ATLAS RESIN PROPPANTS - TAYLOR
Actual Emission Estimates

Year	Month	Gross Production[4], lbs* Proppant Year	Gross Production Proppant Month	Gross Production Proppant Tower A	Gross Production Proppant Tower B	% of Monthly Gross Proppant Production Tower A	% of Monthly Gross Proppant Production Tower B	Operating Schedule, hrs* Tower A	Operating Schedule, hrs* Tower B	Nitrogen from Hexa* Hexa Usage, lbs* Tower A	Hexa Usage, lbs* Tower B	Available N, lbs[6,a] Tower A
Monthly Summary												
2008	1	246,970,786	19,267,980	19,267,980	0	100%	0%	617	0	76,500	0	30,573
2008	2	246,970,786	17,803,331	17,803,331	0	100%	0%	570	0	74,100	0	29,614
2008	3	246,970,786	19,568,092	19,568,092	0	100%	0%	627	0	85,600	0	34,210
2008	4	246,970,786	18,794,700	18,794,700	0	100%	0%	602	0	80,050	0	31,992
2008	5	246,970,786	17,946,921	17,946,921	0	100%	0%	575	0	74,075	0	29,604
2008	6	246,970,786	18,251,888	18,251,888	0	100%	0%	585	0	75,225	0	30,063
2008	7	246,970,786	18,968,774	18,968,774	0	100%	0%	608	0	80,950	0	32,351
2008	8	246,970,786	19,841,135	19,841,135	0	100%	0%	636	0	84,725	0	33,860
2008	9	246,970,786	17,846,348	17,846,348	0	100%	0%	572	0	73,775	0	29,484
2008	10	246,970,786	26,231,545	17,512,914	8,718,631	67%	33%	561	277	73,706	36,694	29,456
2008	11	246,970,786	26,821,046	12,148,725	14,672,321	45%	55%	389	466	50,776	61,324	20,293
2008	12	246,970,786	25,629,026	11,722,325	13,906,701	46%	54%	375	442	53,148	63,052	21,240
2009	1	366,493,966	24,985,380	11,288,685	13,696,695	45%	55%	362	435	47,869	58,081	19,131
2009	2	366,493,966	26,968,205	14,366,250	12,601,955	53%	47%	460	400	64,072	56,203	25,606
2009	3	366,493,966	27,595,666	14,013,480	13,582,186	51%	49%	449	432	62,804	60,871	25,099
2009	4	366,493,966	26,122,050	12,749,365	13,372,685	49%	51%	426	457	55,054	57,746	22,002
2009	5	366,493,966	20,729,614	10,737,129	9,992,485	52%	48%	338	340	48,481	45,119	19,375
2009	6	366,493,966	24,895,283	13,414,689	11,480,594	54%	46%	449	409	61,132	52,318	24,431
2009	7	366,493,966	30,248,470	16,016,015	14,232,455	53%	47%	541	525	77,066	68,484	30,799
2009	8	366,493,966	29,991,874	15,117,325	14,874,549	50%	50%	513	505	69,155	68,045	27,638
2009	9	366,493,966	32,303,233	16,252,624	16,050,609	50%	50%	536	534	74,815	73,885	29,900
2009	10	366,493,966	39,705,442	19,645,791	20,059,651	49%	51%	622	608	83,223	84,977	33,260
2009	11	366,493,966	44,725,781	22,255,079	22,470,702	50%	50%	640	663	89,890	90,760	35,924
2009	12	366,493,966	38,222,968	16,851,906	21,371,062	44%	56%	516	627	83,614	106,036	33,416
2010	1	494,189,145	45,498,372	24,255,002	21,243,370	53%	47%	686	659	98,969	86,681	39,553
2010	2	494,189,145	38,409,122	20,360,623	18,048,499	53%	47%	593	555	79,594	70,556	31,810
2010	3	494,189,145	45,096,462	24,506,603	20,589,859	54%	46%	698	666	91,133	76,567	36,421
2010	4	494,189,145	44,054,975	22,588,544	21,466,431	51%	49%	644	658	84,448	80,252	33,749
2010	5	494,189,145	41,566,225	19,017,364	22,548,861	46%	54%	562	675	66,844	79,256	26,714
2010	6	494,189,145	36,142,201	14,163,874	21,978,327	39%	61%	472	629	47,635	73,915	19,037
2010	7	494,189,145	40,207,243	16,169,306	24,037,937	40%	60%	544	690	45,946	68,304	18,362
2010	8	494,189,145	39,703,973	16,366,142	23,337,831	41%	59%	553	672	71,909	102,541	28,738
2010	9	494,189,145	41,409,535	18,392,827	23,016,708	44%	56%	611	663	62,206	77,844	24,860
2010	10	494,189,145	43,790,146	19,883,409	23,906,737	45%	55%	663	686	65,385	78,615	26,131
2010	11	494,189,145	38,890,184	19,155,176	19,735,008	49%	51%	639	615	61,741	63,609	24,674
2010	12	494,189,145	39,420,707	18,881,654	20,539,053	48%	52%	612	618	27,680	30,109	11,062
2011	1	536,625,693	45,974,895	22,831,347	23,143,548	50%	50%	695	680	32,678	33,124	13,060
2011	2	536,625,693	41,047,250	20,837,112	20,210,138	51%	49%	620	611	39,071	37,896	15,615
2011	3	536,625,693	47,190,882	23,594,773	23,596,109	50%	50%	686	693	32,990	32,992	13,184
2011	4	536,625,693	43,187,376	21,749,639	21,437,737	50%	50%	635	627	35,994	35,477	14,385
2011	5	536,625,693	48,383,405	24,253,213	24,130,192	50%	50%	693	689	40,718	40,512	16,273
2011	6	536,625,693	45,568,528	22,749,720	22,818,808	50%	50%	647	650	41,309	41,434	16,509
2011	7	536,625,693	43,101,361	21,076,147	22,025,214	49%	51%	603	630	32,935	34,418	13,162
2011	8	536,625,693	47,399,892	23,552,734	23,847,158	50%	50%	681	680	44,293	44,847	17,702
2011	9	536,625,693	42,739,469	22,277,182	20,462,287	52%	48%	633	592	33,522	30,791	13,397
2011	10	536,625,693	46,395,625	23,599,014	22,796,611	51%	49%	668	655	47,842	46,215	19,120
2011	11	536,625,693	43,056,770	22,241,626	20,815,144	52%	48%	642	581	58,541	54,786	23,396
2011	12	536,625,693	42,580,240	21,373,455	21,206,785	50%	50%	615	605	38,403	38,103	15,348
2012	1	389,676,182	36,123,040	12,826,794	23,296,246	36%	64%	369	660	23,052	41,867	9,213
2012	2	389,676,182	44,588,652	21,861,879	22,726,773	49%	51%	630	649	28,198	29,314	11,269
2012	3	389,676,182	30,864,842	17,150,622	13,714,220	56%	44%	567	476	33,914	27,118	13,553
2012	4	389,676,182	20,823,726	9,007,835	11,815,891	43%	57%	297	400	19,993	26,226	7,990
2012	5	389,676,182	38,012,829	20,360,359	17,652,470	54%	46%	684	615	40,349	34,983	16,125
2012	6	389,676,182	44,065,061	21,677,773	22,387,288	49%	51%	644	659	46,169	47,680	18,451
2012	7	389,676,182	36,649,849	18,325,102	18,324,747	50%	50%	636	640	40,179	40,179	16,058
2012	8	389,676,182	40,579,334	19,762,691	20,816,643	49%	51%	677	715	35,782	36,859	14,300
2012	9	389,676,182	40,365,031	19,958,288	20,406,743	49%	51%	641	642	31,598	32,309	12,628
2012	10	389,676,182	22,453,443	3,344,640	19,108,803	15%	85%	97	623	5,985	34,194	2,392
2012	11	389,676,182	15,526,880	0	15,526,880	0%	100%	0	512	0	48,005	0
2012	12	389,676,182	19,623,495	0	19,623,495	0%	100%	0	622	0	40,867	0
2013	1	138,706,399	22,614,058	0	22,614,058	0%	100%	0	677	0	54,343	0
2013	2	138,706,399	17,217,797	9,677,375	7,540,422	56%	44%	320	219	18,339	14,290	7,329
2013	3	138,706,399	17,602,331	14,431,220	3,171,111	82%	18%	490	167	15,950	3,505	6,374
2013	4	138,706,399	29,991,608	14,357,880	15,633,728	48%	52%	430	490	17,150	18,675	6,854
2013	5	138,706,399	36,761,444	20,222,404	16,539,040	55%	45%	654	583	20,344	16,638	8,130
2013	6	138,706,399	14,519,161	8,381,755	6,137,406	58%	42%	531	465	0	0	0
Annual Summary												
2008		246,970,786		209,673,133	37,297,653			6,716	1,185	882,630	161,070	352,741
2009		366,493,966		182,708,338	183,785,628			5,849	5,934	817,175	822,525	326,582
2010		494,189,145		233,740,524	260,448,621			7,276	7,786	803,487	888,252	321,112
2011		536,625,693		270,135,962	266,489,731			7,820	7,695	478,295	470,596	191,149
2012		389,676,182		164,275,983	225,400,199			5,242	7,213	305,220	439,600	121,980
2013		138,706,399		67,070,634	71,635,765			2,424	2,602	71,784	107,450	28,688

