Missouri Department of Natural Resources

National Ambient Air Quality Standards-Nitrogen Dioxide

Nitrogen dioxide (NO_2) is one component of a group of highly reactive gases known as oxides of nitrogen (NO_x). NO_2 rapidly forms in the atmosphere due to the release of emissions from vehicles, combustion processes and off-road equipment. NO_2 is an ozone precursor and also contributes to the secondary formation of fine particulate matter.

On January 22, 2010, the Environmental Protection Agency substantially strengthened the NO_2 National Ambient Air Quality Standards (NAAQS) through the establishment of a new 1-hour standard of 100 parts per billion. This standard is in addition to the existing, annual NO_2 standard of 53 parts per billion. Unlike the annual NAAQS, the new 1-hour standard is a statistical standard that is based upon the three-year average of the 98th percentile of the annual distribution of daily maximum 1-hour average concentrations, refer to Table 1.

Table 1
NO_2 NAAQS

Pollutant	Averaging Time	NAAQS	Comment
		($\mu g/m^3$)	
NO_2	1-Hour	188.68* (100 parts per billion)	3-year average of the 98th percentile of the annual distribution of the daily maximum 1-hour concentrations
NO_2	Annual	100	Not to be exceeded

****Assumes 53 parts per billion = 100 $\mu g/m^3$ per February 25, 2010 NO_2 NAAQS Fact Sheet***

If a facility is required to conduct a full impact analysis for NO_2, the study must include the emissions from the proposed source, existing "interactive" sources and monitored background concentrations. The modeled emission rates must reflect the maximum allowable operating conditions for each source based upon federally enforceable emission limits and operating level(s).

If the predicted impact due to the proposed source, interactive sources and the monitored background value is below the NAAQS for each applicable averaging period, compliance has been demonstrated and no further analysis for NO_2 is necessary.

If, on the other hand, violations of the 1-hour NO_2 NAAQS are predicted to occur at one or more receptors, the applicant will be required to determine if the proposed project or modification has a significant ambient impact. If the source can demonstrate that it does not have a significant impact on a violating receptor(s), measured in time and space, a permit can be issued without further review of the standards. If the source cannot demonstrate less than significant impacts, the facility must consider emission limits, the installation of controls or other measures in order to reduce its ambient impact at all violating receptors.

For the annual averaging period, the proposed project cannot significantly impact a violation. If annual violations are predicted to occur and the applicant has a significant annual impact, a construction permit cannot be issued. If insignificant ambient impacts are predicted to occur on a violating receptor, no further analysis is necessary for the annual averaging period.

For the 1-hour averaging period, the determination of significant impact must consider the source's impact for each instance where the cumulative impact exceeds the NAAQS at or below the 98th percentile. Because this analysis can become complicated, the Environmental Protection Agency developed an output option in the AERMOD system that compares the contribution from the proposed project to the cumulative impact at each receptor paired in time and space, MAXDCONT. If insignificant impacts are predicted to occur, in time and space, no further analysis for the 1-hour averaging period is necessary.

Because NO_2 is highly reactive, 40 CFR Part 51 Appendix W, "The Guideline on Air Quality Models", suggests that a three tiered screening approach be used to determine compliance with the 1-hour and annual averaging periods.

Tier 1

The Tier 1 analysis assumes a total conversion of nitric oxide (NO) to NO_2 for both the 1-hour and annual averaging periods. For the annual averaging period, the maximum, annual average concentration predicted by the dispersion model should be compared to the NAAQS of 100 $\mu g/m^3$.

In order to demonstrate compliance with the 1-hour NAAQS, the applicant must show that the 5-year average of the 98th percentile of the annual distribution of the daily maximum 1-hour concentrations is less than 100 parts per billion. It should be noted that the modeled compliance demonstration is based upon a five-year average, rather than the 3-year average noted in Table 1. The requirements within Section 1(c) (2) of Appendix S to 40 CFR Part 50 states that the 1-hour monitored design value should be based upon a 3-year average, as noted for the form of the standard. For modeling purposes, Section 8.3.1.2 of Appendix W to Part 51 states "[T]he use of 5 years of NWS [National Weather Service] meteorological data or at least 1 year of site specific data is required." The Environmental Protection Agency has indicated that the use of the five years of data does not result in biased model results and should be used for NAAQS compliance purposes, refer to the June 29, 2010 guidance document entitled "Guidance Concerning the Implementation of the 1-hour NO_2 NAAQS for the Prevention of Significant Deterioration Program."

