1194	0.00
Benzene	3.3084	3.3084	0.00
Toluene	9.7617	9.7617	0.00
Ethylbenzene	1.5179	1.5179	0.00
Xylenes	7.9716	7.9716	0.00
C8+ Heavies	4.6281	4.6281	0.00
-----			
Total Emissions	51.7034	51.7034	0.00
Total Hydrocarbon Emissions	51.7034	51.7034	0.00
Total VOC Emissions	42.0433	42.0433	0.00
Total HAP Emissions	23.4841	23.4841	0.00
Total BTEX Emissions	22.5595	22.5595	0.00

EQUIPMENT REPORTS:

-----

ABSORBER

-----

NOTE: Because the Calculated Absorber Stages was below the minimum allowed, GRI-GLYCalc has set the number of Absorber Stages to 1.25 and has calculated a revised Dry Gas Dew Point.

Calculated Absorber Stages: 1.25  
Calculated Dry Gas Dew Point: 2.07 lbs. H2O/MMSCF

Temperature: 80.0 deg. F  
Pressure: 700.0 psig  
Dry Gas Flow Rate: 10.0000 MMSCF/day  
Glycol Losses with Dry Gas: 0.0324 lb/hr  
Wet Gas Water Content: Saturated  
Calculated Wet Gas Water Content: 41.65 lbs. H2O/MMSCF  
Calculated Lean Glycol Recirc. Ratio: 5.45 gal/lb H2O

Table B1.2.8  
Atlantic Rim Emissions Inventory  
GRI-GLYCalc - Aggregate Calculations Report

Component	Remaining in Dry Gas	Absorbed in Glycol
Water	4.97%	95.03%
Carbon Dioxide	99.81%	0.19%
Nitrogen	99.99%	0.01%
Methane	99.99%	0.01%
Ethane	99.96%	0.04%
Propane	99.92%	0.08%
Isobutane	99.89%	0.11%
n-Butane	99.85%	0.15%
Isopentane	99.84%	0.16%
n-Pentane	99.79%	0.21%
n-Hexane	99.63%	0.37%
Cyclohexane	98.34%	1.66%
Other Hexanes	99.72%	0.28%
Heptanes	99.26%	0.74%
Methylcyclohexane	98.07%	1.93%
2,2,4-Trimethylpentane	99.69%	0.31%
Benzene	85.33%	14.67%
Toluene	77.98%	22.02%
Ethylbenzene	70.28%	29.72%
Xylenes	60.98%	39.02%
C8+ Heavies	97.74%	2.26%

REGENERATOR

No Stripping Gas used in regenerator.

Component	Remaining in Glycol	Distilled Overhead
Water	43.39%	56.61%
Carbon Dioxide	0.00%	100.00%
Nitrogen	0.00%	100.00%
Methane	0.00%	100.00%
Ethane	0.00%	100.00%
Propane	0.00%	100.00%
Isobutane	0.00%	100.00%
n-Butane	0.00%	100.00%
Isopentane	0.50%	99.50%
n-Pentane	0.50%	99.50%

Table B1.2.8  
Atlantic Rim Emissions Inventory  
GRI-GLYCalc - Aggregate Calculations Report

n-Hexane	0.50%	99.50%
Cyclohexane	3.20%	96.80%
Other Hexanes	1.00%	99.00%
Heptanes	0.50%	99.50%
Methylcyclohexane	4.00%	96.00%
2,2,4-Trimethylpentane	1.50%	98.50%
Benzene	5.00%	95.00%
Toluene	7.90%	92.10%
Ethylbenzene	10.41%	89.59%
Xylenes	12.91%	87.09%
C8+ Heavies	12.02%	87.98%

STREAM REPORTS:

-----

WET GAS STREAM

-----

Temperature: 80.00 deg. F  
 Pressure: 714.70 psia  
 Flow Rate: 4.17e+005 scfh

Component	Conc. (vol%)	Loading (lb/hr)
-----		
Water	8.78e-002	1.74e+001
Carbon Dioxide	1.29e+000	6.26e+002
Nitrogen	8.35e-001	2.57e+002
Methane	9.43e+001	1.66e+004
Ethane	1.32e+000	4.36e+002
Propane	1.10e+000	5.33e+002
Isobutane	1.38e-001	8.81e+001
n-Butane	3.75e-001	2.39e+002
Isopentane	1.03e-001	8.16e+001
n-Pentane	1.19e-001	9.43e+001
n-Hexane	5.20e-002	4.92e+001
Cyclohexane	2.40e-002	2.22e+001
Other Hexanes	6.49e-002	6.15e+001
Heptanes	1.02e-001	1.12e+002
Methylcyclohexane	3.00e-002	3.24e+001