Notes
** Units (e.g., lbs, hrs, etc.) per period where the period is monthly through rows 7-72, and annually for rows 92-97.*
*** It is conservatively assumed that all PM10 equals the calculated & tabulated PM emission rates. See also Note 4.*

[green] = Estimates (including op. schedule for transloading for BH emission estimates)
[orange] = Corresponds to period during which the oxidizers were exclusively used to control emissions from the coating operations.

1. Calculated based on the following AP-42, 5th ed., Section 1.4 natural gas combustion emission factors coupled with natural gas consumption data. Prior to October 2010, the monthly consumption is assumed to be proportional to proppant production. Actual monthly consumption is used thereafter. Example: (Natural Gas Consumption, CF6/month) x (EF, lb/CF6)

	PM	VOC	NOX	NH3	Formaldehyde
EF, lb/CF6	7.6	5.5	100	3.2	0.075

2. PM Calculated as the combination of emissions attributed to natural gas combustion, baghouse emissions, and sand coating operationg emissions, as follows:
   a. Natural Gas: See Note 1. The resulting emissions are distributed to each tower assuming that such emisisons are directly proportional to proppant production.
   b. Baghouse emissions: See 'Baghouse - PM Estimates' tab for annualized emission estimates. Monthly emissions assumed to be proportional to proppant production.
   c. Sand Coating Operations: Calculated based on stack-test derived emissions factors [See Note 3]

3. Coating Operation Emission Calculations:
   a. Phenol emissions - see'Phenol Monthly' tab for details regarding the calculations, as well as the 'Tower A Phenol' and 'Tower B Phenol' tabs
   b. The balance of the emissions are based on stack-test derived emission factors - Example: (Gross Proppant Production by Tower, lb/month) / (2,000 lb/ton) x (EF, lb/ton)
   Where available, tower-specific EF's have been used (PM & VOC). For formaldehyde, the average EF for Towers C-F has been applied.

Location	Tower	Inlet EF, lb/ton-proppant PM	Inlet EF VOC	Inlet EF Formald.	Scrubber VOC % Removal	Scrubber Outlet EF, lb/ton-proppant PM	Scrubber Outlet EF VOC	Scrubber Outlet EF Formald.	Source	Control Eff. (Source: CPI) PM	Control Eff. VOC	Oxidizer Estimated Outlet EF, lb/ton-proppant PM	Oxidizer Outlet VOC	Oxidizer Outlet Formaldehyde
Taylor	A	0.3465				0.0788	0.1603		May 2006 stack test data	90%	99%	0.0347	0.0067	0.0004
Taylor	B	0.3591	0.4731		30.22%	0.0729	0.3301		March 2009 stack test data	90%	99%	0.0359	0.0067	0.0004
Merrillan W	C		0.8577	0.0556	89.71%	0.0171	0.0882	0.0057	December 2010 stack test data					
Merrillan W	D		0.6664	0.0068	84.59%	0.0093	0.1027	0.0010	December 2010 stack test data					
Merrillan E	E		0.6683	0.0651	89.62%	0.0229	0.0694	0.0068	Oct-Nov 2011 stack test data					
Merrillan E	F		0.4832	0.0180	86.13%	0.0317	0.0670	0.0025	Oct-Nov 2011 stack test data					
Average (C-F)			0.6689	0.0364		0.0203	0.0818	0.0040						

- PM Inlet EFs are back-calculated based on assumed PM removal effiencies coupled with stack test outlet emissions data and, in the case of Tower A, a safety factor consistent with the original construction permit application.
- Formaldehyde Inlet EFs are back-calculated based on measured VOC removal effiencies, which are conservatively assumed to be representative of formaldehyde, coupled with stack test outlet emissions data.
- For the Oxidizer, the average inlet EF's for Towers C-F were used to estimate inlet loading for VOC and Formaldehyde. The manufacturer's specified VOC control efficiency was, in turn, applied to estimate the outlet emission factors.