Based upon the form of the new 1-hour standard, the modeled design value is the five year average of the eighth highest, daily maximum, 1-hour concentrations. It should be noted that the Environmental Protection Agency has updated AERMOD to allow the user to more easily calculate the design value for the new 1-hour NO_2 standard through the use of additional model options in the output pathway.

Tier 2

For the Tier 2 analysis, the Tier 1 results are multiplied by a default, NO_2/NO_x ambient ratio for both the 1-hour and annual averaging periods. Differing ratios have been developed based upon existing literature which suggests that the 1-hour ratio is sensitive to hourly meteorological conditions and is not equivalent to an annual ratio where hourly differences in ambient conditions are less critical.

For the annual averaging period, the maximum, annual average concentration should be multiplied by an ambient ratio of 0.75 and compared to the NAAQS of 100 $\mu g/m^3$.

For the 1-hour averaging period, the calculated design value, described under Tier 1, should be multiplied by an ambient ratio of 0.80 and compared to the NAAQS of 188.68 $\mu g/m^3$.

Tier 3

If an applicant fails to demonstrate compliance through the application of the Tier 2 ambient ratio method, a more detailed, screening method may be implemented on a case by case basis. A Tier 3 model analysis for NO_2 is considered a non-regulatory default option and requires approval from the Environmental Protection Agency Region VII in accordance with Section 3.2.2, paragraph (e) in 40 CFR Part 51 Appendix W.

In the June 29, 2010 guidance document referenced above, the Environmental Protection Agency offered two differing NO to NO_2 conversion methods: the ozone limiting method (OLM) and the plume volume molar ratio method (PVMRM). To date, the Environmental Protection Agency has not stated a preference for either model option and will allow the use of either method provided adequate justification for a Tier 3 analysis is provided.

In order to conduct a model analysis using the OLM or the PVMRM method, the user must provide the following parameters: the in-stack NO_2/NO_x ratio, a background ozone value and an optional equilibrium ratio. A default in-stack ratio of 0.50 can be input into the air quality model without further justification. If an applicant proposes the use of a differing NO_2/NO_x ratio, justification must be provided to the construction permit engineer reviewing the application. If inadequate justification is provided due to a lack of available data, post-construction stack testing will be required to confirm the accuracy of the ratio since it directly impacts the model predictions that are ultimately used to determine compliance.

Background ozone values can be input as a single value, temporally varying values or as hourly values. If the applicant chooses to use a single ozone value, the OZONEVAL keyword should be selected. The use of a single ozone value in most instances should result in conservative NO_2 estimates. The value chosen for use in the air quality analysis can be provided by the department's Air Pollution Control Program and is dependent upon the location where the facility will be located.

The applicant may also want to specify background ozone concentrations based upon season, day of the week or time of day. In this instance, the O3VALUES keyword should be selected in the control pathway. As noted above, the values chosen for input into the air quality model will be provided by the department's Air Pollution Control Program.

Lastly, hourly ozone concentrations can be input into the air quality model using a separate, concentration file through the use of the OZONEFILE keyword in the control pathway. The

background ozone file must contain a record for each hour within the year being modeled. All hourly ozone values will be provided by the department's Air Pollution Control Program.

An ambient equilibrium ratio of 0.90 is the default value for the AERMOD modeling system. The user does not have to specify an equilibrium ratio if the default value is chosen. If an applicant chooses to enter a non-default equilibrium ratio; the optional NO2EQUIL keyword must be selected prior to model execution. Any deviation from the default 0.90 ratio must be pre-approved by the Construction Permit Modeling Unit and the Environmental Protection Agency Region VII.

The following paragraphs provide a hypothetical example of a NAAQS evaluation for NO_2. The data describes a basic situation and is not meant to address all modeling scenarios and/or issues that might arise during the review process.