Table B1.2.8  
 Atlantic Rim Emissions Inventory  
 GRI-GLYCalc - Aggregate Calculations Report

2,2,4-Trimethylpentane	6.99e-003	8.78e+000
Benzene	5.99e-003	5.15e+000
Toluene	9.99e-003	1.01e+001
Ethylbenzene	9.99e-004	1.17e+000
Xylenes	4.00e-003	4.66e+000
C8+ Heavies	2.50e-002	4.68e+001
-----		
Total Components	100.00	1.94e+004

DRY GAS STREAM

-----

Temperature: 80.00 deg. F  
 Pressure: 714.70 psia  
 Flow Rate: 4.17e+005 scfh

Component	Conc. (vol%)	Loading (lb/hr)
-----		
Water	4.37e-003	8.64e-001
Carbon Dioxide	1.29e+000	6.25e+002
Nitrogen	8.36e-001	2.57e+002
Methane	9.44e+001	1.66e+004
Ethane	1.32e+000	4.36e+002
Propane	1.10e+000	5.33e+002
Isobutane	1.38e-001	8.80e+001
n-Butane	3.75e-001	2.39e+002
Isopentane	1.03e-001	8.15e+001
n-Pentane	1.19e-001	9.41e+001
n-Hexane	5.18e-002	4.90e+001
Cyclohexane	2.36e-002	2.18e+001
Other Hexanes	6.48e-002	6.14e+001
Heptanes	1.01e-001	1.11e+002
Methylcyclohexane	2.94e-002	3.17e+001
2,2,4-Trimethylpentane	6.98e-003	8.76e+000
Benzene	5.12e-003	4.39e+000
Toluene	7.80e-003	7.89e+000
Ethylbenzene	7.03e-004	8.20e-001
Xylenes	2.44e-003	2.84e+000
C8+ Heavies	2.44e-002	4.57e+001
-----		
Total Components	100.00	1.93e+004

Table B1.2.8  
 Atlantic Rim Emissions Inventory  
 GRI-GLYCalc - Aggregate Calculations Report

LEAN GLYCOL STREAM

-----  
 Temperature: 80.00 deg. F  
 Flow Rate: 1.50e+000 gpm

Component	Conc.	Loading
(wt%)	(lb/hr)	
-----		
TEG	9.84e+001	8.30e+002
Water	1.50e+000	1.27e+001
Carbon Dioxide	1.39e-011	1.18e-010
Nitrogen	4.04e-013	3.40e-012
Methane	8.05e-018	6.79e-017
Ethane	1.03e-008	8.71e-008
Propane	1.94e-009	1.63e-008
Isobutane	3.51e-010	2.96e-009
n-Butane	1.06e-009	8.94e-009
Isopentane	7.80e-005	6.58e-004
n-Pentane	1.18e-004	9.97e-004
n-Hexane	1.10e-004	9.24e-004
Cyclohexane	1.44e-003	1.22e-002
Other Hexanes	2.06e-004	1.74e-003
Heptanes	4.93e-004	4.16e-003
Methylcyclohexane	3.08e-003	2.60e-002
2,2,4-Trimethylpentane	4.92e-005	4.15e-004
Benzene	4.71e-003	3.98e-002
Toluene	2.27e-002	1.91e-001
Ethylbenzene	4.77e-003	4.03e-002
Xylenes	3.20e-002	2.70e-001
C8+ Heavies	1.71e-002	1.44e-001
-----		
Total Components	100.00	8.43e+002

RICH GLYCOL STREAM

-----  
 Temperature: 80.00 deg. F  
 Pressure: 714.70 psia  
 Flow Rate: 1.56e+000 gpm  
 NOTE: Stream has more than one phase.