4. Exceptions from Item 19 Requested Information: Atlas has not historically been required to document monthly emissions of PM2.5. As such, no PM2.5 documentation is available. Also note, prior to the issuance of Permit No. 12-MHR-176 and installation of the RTOs in 2013, NOx emissions were not expected in association with hexa consumption and, therefore, have only been estimated on a lb/lb-hexa basis for the period of time that the oxidizers have operated.

5. Change-over from scrubbers to oxidizers occurred in February 2013.
   Tower A - No scrubber operation in 2013 prior to change-over.
   Tower B - Last day of scrubber operation: 2/11/2013
   Tower B - First day of oxidizer operation: 3/19/2013

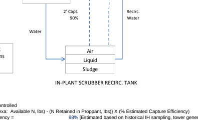
6. Nitrogen from Hexa - estimated retention in proppant.
   a. Hexa, lb-mole/month = (lb-Hexa/month) / (MW-Hexa, 140.19 lb/lb-mole)
   Nitrogen, Available lb-mole/month = (Hexa, lb-mole/month) x (4 lb-mole N / lb-mole Hexa)
   Nitrogen, Available lb/month = (Nitrogen, lb-mole/month) x (MW-N, 14.007 lb/lb-mole)
   b. Based on average annualized estimates - See 'CRC PRC Estimates' tab for details.
   Example Calculation: (Available N, lbs/month) x (Avg. Estimated % of Available N Retained in Proppant)

7. Sand Coating Operation - Scrubber Controlled
   a. Scrubber Controlled: Available N, lbs = (Nitrogen from Hexa: Available N, lbs) - {(N Retained in Proppant, lbs) + (Oxiidzer Operations - Inlet as N, lbs) + (Uncaptured NH3 as N, lbs)}
   b. Precontrol NH3, lbs = (Scrubber Controlled: Available N, lbs) / (14.007 lb-N / lb-mole N) x (1 lb-mole NH3 / 1 lb-mole N) x (17.031 lb-NH3 / lb-mole NH3)
   c. Based on scrubber water and sludge disposal information, coupled with the historical sampling data:.
   Scrubber water per S-F Analytical Laboratories report dated June 3, 2010. 1.32% % nitrogen, by mass. Example Calculation: (Scrubber Water, gal) x (8.34 lb/gal) x (% nitrogen, by mass)
   Scrubber sludge per S-F Analytical Laboratories report dated June 3, 2010. 2.04% % nitrogen, by mass. Example Calculation: (Scrubber Sludge) x (% nitrogen, by mass)
   d. Scrubber Outlet NH3, lbs = {(Precontrol NH3, lbs) - [(N Retained in Scrubber H2O, lbs) + (N Retained in Sludge, lbs)] / (14.007 lb-N / lb-mole N) x (1 lb-mole NH3 / 1 lb-mole N) x (17.031 lb-NH3 / lb-mole NH3)} x (Estimated % Capture)
   Roof Exhaust NH3, lbs = {(Precontrol NH3, lbs) - [(N Retained in Scrubber H2O, lbs) + (N Retained in Sludge, lbs)] / (14.007 lb-N / lb-mole N) x (1 lb-mole NH3 / 1 lb-mole N) x (17.031 lb-NH3 / lb-mole NH3)} x (1 - Estimated % Capture)
   Where Estimated % Capture = 93.02% [Derivation presented below]

   A portion of the NH3 that volatizes from the water in the in-plant scrubber water recirculation tank is expected to be secondarily captured and vented to the scrubber.
   The estimated capture efficiency for emissions from the tank is: 90% [Assumption]
   The remaining uncaptured NH3 is released inside the building as fugitive indoor emissions, which are ultimately assumed to be vented to the atmosphere via the general exhaust fans at the top of the towers.
   Factoring in recirculation, the estimated overall portion of the total NH3 loading (less NH3 retained in water & sludge) emitted to atmosphere via:
   Scrubber Stack: 93.02% by wt. [Derivation presented below]
   General Roof Exhaust (Tower): 6.98% by wt. [Derivation presented below]

   The estimated control efficiency of the scrubber for the initial NH3 loading is: 42.9% [Based on engineering study performed by RMT on March 1, 2010 - See 'NH3 Scrubber Efficiency' tab]

Estimation of Percentage of Overall NH3 Loading Vented to Scrubber and Roof Fan
Dependent on the scrubber efficiency and the estimated capture efficiency of the exhaust hood on scrubber water tank



IN-PLANT SCRUBBER RECIRC. TANK

lbs-NH3/yr	Loading	Scrbr. Stack	Tank	2' Capt.	Roof Exh.
Initial Loading	100	57	43	39	4
	39	22	17	15	2
	15	9	6	6	1
	6	3	2	2	0
	2	1	1	1	0
	1	0	0	0	0
Ending Loading	0	0	0	0	0
TOTAL	100	93	70	63	7
Overall Distribution		93.02%			6.98%

8. Sand Coating Operation - Oxidizer Controlled
   a. Inlet as N, lbs = {(Nitrogen from Hexa: Available N, lbs) - (N Retained in Proppant, lbs)} X (% Estimated Capture Efficiency)
   Where % Estimated Capture Efficiency = 98% [Estimated based on historical IH sampling, tower general exhaust flow estimates, and historical stack test data]
   b. Outlet N, as NOx, lbs = (Inlet as N, lbs) x (% Conversion of Inlet N to NOx) / (14.007 lb-N / lb-mole N) x (1 lb-mole NOx / 1 lb-mole N) x (46.005 lb-NOx / lb-mole NOx)
   Where 'Conversion of Inlet N to NOx' = 12.83% [Calculated per CPI consultant-provided stack test related information]
   c. Outlet - Nonoxidized N, lbs = (Inlet as N, lbs) x (1 - % Conversion of Inlet N to NOx)
   d. Outlet NH3 as N, lbs = (Inlet as N, lbs) x (% Estimated Available N at Inlet Converted to NH3)
   Where percent conversion estimated as: 36% by wt. [See 'NOx & NH3' tab]
   e. Outlet N, as NH3, lbs = (Outlet NH3 as N, lbs) / (14.007 lb-N / lb-mole N) x (1 lb-mole NH3 / 1 lb-mole N) x (17.031 lb-NH3 / lb-mole NH3)
   f. Uncaptured N, as NH3, lbs = {(Nitrogen from Hexa: Available N, lbs) - (N Retained in Proppant, lbs) - (Inlet as N, lbs)} / (14.007 lb-N / lb-mole N) x (1 lb-mole NH3 / 1 lb-mole N) x (17.031 lb-NH3 / lb-mole NH3)