<u>Example NAAQS Demonstration</u>

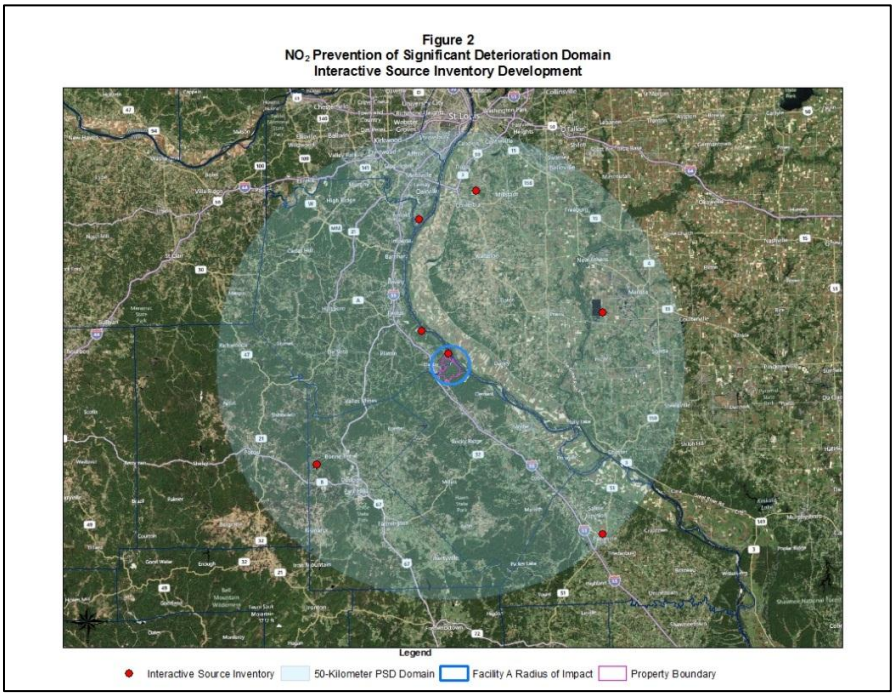
Facility A is proposing to install a coal-fired boiler at a greenfield site. Based upon the emissions from the worst case operating load, the preliminary impact analysis indicates that Facility A's radius of impact extends 4.52-kilometers beyond the center of the proposed facility, refer to Figure 1.

Because the ambient impact due to the proposed construction exceeds the 1-hour and annual significant impact thresholds, 7.55 $\mu g/m^3$ and 1.00 $\mu g/m^3$, a full impact analysis is required and must include an evaluation of compliance with the NAAQS.

Figure 1
NO_2 Significant Impact Determination
1-Hour and Annual Significant Impact Comparison

As noted in the introduction, NAAQS compliance is based upon the impact due to the combination of the emissions from the proposed source, existing "interactive" sources and monitored background concentrations. In order to determine the impact due to the proposed source and interactive sources, the emissions from Facility A and existing NO_2 sources were explicitly modeled. The monitored background value was obtained from a representative monitoring site.

The radius of impact due to the proposed project determined what sources were explicitly modeled for compliance purposes. Facility A is undergoing a Prevention of Significant Deterioration (PSD) review and; as such, the air quality analysis considered any emission source that could significantly impact the air quality within the region of Facility A, i.e. 50-kilometers beyond the furthest extent of the significant impact area, refer to Figure 2.



Emission rates and release parameters for each source within the inventory were input into the air quality model. The combined ambient impact due to the modeled sources were calculated and output on a receptor by receptor basis for use in the compliance demonstration. It is important to note that the model outputs do not include the monitored background concentration; this value must be added to the model predictions prior to determining compliance with the NAAQS. Table 2 contains the model outputs for a sampling of receptors that were evaluated for this example. The results reflect the Tier 1 model concentrations where a total conversion of NO to NO_2 is assumed.