Table B1.2.8  
 Atlantic Rim Emissions Inventory  
 GRI-GLYCalc - Aggregate Calculations Report

Component	Conc. (wt%)	Loading (lb/hr)
-----		
TEG	9.51e+001	8.30e+002
Water	3.34e+000	2.92e+001
Carbon Dioxide	1.35e-001	1.18e+000
Nitrogen	3.90e-003	3.41e-002
Methane	2.32e-001	2.02e+000
Ethane	2.11e-002	1.85e-001
Propane	4.60e-002	4.01e-001
Isobutane	1.13e-002	9.86e-002
n-Butane	4.13e-002	3.60e-001
Isopentane	1.51e-002	1.32e-001
n-Pentane	2.28e-002	1.99e-001
n-Hexane	2.12e-002	1.85e-001
Cyclohexane	4.36e-002	3.80e-001
Other Hexanes	1.99e-002	1.74e-001
Heptanes	9.52e-002	8.31e-001
Methylcyclohexane	7.45e-002	6.50e-001
2,2,4-Trimethylpentane	3.17e-003	2.77e-002
Benzene	9.11e-002	7.95e-001
Toluene	2.77e-001	2.42e+000
Ethylbenzene	4.43e-002	3.87e-001
Xylenes	2.39e-001	2.09e+000
C8+ Heavies	1.38e-001	1.20e+000
-----		
Total Components	100.00	8.73e+002

REGENERATOR OVERHEADS STREAM

-----  
 Temperature: 212.00 deg. F  
 Pressure: 14.70 psia  
 Flow Rate: 4.49e+002 scfh

Component	Conc. (vol%)	Loading (lb/hr)
-----		
Water	7.75e+001	1.65e+001
Carbon Dioxide	2.26e+000	1.18e+000
Nitrogen	1.03e-001	3.41e-002
Methane	1.07e+001	2.02e+000
Ethane	5.19e-001	1.85e-001

Table B1.2.8  
Atlantic Rim Emissions Inventory  
GRI-GLYCalc - Aggregate Calculations Report

Propane	7.70e-001	4.01e-001
Isobutane	1.44e-001	9.86e-002
n-Butane	5.25e-001	3.60e-001
Isopentane	1.54e-001	1.31e-001
n-Pentane	2.33e-001	1.98e-001
n-Hexane	1.80e-001	1.84e-001
Cyclohexane	3.70e-001	3.68e-001
Other Hexanes	1.69e-001	1.72e-001
Heptanes	6.98e-001	8.27e-001
Methylcyclohexane	5.38e-001	6.24e-001
2,2,4-Trimethylpentane	2.02e-002	2.73e-002
Benzene	8.18e-001	7.55e-001
Toluene	2.05e+000	2.23e+000
Ethylbenzene	2.76e-001	3.47e-001
Xylenes	1.45e+000	1.82e+000
C8+ Heavies	5.25e-001	1.06e+000
-----		
Total Components	100.00	2.95e+001

ANNUAL AIR-COOLED CONDENSER PERFORMANCE:

ANNUAL AIR-COOLED CONDENSER PERFORMANCE

Nearest Site for Air Temperature Data: Midland, TX

Ambient Air		
Dry Bulb		
Temperature		Condenser Outlet
(deg. F)	Frequency (%)	Temperature (deg. F)
<=50	27.33	<=70
51-55	7.38	71-75
56-60	8.11	76-80
61-65	8.69	81-85
66-70	11.03	86-90
71-75	11.00	91-95
76-80	8.52	96-100
81-85	6.79	101-105
86-90	5.33	106-110
91-95	3.96	111-115
96-100	1.56	116-120
>100	0.30	>120

Condenser outlet temperature approach to ambient: 20.00 deg. F

Table B1.2.8  
Atlantic Rim Emissions Inventory  
GRI-GLYCalc - Aggregate Calculations Report

-----  
Annual air-cooled condenser emissions and control efficiency:

	Uncontrolled emissions tons/year	Controlled emissions tons/year	% Control
Benzene	3.308	3.308	0.00
BTEX	22.560	22.560	0.00
Total HAP	23.484	23.484	0.00
VOC	42.043	42.043	0.00

Table B1.2.9  
Atlantic Rim Emissions Inventory  
Gas Analysis



**605 Skyline Drive**  
**Laramie, WY 82070**  
**Phone: (307) 742-3843**  
**Fax: (307) 745-8317**

Project: Atlantic Rim  
Phase: Production  
Activity: Gas Analysis  
Engineer: Cassady Marshall  
Date: 8/30/2004

**Gas Analysis<sup>1</sup>**

carbon dioxide	1.295
nitrogen	0.836
methane	94.386
ethane	1.32
propane	1.101
isobutane	0.138
n-butane	0.375
isopentane	0.103
n-pentane	0.119
cyclopentane	0
n-hexane	0.052
cyclohexane	0.024
other hexanes	0.065
heptanes	0.102
methylcyclohexane	0.03
2,2,4- trimethylpentane	0.007
benzene	0.006
toluene	0.01
ethylbenzene	0.001
zylene	0.004
C8+ heavies	0.025

---

**Total** **100.00**

<sup>1</sup>Gas analysis based on a mix 10% conventional wells and 90% CBM.