MW of NOx 46.005 lb/lb-mole
MW of Nitrogen 14.007 lb/lb-mole
MW of NH3 17.031 lb/lb-mole

2008	2009	2010	2011	2012	2013	
246,970,786	366,493,966	494,189,145	536,625,693	389,676,182	138,706,399	
6,728,656	11,445,244	14,084,883	12,683,026	9,260,045	3,335,476	
0	48,337	1,010,520	3,985,328	3,502,164	1,428,000	
1,043,700	1,639,700	1,691,739	948,891	744,820	179,234	
417,112	655,302	676,099	379,222	297,665	71,630	
0	5,688,386	118,919,831	469,000,645	389,676,182	138,706,399	
0	8,569	179,138	706,490	744,820	179,234	
0.00%	0.15%	0.15%	0.15%	0.19%	0.13%	
0	3,425	71,592	282,347	297,665	71,630	
0.0000%	0.0269%	0.0269%	0.0269%	0.0341%	0.0231%	Estimated as follows: (Hexa:CRC Ratio) / (Avg. Hexa:PRC Ratio) x (% N Retained in PRC Sand)
0	1,530	31,993	126,177	133,023	32,011	
0%	18%	18%	18%	18%	18%	
0	147,208	3,077,493	10,840,599	9,260,045	3,335,476	
0	48,337	1,010,520	3,985,328	3,502,164	1,428,000	
246,970,786	360,805,580	375,269,314	67,625,048	0	0	Average
1,043,700	1,631,131	1,512,601	242,401	0	0	
0.42%	0.45%	0.40%	0.36%	0.00%	0.00%	0.42%
417,112	651,877	604,507	96,875	0	0	
0.0753%	0.0753%	0.0753%	0.0753%	0.0753%	0.0753%	0.0753%
185,969	271,687	282,578	50,922	0	0	
18%	17%	19%	21%	0%	0%	
6,728,656	11,298,036	11,007,390	1,842,427	0	0	
185,969	273,217	314,571	177,099	133,023	32,011	
0.075%	0.075%	0.064%	0.033%	0.034%	0.023%	
417,112	655,302	676,099	379,222	297,665	71,630	
44.58%	**41.69%**	**46.53%**	**46.70%**	**44.69%**	**44.69%**	

ATLAS RESIN PROPPANTS - TAYLOR, WI

The following serves to estimate particulate emissions from the baghouses (C20 & C120), which control particulate emissions from various elevators, conveyors, tanks, weigh hopppers, screens, heaters, coolers, belts and silos. The emissions have been estimated based on March 2009 stack test data (Badger Laboratories & Enginering Co., Inc.). It is conservatively assumed that PM10 equals PM.

	Tower A (C20)				Tower B (C120)			
Test Run:	1	2	3	Avg	1	2	3	Avg
Particulate Sample:								
Air Volume, dscf:	50.111	49.582	49.155		64.752	67.807	69.522	
Front Half Particulate, mg	4.7	4	4.7		3.2	3.4	2.9	
Back Half Particulate, mg	4.3	1.4	0.4		4.5	11.8	12.8	
Total Particulate, mg	9.0	5.4	5.1		7.7	15.2	15.7	
Concentration:								
Front Half Particulate, gr/dscf	0.0014	0.0012	0.0015	0.0014	0.0008	0.0008	0.0006	0.0007
Back Half Particulate, gr/dscf	0.0013	0.0004	0.0001	0.0006	0.0011	0.0027	0.0028	0.0022
Total Particulate, gr/dscf	0.0028	0.0017	0.0016	0.0020	0.0018	0.0035	0.0035	0.0029
Exhaust Flow, dscfm	8,571	8,490	8,394	8,485	11,149	11,624	11,917	11,563

Estimated PM & PM10 emissions for P-16 (Conservatively assuming that PM10 equals PM)

	Tower A		Tower B		TOTAL
Year	h/yr	PM	h/yr	PM	PM
2008	6,716	986	1,185	344	1,329
2009	5,849	858	5,934	1,721	2,580
2010	7,276	1,068	7,786	2,258	3,326
2011	7,820	1,148	7,695	2,232	3,380
2012	5,242	769	7,213	2,092	2,862
2013	2,424	356	2,602	755	1,110
2014	0	0	0	0	0