Table 2 Tier 1 NO_2 NAAQS Compliance Determination											
1-Hour Averaging Period *(NAAQS = 188.68 μg/m³)*											
Easting	**Northing**	**Elevation**	**Hill**	**2003**	**2004**	**2005**	**2006**	**2007**	**5-Yr Average**	**Background**	**NAAQS**
(Meters)	*(Meters)*	*(Meters)*	*(Meters)*	*(μg/m³)*	*(μg/m³)*	*(μg/m³)*	*(μg/m³)*	*(μg/m³)*	*(μg/m³)*	*(μg/m³)*	*(μg/m³)*
				(Eighth)	*(Eighth)*	*(Eighth)*	*(Eighth)*	*(Eighth)*	*(Eighth)*	*(Monitored)*	*(Eighth)*
733500	4229000	136.07	250.63	10677.98	10677.98	13016.25	18957.18	18957.18	14457.31	67	14524.31
732500	4229000	148.56	208.98	13386.9	13386.9	11921.62	11340.99	11340.99	12275.48	67	12342.48
733500	4230000	140.56	215.67	11236.15	11236.15	11493.38	9436.033	9436.033	10567.55	67	10634.55
733500	4229500	131.02	250.63	5284.116	5284.116	5154.328	5728.682	5728.682	5435.985	67	5502.985
731000	4230000	149.75	257.81	3060.516	3060.516	6676.79	4984.876	4984.876	4553.515	67	4620.515
732500	4228500	139.64	213.81	4309.274	4309.274	4614.185	3248.756	3248.756	3946.049	67	4013.049
734000	4229500	114.4	250.63	3598.466	3598.466	3784.507	3662.332	3662.332	3661.221	67	3728.221
731500	4230000	153.87	257.81	3228.465	3228.465	4259.307	3111.114	3111.114	3387.693	67	3454.693
733000	4229000	125.3	250.63	3030.532	3030.532	3213.979	3249.968	3249.968	3154.996	67	3221.996
730000	4228500	151.18	210.93	3111.3	3111.3	2848.363	2488.086	2488.086	2809.427	67	2876.427
Annual Averaging Period *(NAAQS = 100.00 μg/m³)*											
Easting	**Northing**	**Elevation**	**Hill**	**2003**	**2004**	**2005**	**2006**	**2007**	**Max**	**Background**	**NAAQS**
(Meters)	*(Meters)*	*(Meters)*	*(Meters)*	*(μg/m³)*	*(μg/m³)*	*(μg/m³)*	*(μg/m³)*	*(μg/m³)*	*(μg/m³)*	*(μg/m³)*	*(μg/m³)*
				(H1H)	*(H1H)*	*(H1H)*	*(H1H)*	*(H1H)*	*(H1H)*	*(Monitored)*	*(H1H)*
733500	4229000	136.07	250.63	174.9604	109.1933	144.0504	157.7776	200.3785	200.3785	13	213.3785
733500	4229500	131.02	250.63	149.2271	103.803	94.25913	104.4304	131.7712	149.2271	13	162.2271
733500	4230000	140.56	215.67	76.62919	127.6382	116.4365	108.0716	101.4779	127.6382	13	140.6382
734000	4229500	114.4	250.63	65.96769	82.418	89.48804	78.59625	79.48997	86.48804	13	99.488
732500	4229000	148.56	208.98	22.61656	56.92957	66.55613	50.60294	48.12312	66.55613	13	79.55613
734000	4230000	114.29	250.63	55.70069	53.29164	62.25663	52.94081	61.28596	62.25663	13	75.25663
731000	4230000	149.75	257.81	11.86281	25.90944	42.67803	25.00151	23.00302	42.67803	13	55.67803
732500	4228500	139.64	213.81	38.69583	25.00575	39.11903	24.88653	42.61016	42.61016	13	55.61016
733000	4229000	125.3	250.63	39.30284	26.35946	40.738	39.02798	40.42813	40.738	13	53.738
734500	4229500	114.29	250.63	38.75287	31.05034	31.56057	34.05512	38.87486	38.87486	13	51.87486

The first four columns contain information regarding the location of the receptor under review, followed by the predicted concentration from the dispersion model for each year under consideration. For the 1-hour averaging period, the eighth highest, 1-hour value for each year was determined and averaged across the five year period in order to calculate the predicted design value. Prior to comparing the modeled design value to the NAAQS, a monitored background number was added to the five year average. This sum represents the total concentration that should be compared to the NAAQS. Based upon the results contained within Table 2 for the 1-hour averaging period, the Tier 1 concentrations at all ten receptors violate the 1-hour NAAQS.

For the annual averaging period, the maximum concentration for the five year period was obtained and added to the monitored background number. The sum represents the total concentration that should be compared to the NAAQS in order to determine compliance. Based upon the results contained within Table 2, the top three annual concentrations exceed the NAAQS of 100 μg/m³. Because NAAQS violations are predicted to occur, the applicant must determine if Facility A has a significant impact on a violating receptor, refer to Table 3.

Table 3 Tier 1 NO_2 NAAQS Violations vs. Significant Impact					
1-Hour NAAQS (188.68 µg/m^3) vs. Significance (7.52 µg/m^3)					
Easting	**Northing**	**Elevation**	**Hill**	**NAAQS**	**Significant Impact Concentration**
(Meters)	***(Meters)***	***(Meters)***	***(Meters)***	***(µg/m^3)***	***(µg/m^3)***
				(Eighth High)	***(H1H)***
733500	4229000	136.07	250.63	14524.31	12.98
732500	4229000	148.56	208.98	12342.48	3.81
733500	4230000	140.56	215.67	10634.55	11.82
733500	4229500	131.02	250.63	5502.985	10.95
731000	4230000	149.75	257.81	4620.515	3.400
732500	4228500	139.64	213.81	4013.049	5.900
734000	4229500	114.4	250.63	3728.221	8.54
731500	4230000	153.87	257.81	3454.693	6.46
733000	4229000	125.3	250.63	3221.996	7.96
730000	4228500	151.18	210.93	2876.427	8.78
Annual NAAQS (100.0 µg/m^3) vs. Significance (1.0 µg/m^3)					
Easting	**Northing**	**Elevation**	**Hill**	**NAAQS**	**Significant Impact Concentration**
(Meters)	***(Meters)***	***(Meters)***	***(Meters)***	***(µg/m^3)***	***(µg/m^3)***
				(H1H)	***(H1H)***
733500	4229000	136.07	250.63	213.3785	1.23
733500	4229500	131.02	250.63	162.2271	1.00
733500	4230000	140.56	215.67	140.6382	0.928