Table B1.2.10  
Atlantic Rim Emissions Inventory  
Blue Sky Compressor Station



**605 Skyline Drive**  
**Laramie, WY 82070**  
**Phone: (307) 742-3843**  
**Fax: (307) 745-8317**

Project: Atlantic Rim  
Phase: Production  
Activity: Blue Sky Compressor Station  
Engineer: Cassidy Marshall  
Date: 6/24/2004

**Fuel Combustion Source**

Unit Description                      Blue Sky Compressor Station  
Total Horsepower                      4,824

**Facility Emission Summary**

Unit	Rating	Rating Units	NOx (tpy)	CO (tpy)	VOC (tpy)	Formaldehyde (tpy)	Emissions Source
CAT 3516TALE	1206	hp	17.5	5.8	5.2	0.82	
CAT 3516TALE	1206	hp	17.5	5.8	5.2	0.82	
CAT 3516TA	1206	hp	11.1	16.7	5.0	0.78	Blue Sky Permit
CAT 3516TA	1206	hp	11.1	16.7	5.0	0.78	
Dehy Reboiler	0.25	MMBTU/hr	0.1	0.1	--	--	
Tank	400.0	bbls					
<b>Total</b>			57.3	45.1	20.4	3.2	

Table B1.2.11  
Atlantic Rim Emissions Inventory  
Brown Cow Compressor Station



**605 Skyline Drive**  
**Laramie, WY 82070**  
**Phone: (307) 742-3843**  
**Fax: (307) 745-8317**

Project: Atlantic Rim  
Phase: Production  
Activity: Brown Cow Compressor Station  
Engineer: Cassady Marshall  
Date: 6/24/2004

**Fuel Combustion Source**

Unit Description                      Brown Cow Compressor Station  
Total Horsepower                      4,824

**Facility Emission Summary**

Unit	Rating	Rating Units	NOx (tpy)	CO (tpy)	VOC (tpy)	Formaldehyde (tpy)	Emissions Source
CAT 3516TALE	1206	hp	17.5	5.8	5.2	0.82	Assumed to be identical to most commonly permitted compressor station.
CAT 3516TALE	1206	hp	17.5	5.8	5.2	0.82	
CAT 3516TA	1206	hp	11.1	16.7	5.0	0.70	
CAT 3516TA	1206	hp	11.1	16.7	5.0	0.70	
Dehy Reboiler	0.25	MMBTU/hr	0.1	0.1	--	--	
Tank	400.0	bbls					
<b>Total</b>			57.3	45.1	20.4	3.0	

Table B1.2.12  
Atlantic Rim Emissions Inventory  
Cow Creek Compressor Station



**605 Skyline Drive**  
**Laramie, WY 82070**  
**Phone: (307) 742-3843**  
**Fax: (307) 745-8317**

Project: Atlantic Rim  
Phase: Production  
Activity: Cow Creek Compressor Station  
Engineer: Cassidy Marshall  
Date: 6/24/2004

**Fuel Combustion Source**

Unit Description Cow Creek Compressor Station  
Total Horsepower 2,090

**Facility Emission Summary**

Unit	Rating	Rating Units	NOx (tpy)	CO (tpy)	VOC (tpy)	Formaldehyde (tpy)	Emissions Source
CAT 3516TALE	1089	hp	15.8	5.3	5.3	0.74	Cow Creek Permit MD-951
CAT 398TA	394	hp	3.8	3.8	1.9	0.23	
CAT 3412TA	607	hp	5.9	5.9	2.9	0.35	
Dehy Reboiler	0.25	MMBTU/hr	0.1	0.1	--	--	
Tank	400.0	bbls					
<b>Total</b>			25.6	15.1	10.1	1.3	

Table B1.2.13  
Atlantic Rim Emissions Inventory  
Doty Mountain Compressor Station