			Tower A								Tower B							
			Novalac				Resol		Total Phenol		Novalac				Resol		Total Phenol	
	Month	Date	lb-resin		lb per					Ton per	lb-resin		lb per					Ton per
Phenol EF, lb-phenol/lb-resin >>			Month	12-MRA	12-MRT	lb-phenol	lb-resin	lb-phenol	lb/month	12-MRT	Month	12-MRA	12-MRT	lb-phenol	lb-resin	lb-phenol	lb/month	12-MRT
LIMITS>>				**586,417**	**7,037,000**					**9.5**	**850,000**		**10,200,000**					**9.5**
2008	1	1/1/2008	428,291			1,154	0	0	1,154		0			0	0	0	0	
2008	2	2/1/2008	533,636			1,438	0	0	1,438		0			0	0	0	0	
2008	3	3/1/2008	498,839			1,344	0	0	1,344		0			0	0	0	0	
2008	4	4/1/2008	541,136			1,458	0	0	1,458		0			0	0	0	0	
2008	5	5/1/2008	521,571			1,406	0	0	1,406		0			0	0	0	0	
2008	6	6/1/2008	492,515			1,327	0	0	1,327		0			0	0	0	0	
2008	7	7/1/2008	524,881			1,415	0	0	1,415		0			0	0	0	0	
2008	8	8/1/2008	551,316			1,486	0	0	1,486		0			0	0	0	0	
2008	9	9/1/2008	574,477			1,548	0	0	1,548		0			0	0	0	0	
2008	10	10/1/2008	351,036			946	0	0	946		174,760			327	0	0	327	
2008	11	11/1/2008	347,021			935	0	0	935		419,107			783	0	0	783	
2008	12	12/1/2008	352,218			949	0	0	949		417,852			781	0	0	781	
2009	1	1/1/2009	422,140			1,138	0	0	1,138		512,187			957	0	0	957	
2009	2	2/1/2009	453,730			1,223	0	0	1,223		398,009			744	0	0	744	
2009	3	3/1/2009	419,508			1,131	254	0	1,131		406,597			760	246	0	760	
2009	4	4/1/2009	374,471			1,009	839	0	1,010		392,778			734	881	0	734	
2009	5	5/1/2009	320,473			864	300	0	864		298,248			557	280	0	557	
2009	6	6/1/2009	406,509			1,096	833	0	1,096		347,900			650	713	0	650	
2009	7	7/1/2009	486,934			1,312	0	0	1,312		432,708			809	0	0	809	
2009	8	8/1/2009	478,933			1,291	6,153	3	1,294		471,242			881	6,055	3	884	
2009	9	9/1/2009	511,425			1,378	6,161	3	1,382		505,068			944	6,085	3	947	
2009	10	10/1/2009	616,222			1,661	3,606	2	1,663		629,204			1,176	3,681	2	1,178	
2009	11	11/1/2009	686,288			1,850	4,180	2	1,852		692,938			1,295	4,220	2	1,297	
2009	12	12/1/2009	521,007			1,404	1,697	1	1,405		660,725			1,235	2,153	1	1,236	
2010	1	1/1/2010	715,895			1,930	14,524	8	1,937		627,005			1,172	12,720	7	1,178	
2010	2	2/1/2010	626,024			1,687	25,087	13	1,701		554,933			1,037	22,239	12	1,049	
2010	3	3/1/2010	709,616	537,816	6,453,797	1,913	42,929	23	1,936	8.7	596,203	517,413	6,208,952	1,114	36,067	19	1,133	5.8
2010	4	4/1/2010	670,436	562,480	6,749,763	1,807	28,413	15	1,822	9.1	637,131	537,775	6,453,304	1,191	27,001	15	1,205	6.1
2010	5	5/1/2010	570,218	583,292	6,999,507	1,537	22,340	12	1,549	9.5	676,106	569,264	6,831,163	1,263	26,488	14	1,278	6.4
2010	6	6/1/2010	416,384	584,115	7,009,382	1,122	30,807	17	1,139	9.5	646,111	594,114	7,129,374	1,207	47,805	26	1,233	6.7
2010	7	7/1/2010	490,806	584,438	7,013,255	1,323	21,603	12	1,334	9.5	729,653	618,860	7,426,318	1,363	32,117	17	1,381	7.0
2010	8	8/1/2010	422,675	579,750	6,956,997	1,139	31,525	17	1,156	9.4	602,728	629,817	7,557,804	1,126	44,955	24	1,150	7.1
2010	9	9/1/2010	540,215	582,149	6,985,787	1,456	33,166	18	1,474	9.5	676,022	644,063	7,728,758	1,263	41,504	22	1,286	7.3
2010	10	10/1/2010	582,842	579,367	6,952,406	1,571	39,199	21	1,592	9.4	700,777	650,028	7,800,332	1,309	47,131	25	1,335	7.4
2010	11	11/1/2010	493,637	563,313	6,759,755	1,330	87,353	47	1,377	9.2	508,580	634,664	7,615,974	950	89,997	48	999	7.2
2010	12	12/1/2010	426,715	555,455	6,665,463	1,150	98,454	53	1,203	9.1	464,171	618,285	7,419,420	867	107,096	58	925	7.1
2011	1	1/1/2011	535,454	540,418	6,485,022	1,443	162,255	87	1,530	8.9	542,775	611,266	7,335,190	1,014	164,473	88	1,103	7.0
2011	2	2/1/2011	494,212	529,434	6,353,210	1,332	129,001	69	1,401	8.8	479,342	604,967	7,259,599	896	125,120	67	963	7.0
2011	3	3/1/2011	558,452	516,837	6,202,046	1,505	184,065	99	1,604	8.6	558,483	601,823	7,221,879	1,044	184,075	99	1,143	7.0
2011	4	4/1/2011	548,272	506,657	6,079,882	1,478	143,217	77	1,555	8.5	540,410	593,763	7,125,158	1,010	141,163	76	1,086	6.9
2011	5	5/1/2011	674,455	515,343	6,184,119	1,818	171,012	92	1,910	8.6	671,033	593,340	7,120,085	1,254	170,145	91	1,345	7.0
2011	6	6/1/2011	521,095	524,069	6,288,829	1,404	180,194	97	1,501	8.8	522,677	583,054	6,996,652	977	180,741	97	1,074	6.9
2011	7	7/1/2011	478,803	523,069	6,276,825	1,290	144,387	78	1,368	8.8	500,363	563,947	6,767,363	935	150,889	81	1,016	6.7
2011	8	8/1/2011	551,295	533,787	6,405,445	1,486	182,663	98	1,584	9.1	558,186	560,235	6,722,821	1,043	184,947	99	1,142	6.7
2011	9	9/1/2011	519,273	532,042	6,384,503	1,400	215,259	116	1,515	9.1	476,969	543,647	6,523,768	891	197,722	106	998	6.6
2011	10	10/1/2011	527,378	527,420	6,329,040	1,421	171,847	92	1,514	9.0	509,447	527,703	6,332,437	952	166,003	89	1,041	6.4
2011	11	11/1/2011	516,751	529,346	6,352,153	1,393	119,286	64	1,457	9.1	483,608	525,622	6,307,466	904	111,636	60	964	6.4
2011	12	12/1/2011	458,936	532,031	6,384,375	1,237	203,407	109	1,346	9.1	455,357	524,888	6,298,651	851	201,821	109	959	6.4
2012	1	1/1/2012	255,797	508,726	6,104,718	689	84,155	45	735	8.7	464,582	518,372	6,220,458	868	152,845	82	950	6.3
2012	2	2/1/2012	413,167	501,973	6,023,672	1,114	244,639	132	1,245	8.7	429,512	514,219	6,170,629	803	254,317	137	939	6.3
2012	3	3/1/2012	389,783	487,917	5,855,004	1,051	105,350	57	1,107	8.4	311,684	493,652	5,923,829	582	84,242	45	628	6.1
2012	4	4/1/2012	227,607	461,195	5,534,339	613	69,389	37	651	8.0	298,561	473,498	5,681,980	558	91,019	49	607	5.8
2012	5	5/1/2012	492,065	445,996	5,351,949	1,326	184,895	99	1,426	7.7	426,621	453,131	5,437,568	797	160,305	86	883	5.6
2012	6	6/1/2012	489,343	443,350	5,320,197	1,319	154,856	83	1,402	7.7	505,359	451,687	5,420,250	944	159,924	86	1,030	5.6
2012	7	7/1/2012	518,230	446,635	5,359,624	1,397	187,462	101	1,498	7.7	518,219	453,175	5,438,106	968	187,458	101	1,069	5.6
2012	8	8/1/2012	503,233	442,630	5,311,562	1,356	181,174	97	1,454	7.7	518,377	449,858	5,398,297	969	186,626	100	1,069	5.6
2012	9	9/1/2012	500,445	441,061	5,292,734	1,349	269,225	145	1,494	7.7	511,690	452,752	5,433,018	956	275,275	148	1,104	5.6
2012	10	10/1/2012	80,050	403,784	4,845,406	216	39,401	21	237	7.0	457,347	448,410	5,380,918	855	225,107	121	976	5.6
2012	11	11/1/2012	0	360,721	4,328,655	0	0	0	0	6.3	423,680	443,416	5,320,990	792	44,500	24	816	5.5
2012	12	12/1/2012	0	322,477	3,869,719	0	0	0	0	5.6	524,693	449,194	5,390,326	980	160,000	86	1,066	5.6