For the 1-hour and annual averaging periods, Facility A had a significant impact on a portion of the violating receptors; as such, Facility A's compliance with the 1-hour and annual NAAQS has not been demonstrated and additional review is necessary.

Prior to reviewing additional control measures, a Tier 2 NO_2 analysis should be performed. The Tier 2 analysis, commonly referred to as the ambient ratio method, applies a NO_2/NO_x conversion rate of 0.75 to the annual concentrations and a NO_2/NO_x conversion rate of 0.80 to the 1-hour concentrations. The ambient ratio method can be applied to <u>both</u> the NAAQS concentrations and the significant impact concentrations in order to determine if a significant ambient impact takes place at the same time as a violation. Table 4 contains the predicted concentrations that result after the application of the ambient ratio method to the NAAQS and significant impact values for the 1-hour and annual averaging periods.

Table 4 Application of the Tier 2 Ambient Ratio Method NAAQS Compliance Determination							
1-Hour NAAQS (188.68 μg/m^3) vs. Significance (7.52 μg/m^3)							
Easting	**Northing**	**Elevation**	**Hill**	**NAAQS**	**Significant Impact Concentration**	**NAAQS**	**Significant Impact Concentration**
						Ambient Ratio Method	
(Meters)	***(Meters)***	***(Meters)***	***(Meters)***	***(μg/m^3)***	***(μg/m^3)***	***(μg/m^3)***	***(μg/m^3)***
				(Eighth High)	***(H1H)***	***(Eighth High)***	***(H1H)***
733500	4229000	136.07	250.63	14524.31	12.98	11619.45	10.384
733500	4230000	140.56	215.67	10634.55	11.82	8507.639	9.456
733500	4229500	131.02	250.63	5502.985	10.95	4402.388	8.7632
734000	4229500	114.4	250.63	3728.221	8.54	2982.576	6.832
733000	4229000	125.3	250.63	3221.996	7.96	2577.597	6.372486
730000	4228500	151.18	210.93	2876.427	8.78	2301.142	7.028935
Annual NAAQS (100.00 μg/m^3) vs. Significance (1.0 μg/m^3)							
Easting	**Northing**	**Elevation**	**Hill**	**NAAQS**	**Significant Impact Concentration**	**NAAQS**	**Significant Impact Concentration**
						Ambient Ratio Method	
(Meters)	***(Meters)***	***(Meters)***	***(Meters)***	***(μg/m^3)***	***(μg/m^3)***	***(μg/m^3)***	***(μg/m^3)***
				(H1H)	***(H1H)***	***(H1H)***	***(H1H)***
733500	4229000	136.07	250.63	213.3785	1.23	160.0339	0.9225
733500	4229500	131.02	250.63	162.2271	1.00	121.6703	0.75

After the application of the Tier 2 ambient ratio method, 1-hour and annual NAAQS violations remain evident. However, it is important to note that on an annual basis, the impact due to the proposed project falls below the significance threshold of 1.0 μg/m^3 through the application of the Tier 2 approach. As such, compliance with the annual NAAQS for NO_2 has been demonstrated and no further analysis for this averaging period is necessary.

On a 1-hour basis, the facility continues to significantly impact violating receptors. Given the conservative nature of the Tier 2 approach, a third model run was conducted using the Plume Volume Molar Ratio Method (PVMRM) described previously in the Tier 3 analysis section of this document. Tier 3 analyses should only be pursued after consultation with the permit granting authority and the Environmental Protection Agency Region VII. Any assumptions that are made must be pre-approved prior to their use in a compliance demonstration.

In order to conduct a model analysis using the PVMRM method, the applicant had to input an in-stack NO_2/NO_x ratio, a background ozone value and an optional equilibrium ratio. For this example, default values for the in-stack ratio and equilibrium ratio of 0.50 and 0.90 were input into the air quality model. Additionally, a single ozone value was used in the analysis rather than an hourly ozone file. Table 5 contains the predicted concentrations that result after the application of PVMRM in the NAAQS input file for the 1-hour averaging period.