**605 Skyline Drive**  
**Laramie, WY 82070**  
**Phone: (307) 742-3843**  
**Fax: (307) 745-8317**

Project: Atlantic Rim  
Phase: Production  
Activity: Doty Mountain Compressor Station  
Engineer: Cassidy Marshall  
Date: 6/24/2004

**Fuel Combustion Source**

Unit Description                      Doty Mountain Compressor Station  
Total Horsepower                      4,824

**Facility Emission Summary**

Unit	Rating	Rating	NOx	CO	VOC	Formaldehyde	Emissions Source
	Rating	Units	(tpy)	(tpy)	(tpy)	(tpy)	
CAT 3516TALE	1206	hp	17.5	5.8	5.2	0.82	Doty Mountain Permit CT-3349
CAT 3516TALE	1206	hp	17.5	5.8	5.2	0.82	
CAT 3516TA	1206	hp	11.7	17.5	5.2	0.70	
CAT 3516TA	1206	hp	11.7	17.5	5.2	0.70	
Dehy Reboiler	0.25	MMBTU/hr	0.1	0.1	--	--	
Tank	400.0	bbls					
<b>Total</b>			58.5	46.7	20.8	3.0	

Table B1.2.14  
 Atlantic Rim Emissions Inventory  
 Jolly Rogers Compressor Station



**605 Skyline Drive**  
**Laramie, WY 82070**  
**Phone: (307) 742-3843**  
**Fax: (307) 745-8317**

Project: Atlantic Rim  
 Phase: Production  
 Activity: Jolly Rogers Compressor Station  
 Engineer: Cassady Marshall  
 Date: 6/24/2004

**Fuel Combustion Source**

Unit Description Jolly Rogers Compressor Station  
 Total Horsepower 4,824

**Facility Emission Summary**

Unit	Rating	Rating Units	NOx (tpy)	CO (tpy)	VOC (tpy)	Formaldehyde (tpy)	Emissions Source
CAT 3516TALE	1206	hp	17.5	5.8	5.2	0.80	Jolly Rogers Permit Application
CAT 3516TALE	1206	hp	17.5	5.8	5.2	0.80	
CAT 3516TA	1206	hp	11.6	17.5	11.6	0.60	
CAT 3516TA	1206	hp	11.6	17.5	11.6	0.60	
Dehy Reboiler	0.25	MMBTU/hr	0.1	0.1	--	--	
Tank	400.0	bbls					
<b>Total</b>			58.3	46.7	33.6	2.8	

Table B1.2.15  
Atlantic Rim Emissions Inventory  
Muddy Mountain Compressor Station



**605 Skyline Drive**  
**Laramie, WY 82070**  
**Phone: (307) 742-3843**  
**Fax: (307) 745-8317**

Project: Atlantic Rim  
Phase: Production  
Activity: Muddy Mountain Compressor Station  
Engineer: Cassidy Marshall  
Date: 6/24/2004

**Fuel Combustion Source**

Unit Description Muddy Mountain Compressor Station  
Total Horsepower 4,824

**Facility Emission Summary**

Unit	Rating	Rating	NOx	CO	VOC	Formaldehyde	Emissions Source
	Rating	Units	(tpy)	(tpy)	(tpy)	(tpy)	
CAT 3516TALE	1206	hp	17.5	5.8	5.2	0.81	
CAT 3516TALE	1206	hp	17.5	5.8	5.2	0.81	
CAT 3516TA	1206	hp	11.6	17.5	5.2	0.70	Muddy Mountain Permit CT-3352
CAT 3516TA	1206	hp	11.6	17.5	5.2	0.70	
Dehy Reboiler	0.25	MMBTU/hr	0.1	0.1	--	--	
Tank	400.0	bbls					
<b>Total</b>			58.3	46.7	20.8	3.0	

Table B1.2.16  
Atlantic Rim Emissions Inventory  
Red Rim Compressor Station



**605 Skyline Drive**  
**Laramie, WY 82070**  
**Phone: (307) 742-3843**  
**Fax: (307) 745-8317**

Project: Atlantic Rim  
Phase: Production  
Activity: Red Rim Compressor Station  
Engineer: Cassidy Marshall  
Date: 6/24/2004

**Fuel Combustion Source**

Unit Description                      Red Rim Compressor Station  
Total Horsepower                      4,255