ATLAS RESIN PROPPANTS, LLC - TAYLOR, WI
TOWER A

DERIVATION OF PRODUCTION LIMIT: NOVALAC RESIN

Capacity:	37,200	lb-product/hr	
Resin:	0.035	lb-resin/lb-product	
Max. throughput:	1,302	lb-resin/hr	
Max. Phenol Content:	1.5%	by wt. Max. Available Phenol	
Max. Available Phenol:	19.53	lb-phenol/hr [Available]	
Est. % Phenol Emitted:	39.5%	by wt. of available phenol emitted	[Conservative compared to a calculated 23% by wt. based on June 2006 stack test]

Avg. Stack Test Data - June 3, 2006 [Tower A]

Throughput:	29,731	lb-product/hr		
Inlet Loading:	3.584	lb-phenol/hr	1.21E-04	lb-phenol/lb-product
Outlet Loading:	1.629	lb-phenol/hr or	5.48E-05	lb-phenol/lb-product
% Control Efficiency:	54.5%			

Maximum Theoretical Emission (MTE) Estimation

19.53 lb-phenol/hr x 39.5% by wt. emitted = 7.71 lb-phenol/hr 0.0059 lb-phenol/lb-resin

Potential to Emit (PTE) Estimation

7.71 lb-phenol/hr x (1 - 54.5%) = 3.51 lb-phenol/hr or 0.0027 lb-phenol/lb-resin

DERIVATION OF PROPOSED PRODUCTION LIMIT: RESOL RESIN

Capacity:	37,200	lb-product/hr	
Resin:	0.035	lb-resin/lb-product	
Max. throughput:	1,302	lb-resin/hr	
Max. Phenol Content:	0.3%	by wt. Max. Available Phenol	
Max. Available Phenol:	3.906	lb-phenol/hr [Available]	
Est. % Phenol Emitted:	39.5%	by wt. of available phenol emitted	[Conservative compared to a calculated 23% by wt. based on June 2006 stack test]

Maximum Theoretical Emission (MTE) Estimation

3.906 lb-phenol/hr x 39.5% by wt. emitted = 1.54 lb-phenol/hr 0.0012 lb-phenol/lb-resin

Potential to Emit (PTE) Estimation

1.54 lb-phenol/hr x (1 - 54.5%) = 0.70 lb-phenol/hr 0.0005 lb-phenol/lb-resin

PROPOSED COMBINED EMISSION LIMIT FOR NOVALAC & RESOL RESINS

(Phenol Emissions, lb/month) = $(E_{Novalac} \times P_{Novalac}) + (E_{Resol} \times P_{Resol})$

Where:	$E_{Novalac}$ =	Phenol emission factor for Novalac Resin:	0.0027	lb-phenol/lb-resin
	$P_{novalac}$ =	Amount of Novalac Resin Used, lbs/month		
	E_{Resol} =	Phenol emission factor for Resol Resin:	0.0005	lb-phenol/lb-resin
	P_{Resol} =	Amount of Resol Resin Used, lbs/month		

The 12-month rolling average monthly Phenol Emission Rate cannot exceed: 9.5 tons-phenol/yr

ATLAS RESIN PROPPANTS, LLC - TAYLOR, WI
TOWER B

DERIVATION OF PRODUCTION LIMIT: NOVALAC RESIN

Capacity:	37,200	lb-product/hr		
Resin:	0.035	lb-resin/lb-product		
Max. throughput:	1,302	lb-resin/hr		
Max. Phenol Content:	1.5%	by wt. Max. Available Phenol		
Max. Available Phenol:	19.53	lb-phenol/hr [Available]		
Est. % Phenol Emitted:	27.4%	by wt. of available phenol emitted		[Conservative compared to a calculated 23% by wt. based on June 2006 stack test]

Avg. Stack Test Data - June 3, 2006 [Tower A - Conservatively used over 2009 stack test for Tower B due to significant variability in results for 2009]

Throughput:	29,731	lb-product/hr		
Inlet Loading:	3.584	lb-phenol/hr	1.21E-04	lb-phenol/lb-product
Outlet Loading:	1.629	lb-phenol/hr or	5.48E-05	lb-phenol/lb-product
% Control Efficiency:	54.5%			

Maximum Theoretical Emission (MTE) Estimation

19.53	lb-phenol/hr x	27.4%	by wt. emitted =	5.34	lb-phenol/hr	0.0041	lb-phenol/lb-resin

Potential to Emit (PTE) Estimation

5.34	lb-phenol/hr x	(1 - 54.5%) =	2.43	lb-phenol/hr	or	0.0019	lb-phenol/lb-resin

DERIVATION OF PROPOSED PRODUCTION LIMIT: RESOL RESIN

Capacity:	37,200	lb-product/hr		
Resin:	0.035	lb-resin/lb-product		
Max. throughput:	1,302	lb-resin/hr		
Max. Phenol Content:	0.3%	by wt. Max. Available Phenol		
Max. Available Phenol:	3.906	lb-phenol/hr [Available]		
Est. % Phenol Emitted:	39.5%	by wt. of available phenol emitted		[Conservative compared to a calculated 23% by wt. based on June 2006 stack test]