Table 5 Tier 3 NO_2 NAAQS Compliance Determination											
1-Hour Averaging Period *(NAAQS = 188.68 µg/m³)*											
Easting	Northing	Elevation	Hill	2003	2004	2005	2006	2007	5-Yr Average	Background	NAAQS
(Meters)	*(Meters)*	*(Meters)*	*(Meters)*	*(µg/m³)*	*(µg/m³)*	*(µg/m³)*	*(µg/m³)*	*(µg/m³)*	*(µg/m³)*	*(µg/m³)*	*(µg/m³)*
				(Eighth)	*(Eighth)*	*(Eighth)*	*(Eighth)*	*(Eighth)*	*(Eighth)*	*(Monitored)*	*(Eighth)*
733500	4229000	136.07	250.63	3342.841	2740.569	3352.822	4233.977	4233.977	3580.837	67	3647.837
733500	4230000	140.56	215.67	2137.411	2893.259	2959.034	2643.407	2643.407	2655.303	67	2722.303
732500	4229000	148.56	208.98	693.9957	3432.213	3000.183	2907.336	2907.336	2588.213	67	2655.213
733500	4229500	131.02	250.63	1489.404	1383.848	1358.736	1409.54	1409.54	1410.214	67	1477.214
732500	4228500	139.64	213.81	1303.733	1197.762	1307.982	1334.032	1334.032	1295.508	67	1362.508
737000	4230000	117.07	117.07	1082.937	1083.192	1091.74	1264.353	1264.353	1157.315	67	1224.315
732500	4232500	120.39	257.67	1260.573	1288.892	1035.145	1076.155	1076.155	1147.384	67	1214.384
731000	4229000	138.48	191.08	1151.965	1021.774	1186.081	1172.8	1172.8	1141.084	67	1208.084
736000	4230500	118.17	118.17	1111.615	1162.098	881.7135	1217.737	1217.737	1118.18	67	1185.18
733500	4232500	121.8	124.69	733.4885	1152.768	1117.364	1290.357	1290.357	1116.867	67	1183.867

Although the concentrations predicted for the 1-hour averaging period experienced significant reductions after the application of the Tier 3 screening methods, violations continue and require the applicant to determine if a significant impact is occurring at the same time as a violation, refer to Table 6.

Table 6 Tier 3 NO_2 NAAQS Violations vs. Significant Impact					
1-Hour NAAQS (188.68 µg/m³) vs. Significance (7.52 µg/m³)					
Easting	Northing	Elevation	Hill	NAAQS	Significant Impact Concentration
(Meters)	*(Meters)*	*(Meters)*	*(Meters)*	*(µg/m³)*	*(µg/m³)*
				(Eighth High)	*(H1H)*
733500	4229000	136.07	250.63	3647.837	12.98
733500	4230000	140.56	215.67	2722.303	0.81
732500	4229000	148.56	208.98	2655.213	4.92
733500	4229500	131.02	250.63	1477.214	3.78
732500	4228500	139.64	213.81	1362.508	1.14
737000	4230000	117.07	117.07	1224.315	2.90
732500	4232500	120.39	257.67	1214.384	6.57
731000	4229000	138.48	191.08	1208.084	7.00
736000	4230500	118.17	118.17	1185.18	3.84
733500	4232500	121.8	124.69	1183.867	6.18

Facility A had a significant impact on one of the violating receptors; as such, it must be determined if the significant impact occurs at the same time as a violation. In order to demonstrate that a significant impact does not occur at the same time as a violation, the applicant must rank the ambient concentrations from the proposed project and from the NAAQS sources. Once the ranking is complete, the values from each source group must be paired in time and space. AERMOD has the capability to rank values from the daily maximum 1-hour concentrations in order to determine significant contributions through the use of the MAXDCONT keyword in the output pathway of the input run script. Figure 1 displays the results from the MAXDCONT analysis. If the facility has a significant impact, in time and space, consideration of additional control measures would have to be made at this juncture.