**Facility Emission Summary**

Unit	Rating	Rating	NOx	CO	VOC	Formaldehyde	Emissions Source
	Rating	Units	(tpy)	(tpy)	(tpy)	(tpy)	
CAT 3516TALE	1206	hp	17.5	5.8	5.2	0.82	Red Rim Permit CT-3393
CAT 3516TALE	1206	hp	17.5	5.8	5.2	0.82	
CAT 3412A	637	hp	6.2	3.1	2.8	0.43	
CAT 3516TA	1206	hp	11.7	17.5	5.2	0.70	
Dehy Reboiler	0.25	MMBTU/hr	0.1	0.1	--	--	
Tank	400.0	bbls					
<b>Total</b>			53.0	32.3	18.4	2.8	

Table B1.2.17  
Atlantic Rim Emissions Inventory  
Sun Dog Compressor Station



**605 Skyline Drive**  
**Laramie, WY 82070**  
**Phone: (307) 742-3843**  
**Fax: (307) 745-8317**

Project: Atlantic Rim  
Phase: Production  
Activity: Sun Dog Compressor Station  
Engineer: Cassady Marshall  
Date: 6/24/2004

**Fuel Combustion Source**

Unit Description                      Sun Dog Compressor Station  
Total Horsepower                      4,824

**Facility Emission Summary**

Unit	Rating		NOx (tpy)	CO (tpy)	VOC (tpy)	Formaldehyde (tpy)	Emissions Source
	Rating	Units					
CAT 3516TALE	1206	hp	17.5	5.8	5.2	0.82	Assumed to be identical to most commonly permitted compressor station.
CAT 3516TALE	1206	hp	17.5	5.8	5.2	0.82	
CAT 3412A	1206	hp	11.1	16.7	5.0	0.70	
CAT 3516TA	1206	hp	11.1	16.7	5.0	0.70	
Dehy Reboiler	0.25	MMBTU/hr	0.1	0.1	--	--	
Tank	400.0	bbls					
<b>Total</b>			57.3	45.1	20.4	3.0	

Table B1.2.18  
Atlantic Rim Emission Inventory  
Unpermitted Compressor Station #1



**605 Skyline Drive**  
**Laramie, WY 82070**  
**Phone: (307) 742-3843**  
**Fax: (307) 745-8317**

Project: Atlantic Rim  
Phase: Production  
Activity: Unpermitted C.S. #1 Compressor  
Station  
Engineer: Cassidy Marshall  
Date: 6/24/2004

**Fuel Combustion Source**

Unit Description Unpermitted Compressor Station #1  
Total Horsepower 4,824

**Facility Emission Summary**

Unit	Rating	Rating Units	NOx (tpy)	CO (tpy)	VOC (tpy)	Formaldehyde (tpy)	Emissions Source
CAT 3516TALE	1206	hp	17.5	5.8	5.2	0.82	Assumed to be identical to most commonly permitted compressor station.
CAT 3516TALE	1206	hp	17.5	5.8	5.2	0.82	
CAT 3412A	1206	hp	11.1	16.7	5.0	0.70	
CAT 3516TA	1206	hp	11.1	16.7	5.0	0.70	
Dehy Reboiler	0.25	MMBTU/hr	0.1	0.1	--	--	
Tank	400.0	bbls					
<b>Total</b>			57.3	45.1	20.4	3.0	

Table B1.2.19  
Atlantic Rim Emission Inventory  
Unpermitted Compressor Station #2



**605 Skyline Drive**  
**Laramie, WY 82070**  
**Phone: (307) 742-3843**  
**Fax: (307) 745-8317**

Project: Atlantic Rim  
Phase: Production  
Activity: Unpermitted C.S. #2 Compressor  
Station  
Engineer: Cassidy Marshall  
Date: 6/24/2004

**Fuel Combustion Source**

Unit Description Unpermitted Compressor Station #2  
Total Horsepower 4,824

**Facility Emission Summary**

Unit	Rating	Rating Units	NOx (tpy)	CO (tpy)	VOC (tpy)	Formaldehyde (tpy)	Emissions Source
CAT 3516TALE	1206	hp	17.5	5.8	5.2	0.82	Assumed to be identical to most commonly permitted compressor station.
CAT 3516TALE	1206	hp	17.5	5.8	5.2	0.82	
CAT 3412A	1206	hp	11.1	16.7	5.0	0.70	
CAT 3516TA	1206	hp	11.1	16.7	5.0	0.70	
Dehy Reboiler	0.25	MMBTU/hr	0.1	0.1	--	--	
Tank	400.0	bbls					
<b>Total</b>			57.3	45.1	20.4	3.0	