Maximum Theoretical Emission (MTE) Estimation

3.906	lb-phenol/hr x	39.5%	by wt. emitted =	1.54	lb-phenol/hr	0.0012	lb-phenol/lb-resin

Potential to Emit (PTE) Estimation

1.54	lb-phenol/hr x	(1 - 54.5%) =	0.70	lb-phenol/hr		0.0005	lb-phenol/lb-resin

PROPOSED COMBINED EMISSION LIMIT FOR NOVALAC & RESOL RESINS

(Phenol Emissions, lb/month) = $(E_{Novalac} \times P_{Novalac}) + (E_{Resol} \times P_{Resol})$

Where:	$E_{Novalac}$ =	Phenol emission factor for Novalac Resin:	0.0019	lb-phenol/lb-resin
	$P_{novalac}$ =	Amount of Novalac Resin Used, lbs/month		
	E_{Resol} =	Phenol emission factor for Resol Resin:	0.0005	lb-phenol/lb-resin
	P_{Resol} =	Amount of Resol Resin Used, lbs/month		

The 12-month rolling average monthly Phenol Emission Rate cannot exceed: 9.5 tons-phenol/yr

TABLE 1
AMMONIA STACK SAMPLING RESULTS SUMMARY - MARCH 1, 2010
ATLAS RESIN - TAYLOR, WISCONSIN

Run # (Approx. Time)	Sample I.D.	Sample Description	Sample Location	Notes	Sample Length (Min.)	# of Batches per hour	LBS Sand Per Batch	LBS Resin Per Batch	LBS Hexa Per Batch	*Duct Size (Inches)*	*Velocity (FPM)*	*Flow Rate (CFM)*	Analyte	Units	Result	Emission Rate (lb/hr)	Comments
Run 1 (9:08-10:08)	70193	Scrubber Inlet - Front Two Impingers	Deck 4 - Scrubber Inlet Duct	*2*	60	11	2800 (30,800 lb/hr)	93 (1,023 lb/hr)	40 (440 lb/hr)	*16*	*3,700*	*5,166*	Ammonia	ppm	24,000	325	
	70194	Scrubber Inlet - Back Impinger		*2*	60								Ammonia	ppm	40		
	70195	Scrubber Outlet - Front Two Impingers	Deck 5 - Scrubber Outlet Duct	*1*	61					*14*	*9,950*	*10,637*	Ammonia	ppm	19,000	257	
Run 2 (11:30-12:30)	70199	Scrubber Inlet - Front Two Impingers	Deck 4 - Scrubber Inlet Duct	*2*	62	12	2800 (30,800 lb/hr)	93 (1,023 lb/hr)	40 (440 lb/hr)	*16*	*3,700*	*5,166*	Ammonia	ppm	20,000	271	
	70200	Scrubber Inlet - Back Impinger		*2*	62								Ammonia	ppm	980		
	70201	Scrubber Outlet - Front Two Impingers	Penthouse - Scrubber Stack		63					*20*	*1,600*	*3,491*	Ammonia	ppm	13,000	176	
Run 3 (13:50-14:50)	70202	Scrubber Inlet - Front Two Impingers	Deck 4 - Scrubber Inlet Duct	*2*	63	12	2800 (30,800 lb/hr)	93 (1,023 lb/hr)	40 (440 lb/hr)	*16*	*3,700*	*5,166*	Ammonia	ppm	19,000	257	
	70203	Scrubber Inlet - Back Impinger		*2*	63								Ammonia	ppm	1,300		
	70204	Scrubber Outlet - Front Two Impingers	Penthouse - Scrubber Stack		61					*20*	*1,600*	*3,491*	Ammonia	ppm	11,000	149	

Assumed Nominal System Flow Rate (cfm): 5,200

Notes:

1. Significant carry through of scrubber water observed at Deck 5 location in the negative pressure side of fan. Subsequent samples collected from Penthouse level at the positive pressure side of fan.
2. The sample description "Front Two Impingers" represents the first two midget impingers exposed to stack gases. The "Back Impinger" sample was analyzed separately for purposes of ensuring minimal breakthrough had occurred during sample run.

Ammonia - Engineering Study Basis [Above]

Inlet:	21,000	284	lb-NH3/hr [Inlet]
		2,489,091	lb-NH3/yr [@ 8760 hr/yr]
Outlet:	14,333	162	lb-NH3/hr [Outlet - test runs 2 & 3 only (see note 1)]
		1,422,338	lb-NH3/yr [@ 8760 hr/yr]
Est. Control Eff.:		42.9%	NH3 removal
NR 445		28	NH3/hr (stack height > 75')
		612,587	NH3/yr (stack height > 75')
		418	µg-NH3/m³ [24-hour averaging time]
		100	µg-NH3/m³ [annual]

The hexamethylene tetramine (Hexa) used in the sand coating operations is the primary source of nitrogen introduced into the operation. Specifically, the hexa molecule (C6H12N4) contains four moles of nitrogen. The manufacturer of the recuperative thermal oxidizers, Catalytic Products International (CPI), states that less than 10 percent of the total nitrogen available at the inlet to an oxidizer is converted to nitrogen oxides (NOx); however, a higher estimate of 12.83% has been calculated based on data supplied by CPI's consultant and has, therefore, been used in the calculations below. According to CPI representatives, stack testing of its recuperative thermal oxidizer on similar operations have not resulted in detectable ammonia (NH3) concentrations; in such case, they recommended that a 5 ppm concentration be assumed for NH3. The balance of the nitrogen is expected to be as N2. A 5 ppm concentration of NH3 yields a estimated 0.08 lbs-NH3 per hour, per oxidizer. In lieu of this estimate, modeling has been used to establish a more conservative emissions rate - specifically, the stated concentration, when multiplied by a conservative factor of 200, still yields acceptable ambient impacts.