Figure 1
MAXDCONT Output for Facility A

```
NO2_TIMEDAY_05.txt - Notepad
File  Edit  Format  View  Help
* AERMOD ( 12060): Example 1-hour NOx NAAQS PVMRM                                  11/28/12
* MODELING OPTIONS USED:                                                           09:11:35
* NonDFAULT CONC                                          ELEV
*        MAXDCONT FILE OF   1ST-HIGHEST MAX DAILY  1-HR VALUES AVERAGED OVER   1 YEARS FOR SOURCE GROUP: ALL      ; ABOVE THRESH =     100.0
*        FOR A TOTAL OF      1 RECEPTORS AND    2 SOURCE GROUPS;  WITH CONTRIBUTIONS FROM OTHER SOURCE GROUPS PAIRED IN TIME & SPACE
*        FORMAT: (3(1X,F13.5),3(1X,F8.2),2X,A6,2X,A8,2X,A5,5X,A8,2X,   2(F13.5,2X:))
*       X            Y       AVERAGE CONC    ZELEV    ZHILL    ZFLAG    AVE     GRP      RANK     NET ID   CONT EXAMPLE   CONT ALL
*
 733500.00000 4229000.00000    6618.85800   136.07   250.63     0.00    1-HR  ALL        1ST                      0.00000     6618.85800
* AERMOD ( 12060): Example 1-hour NOx NAAQS PVMRM                                  11/28/12
* MODELING OPTIONS USED:                                                           09:11:35
* NonDFAULT CONC                                          ELEV
*        MAXDCONT FILE OF   2ND-HIGHEST MAX DAILY  1-HR VALUES AVERAGED OVER   1 YEARS FOR SOURCE GROUP: ALL      ; ABOVE THRESH =     100.0
*        FOR A TOTAL OF      1 RECEPTORS AND    2 SOURCE GROUPS;  WITH CONTRIBUTIONS FROM OTHER SOURCE GROUPS PAIRED IN TIME & SPACE
*        FORMAT: (3(1X,F13.5),3(1X,F8.2),2X,A6,2X,A8,2X,A5,5X,A8,2X,   2(F13.5,2X:))
*       X            Y       AVERAGE CONC    ZELEV    ZHILL    ZFLAG    AVE     GRP      RANK     NET ID   CONT EXAMPLE   CONT ALL
*
 733500.00000 4229000.00000    6264.62205   136.07   250.63     0.00    1-HR  ALL        2ND                      0.00000     6264.62205
* AERMOD ( 12060): Example 1-hour NOx NAAQS PVMRM                                  11/28/12
* MODELING OPTIONS USED:                                                           09:11:35
* NonDFAULT CONC                                          ELEV                                                                      PVMRM
*        MAXDCONT FILE OF   3RD-HIGHEST MAX DAILY  1-HR VALUES AVERAGED OVER   1 YEARS FOR SOURCE GROUP: ALL      ; ABOVE THRESH =     100.00000
*        FOR A TOTAL OF      1 RECEPTORS AND    2 SOURCE GROUPS;  WITH CONTRIBUTIONS FROM OTHER SOURCE GROUPS PAIRED IN TIME & SPACE
*        FORMAT: (3(1X,F13.5),3(1X,F8.2),2X,A6,2X,A8,2X,A5,5X,A8,2X,   2(F13.5,2X:))
*       X            Y       AVERAGE CONC    ZELEV    ZHILL    ZFLAG    AVE     GRP      RANK     NET ID   CONT EXAMPLE   CONT ALL
*
 733500.00000 4229000.00000    4956.54877   136.07   250.63     0.00    1-HR  ALL        3RD                      0.00000     4956.54877
* AERMOD ( 12060): Example 1-hour NOx NAAQS PVMRM                                  11/28/12
* MODELING OPTIONS USED:                                                           09:11:35
* NonDFAULT CONC                                          ELEV                                                                      PVMRM
*        MAXDCONT FILE OF   4TH-HIGHEST MAX DAILY  1-HR VALUES AVERAGED OVER   1 YEARS FOR SOURCE GROUP: ALL      ; ABOVE THRESH =     100.00000
*        FOR A TOTAL OF      1 RECEPTORS AND    2 SOURCE GROUPS;  WITH CONTRIBUTIONS FROM OTHER SOURCE GROUPS PAIRED IN TIME & SPACE
*        FORMAT: (3(1X,F13.5),3(1X,F8.2),2X,A6,2X,A8,2X,A5,5X,A8,2X,   2(F13.5,2X:))
*       X            Y       AVERAGE CONC    ZELEV    ZHILL    ZFLAG    AVE     GRP      RANK     NET ID   CONT EXAMPLE   CONT ALL
*
 733500.00000 4229000.00000    4572.74520   136.07   250.63     0.00    1-HR  ALL        4TH                      0.00000     4572.74520