Table B1.2.20  
Atlantic Rim Emission Inventory  
Unpermitted Compressor Station #3



**605 Skyline Drive**  
**Laramie, WY 82070**  
**Phone: (307) 742-3843**  
**Fax: (307) 745-8317**

Project: Atlantic Rim  
Phase: Production  
Activity: Unpermitted C.S. #3 Compressor  
Station  
Engineer: Cassidy Marshall  
Date: 6/24/2004

**Fuel Combustion Source**

Unit Description Unpermitted Compressor Station #3  
Total Horsepower 4,824

**Facility Emission Summary**

Unit	Rating	Rating Units	NOx (tpy)	CO (tpy)	VOC (tpy)	Formaldehyde (tpy)	Emissions Source
CAT 3516TALE	1206	hp	17.5	5.8	5.2	0.82	Assumed to be identical to most commonly permitted compressor station.
CAT 3516TALE	1206	hp	17.5	5.8	5.2	0.82	
CAT 3412A	1206	hp	11.1	16.7	5.0	0.70	
CAT 3516TA	1206	hp	11.1	16.7	5.0	0.70	
Dehy Reboiler	0.25	MMBTU/hr	0.1	0.1	--	--	
Tank	400.0	bbls					
<b>Total</b>			57.3	45.1	20.4	3.0	

Table B1.2.21  
Atlantic Rim Emission Inventory  
Unpermitted Compressor Station #4



**605 Skyline Drive**  
**Laramie, WY 82070**  
**Phone: (307) 742-3843**  
**Fax: (307) 745-8317**

Project: Atlantic Rim  
Phase: Production  
Activity: Unpermitted C.S. #4 Compressor  
Station  
Engineer: Cassidy Marshall  
Date: 6/24/2004

**Fuel Combustion Source**

Unit Description                      Unpermitted Compressor Station #4  
Total Horsepower                      4,824

**Facility Emission Summary**

Unit	Rating	Rating Units	NOx (tpy)	CO (tpy)	VOC (tpy)	Formaldehyde (tpy)	Emissions Source
CAT 3516TALE	1206	hp	17.5	5.8	5.2	0.82	Assumed to be identical to most commonly permitted compressor station.
CAT 3516TALE	1206	hp	17.5	5.8	5.2	0.82	
CAT 3412A	1206	hp	11.1	16.7	5.0	0.70	
CAT 3516TA	1206	hp	11.1	16.7	5.0	0.70	
Dehy Reboiler	0.25	MMBTU/hr	0.1	0.1	--	--	
Tank	400.0	bbls					
<b>Total</b>			57.3	45.1	20.4	3.0	

Table B1.2.22  
Atlantic Rim Emission Inventory  
Wind Erosion



**605 Skyline Drive**  
**Laramie, WY 82070**  
**Phone: (307) 742-3843**  
**Fax: (307) 745-8317**

Project: Atlantic Rim  
Phase: Production  
Activity: Wind Erosion  
Engineer: Cassady Marshall  
Date: 6/24/2004

**Emission Factor :** 0.3534 lb/hr/100m<sup>2</sup> Based on AP-42 Chapter 13.2.5, Industrial Wind Erosion  
Rawlins, Wyoming meteorological data.

**Control Efficiency:** 0 %

**Disturbed Area:**

**Well Pad Production:** 1.0 acres 4047.00 m<sup>2</sup>

**PM-10 Emissions Calculations:**

	PM-10 Emission Factor (lb/hr/100 m <sup>2</sup> )	PM-2.5 Emission Factor (lb/hr/100 m <sup>2</sup> )	Area/100 (100 m <sup>2</sup> )	Control Efficiency (%)	PM-10 Emissions (lb/hr)	PM-2.5 Emissions (lb/hr)	PM-10 Emissions (g/sec)	PM-2.5 Emissions (g/sec)
Well Pad Production	0.3534	0.1414	40.47	0	14.30	5.72	1.80	0.72

Table B1.2.23  
Atlantic Rim Emissions Inventory  
Wind Erosion Output

rawl2003

COMPUTATION OF WIND EROSION EMISSIONS (version 93037)  
BASED ON AP-42 SECTION 13.2.5 INDUSTRIAL WIND EROSION

EXAMINE COMPUTED EMISSIONS FOR DISTURBANCE FREQUENCY --  
COMPUTATION ASSUMES DISTURBANCE EVERY HOUR

Particle Size (1=TSP, 2=PM10): 2  
Anemometer Ht (m): 10.00  
Threshold Friction Velocity (m/sec): 1.02  
Stockpile or Exposed Surface Area (m2): 100.  
Surface Type (1=Flat, 2=Stockpile): 1  
Correction Factor: 1.000