Process Capacity Data - Per Line (Tower)

Batch Size, lb/batch	3,100
Max. Batches / Hr	12
Max. Batch Rate, lb/hr	37,200
Hexa Solution, % Hexa, by wt.	30%
Lbs-Hexa Solution/Batch	50
Lbs-Hexa / Batch	15
Lbs-Hexa / Hr	180

Molecular Weights, lb/mole

MW- Hexa	140.19	C6H12N4
MW - NH3	17.031	NH3
MW - N	14.007	N
MW - Nox	46.005	NO2 [Assumed as NO2]

Estimation of Available Nitrogen

Moles-Hexa / Hr	180	lbs-	Hexa	1	mole-	Hexa			=	1.28 Moles-Hexa
	1	hr-line		140.19	lb-	Hexa				1 Hr-line
Available Nitrogen	1.28	Moles-	Hexa	4	Mole-	N	14.007	lb- N	=	71.94 lb-N
	1	hr-line		1	Mole-	Hexa	1	Mole- N		1 Hr-line
Ammonia Generation	71.94	lb-	N	17.031	lb-NH3/mole		1	mole-NH3	=	87.47 lb-NH3
	1	hr-line		14.007	lb-N/mole		1	mole-N		1 Hr-line
	87.47	lbs-	NH3	1	mole-	NH3			=	5.14 Mole-NH3
	1	hr-line		17.031	lb-	NH3				1 Hr-line

Estimation of NOx Emissions [Attributed Solely to Hexa]

Available Nitrogen	71.94	lb-N/hr-line
Retention of Nitrogen in Sand:	0.0753	% Nitrogen in Sand, by wt. [Based on manufacturer data]
Nitrogen Retained in Sand	28.01	lb-N/hr-line
Nitorgen Inlet Loading	43.93	lb-N/hr-line
CPI - Conversion of Inlet N to NOx:	12.83%	[Calculated per CPI consultant-provided stack test related information]

43.93 lb-N/hr-line x 12.83% = 5.64 lb-N/hr-line

5.64 lb-N/hr-line x (46.005 lb-NOx/mole-NOx / 14.007 lb-N/mole-N) = 18.52 lb-NOx/hr-line

18.52 lb-NOx/hr-line x 8,760 hr/yr / (2,000 lb/ton) = 81 Ton/yr-line

Estimation of NOx Emissions [Attributed Solely to Natural Gas Combustion]

	Oxidizer	Duct Heater	Total	NOx MTE/PTE lb/hr	lb/yr	TPY
Max. Capacity, MMBtu/hr	4.5	1.5	6.0			
Max. Capacity, CF6/hr	0.0045	0.0015	0.0060	0.6	5,256	2.63
Nat. Gas Heat Input, MMBtu/CF6	1,000					
AP-42 Emission Factor, lb/CF6	100					

Estimation of Ammonia Emissions [Attributed Solely to Hexa]

Estimate based on CPI Statement

NH3 Emissions (Outlet):	5	ppmv, which is calculated to be equivalent to (see 'NH3 ppm' tab)	= 0.08 lbs-NH3/hr-line
Increase Factor:	200	[Conservative Assumption]	
Adjuated Estimated Outlet Emissions:	200 x	0.0795443 lbs-NH3/hr	= 15.91 lbs-NH3/hr-line

15.91 lbs-NH3/hr-line x 14.007 lb-N/mole / 17.031 lb-NH3/mole x 1 mole-N/ 1 mole NH3 = 13.08 moles-N/hr-line

Estimated Conversion of NH3: (87.47 lbs-NH3/hr-line - 15.91 lbs-NH3/hr-line) / 87.47 lbs-NH3/hr-line = 82%

Nitrogen Balance	**Overall**			**Oxidizer Inlet**		
Available Nitrogen:	71.94 lbs-N/hr-line	100.00%	Available Nitrogen:	43.93 lbs-N/hr-line		
Retained in Sand:	28.01 lbs-N/hr-line	38.94%				
Converted to NOx:	5.64 lbs-N/hr-line	7.84%	Converted to NOx:	5.64 lbs-N/hr-line	13%	
Converted to NH3:	15.91 lbs-N/hr-line	22.11%	Converted to NH3:	15.91 lbs-N/hr-line	36%	
Converted to N2:	22.38 lbs-N/hr-line	31.11%	Converted to N2:	22.38 lbs-N/hr-line	51%	

Chemical:	The hexamethylene tetramine (Hexa) used in the san	Nitrogen Oxides	
Molecular Weight:		46.005	g/g-mole
Estimated Concentration:		431.00	ppmv

MW =	46.01	g/gmol		
P =	1.0	atm		
T =	770.00	°F	or	683.15 K
R =	0.08206	L-atm/gmol-K		
P/RT =	0.0178	gmol/L		

$$P/RT = \frac{1.0 \text{ atm}}{0.08206 \text{ L-atm/gmol-K}} \Big| \frac{1}{683.15 \text{ K}} = 0.0178383 \text{ gmol/L}$$

$$\frac{0.017838257 \text{ gmol}}{1 \text{ L}} \Big| \frac{1000 \text{ L}}{1 \text{ m}^3} = 17.8 \text{ gmol/m}^3$$

Conversion ppm to mg/m³

C_{mass} = 17.8 gmol/m³ x 431.00 ppm x 46.01 g/gmol = 353,700 µg/m³ or 353.70 mg/m³

Conversion to lb/hr

Stack Data:

Flow	6,000	SCFM	13,982	ACFM
Temp.	770	F or	683.15	K

Emission rate, lb/hr = 353.70 mg/m³ x 2.20E-06 lb/mg x 0.0283 m³/ft³ x 13,982 ACFM x 60 min/hr

= 18.52 lb/hr

Chemical: The hexamethylene tetramine (Hexa) used in	Ammonia		
Molecular Weight:	17.031	g/g-mole	
Estimated Concentration:	5.00	ppmv	*[Estimate per CPI representatives]*

MW =	17.03	g/gmol			
P =	1.0	atm			
T =	770.00	°F	or	683.15	K
R =	0.08206	L-atm/gmol-K			
P/RT =	0.0178	gmol/L			

$$P/RT = \frac{1.0 \text{ atm}}{0.08206 \text{ L-atm/gmol-K}} \Big| \frac{1}{683.15 \text{ K}} = 0.0178383 \text{ gmol/L}$$

$$\frac{0.017838257 \text{ gmol}}{1 \text{ L}} \Big| \frac{1000 \text{ L}}{1 \text{ m}^3} = 17.8 \text{ gmol/m}^3$$

Conversion ppm to mg/m³

C_{mass} = 17.8 gmol/m³ x 5.00 ppm x 17.03 g/gmol = 1,519 µg/m³ or 1.52 mg/m³

Conversion to lb/hr

Stack Data:

Flow	6,000	SCFM		13,982	ACFM
Temp.	770	F	or	683.15	K
Inside Diam.	29.625	" ID			
Area	4.79	ft²			
Velocity	2,921	FPM			

Emission rate, lb/hr = 1.52 mg/m³ x 2.20E-06 lb/mg x 0.0283 m³/ft³ x 13,982 ACFM x 60 min/hr

= 0.08 lb/hr