YR	MO	DAY	HR	ANEM WIND SPEED (m/sec)	THRESHOLD FRICTION VELOCITY (m/sec)	FRICTION VELOCITY @SURFACE (m/sec)	POTENTIAL EMISSION (lb)	POTENTIAL EMISSIONS (g/sec)
3	2	10	6	17	1.02	1.0812	0.1926	0.0243
3	2	16	19	19	1.02	1.2084	0.7461	0.094
3	3	5	18	17.5	1.02	1.113	0.3116	0.0393
3	3	5	19	17	1.02	1.0812	0.1926	0.0243
3	3	5	20	17	1.02	1.0812	0.1926	0.0243
3	3	5	21	17.5	1.02	1.113	0.3116	0.0393
3	3	5	22	16.5	1.02	1.0494	0.0865	0.0109
3	3	6	4	16.5	1.02	1.0494	0.0865	0.0109
3	3	6	5	17.5	1.02	1.113	0.3116	0.0393
3	3	6	14	18.5	1.02	1.1766	0.5883	0.0741
3	3	6	15	16.5	1.02	1.0494	0.0865	0.0109
3	3	6	16	16.5	1.02	1.0494	0.0865	0.0109
3	3	8	13	16.5	1.02	1.0494	0.0865	0.0109
3	3	8	14	17	1.02	1.0812	0.1926	0.0243
3	3	8	17	17.5	1.02	1.113	0.3116	0.0393
3	3	10	18	16.5	1.02	1.0494	0.0865	0.0109
3	4	1	12	18.5	1.02	1.1766	0.5883	0.0741
3	4	1	13	16.5	1.02	1.0494	0.0865	0.0109
3	4	1	16	17.5	1.02	1.113	0.3116	0.0393
3	4	2	12	18	1.02	1.1448	0.4435	0.0559
3	4	2	16	17	1.02	1.0812	0.1926	0.0243
3	9	12	16	17	1.02	1.0812	0.1926	0.0243
3	9	16	14	17.5	1.02	1.113	0.3116	0.0393
3	10	27	10	16.5	1.02	1.0494	0.0865	0.0109
3	10	28	18	17	1.02	1.0812	0.1926	0.0243
3	10	28	19	20.6	1.02	1.3102	1.3379	0.1686
3	10	28	21	20.6	1.02	1.3102	1.3379	0.1686
3	10	28	22	18	1.02	1.1448	0.4435	0.0559
3	10	28	23	20.1	1.02	1.2784	1.1387	0.1435
3	10	28	24	16.5	1.02	1.0494	0.0865	0.0109

Table B1.2.23  
Atlantic Rim Emissions Inventory  
Wind Erosion Output

3	10	29	2	18.5	1.02	1.1766	0.5883	0.0741
3	10	29	9	17.5	1.02	1.113	0.3116	0.0393
3	10	29	11	18.5	1.02	1.1766	0.5883	0.0741
3	11	11	10	16.5	1.02	1.0494	0.0865	0.0109
3	11	11	11	18	1.02	1.1448	0.4435	0.0559
3	11	11	12	18.5	1.02	1.1766	0.5883	0.0741
3	11	18	12	18.5	1.02	1.1766	0.5883	0.0741
3	11	18	13	17	1.02	1.0812	0.1926	0.0243
3	12	13	20	16.5	1.02	1.0494	0.0865	0.0109
3	12	17	8	16.5	1.02	1.0494	0.0865	0.0109
3	12	17	9	18	1.02	1.1448	0.4435	0.0559
3	12	26	20	17	1.02	1.0812	0.1926	0.0243
3	12	30	1	18	1.02	1.1448	0.4435	0.0559
3	12	30	2	18.5	1.02	1.1766	0.5883	0.0741
3	12	30	3	18.5	1.02	1.1766	0.5883	0.0741
3	12	30	4	16.5	1.02	1.0494	0.0865	0.0109
3	12	30	5	16.5	1.02	1.0494	0.0865	0.0109

16.5

16.6101 total/hr  
0.353406 average lb/hr

when ws>16.5 mph