* AERMOD ( 12060): Example 1-hour NOx NAAQS PVMRM                                  11/28/12
* MODELING OPTIONS USED:                                                           09:11:35
* NonDFAULT CONC                                          ELEV                                                                      PVMRM
*        MAXDCONT FILE OF   5TH-HIGHEST MAX DAILY  1-HR VALUES AVERAGED OVER   1 YEARS FOR SOURCE GROUP: ALL      ; ABOVE THRESH =     100.00000
*        FOR A TOTAL OF      1 RECEPTORS AND    2 SOURCE GROUPS;  WITH CONTRIBUTIONS FROM OTHER SOURCE GROUPS PAIRED IN TIME & SPACE
*        FORMAT: (3(1X,F13.5),3(1X,F8.2),2X,A6,2X,A8,2X,A5,5X,A8,2X,   2(F13.5,2X:))
*       X            Y       AVERAGE CONC    ZELEV    ZHILL    ZFLAG    AVE     GRP      RANK     NET ID   CONT EXAMPLE   CONT ALL
*
 733500.00000 4229000.00000    4203.79632   136.07   250.63     0.00    1-HR  ALL        5TH                      0.00000     4203.79632
* AERMOD ( 12060): Example 1-hour NOx NAAQS PVMRM                                  11/28/12
* MODELING OPTIONS USED:                                                           09:11:35
* NonDFAULT CONC                                          ELEV                                                                      PVMRM
*        MAXDCONT FILE OF   6TH-HIGHEST MAX DAILY  1-HR VALUES AVERAGED OVER   1 YEARS FOR SOURCE GROUP: ALL      ; ABOVE THRESH =     100.00000
*        FOR A TOTAL OF      1 RECEPTORS AND    2 SOURCE GROUPS;  WITH CONTRIBUTIONS FROM OTHER SOURCE GROUPS PAIRED IN TIME & SPACE
*        FORMAT: (3(1X,F13.5),3(1X,F8.2),2X,A6,2X,A8,2X,A5,5X,A8,2X,   2(F13.5,2X:))
*       X            Y       AVERAGE CONC    ZELEV    ZHILL    ZFLAG    AVE     GRP      RANK     NET ID   CONT EXAMPLE   CONT ALL
*
 733500.00000 4229000.00000    4039.78534   136.07   250.63     0.00    1-HR  ALL        6TH                      0.00000     4039.78534
* AERMOD ( 12060): Example 1-hour NOx NAAQS PVMRM                                  11/28/12
* MODELING OPTIONS USED:                                                           09:11:35
* NonDFAULT CONC                                          ELEV                                                                      PVMRM
*        MAXDCONT FILE OF   7TH-HIGHEST MAX DAILY  1-HR VALUES AVERAGED OVER   1 YEARS FOR SOURCE GROUP: ALL      ; ABOVE THRESH =     100.00000
*        FOR A TOTAL OF      1 RECEPTORS AND    2 SOURCE GROUPS;  WITH CONTRIBUTIONS FROM OTHER SOURCE GROUPS PAIRED IN TIME & SPACE
*        FORMAT: (3(1X,F13.5),3(1X,F8.2),2X,A6,2X,A8,2X,A5,5X,A8,2X,   2(F13.5,2X:))
*       X            Y       AVERAGE CONC    ZELEV    ZHILL    ZFLAG    AVE     GRP      RANK     NET ID   CONT EXAMPLE   CONT ALL
*
 733500.00000 4229000.00000    4003.26174   136.07   250.63     0.00    1-HR  ALL        7TH                      0.00000     4003.26174
* AERMOD ( 12060): Example 1-hour NOx NAAQS PVMRM                                  11/28/12
* MODELING OPTIONS USED:                                                           09:11:35
* NonDFAULT CONC                                          ELEV                                                                      PVMRM
*        MAXDCONT FILE OF   8TH-HIGHEST MAX DAILY  1-HR VALUES AVERAGED OVER   1 YEARS FOR SOURCE GROUP: ALL      ; ABOVE THRESH =     100.00000
*        FOR A TOTAL OF      1 RECEPTORS AND    2 SOURCE GROUPS;  WITH CONTRIBUTIONS FROM OTHER SOURCE GROUPS PAIRED IN TIME & SPACE
*        FORMAT: (3(1X,F13.5),3(1X,F8.2),2X,A6,2X,A8,2X,A5,5X,A8,2X,   2(F13.5,2X:))
*       X            Y       AVERAGE CONC    ZELEV    ZHILL    ZFLAG    AVE     GRP      RANK     NET ID   CONT EXAMPLE   CONT ALL
*
 733500.00000 4229000.00000    3342.84078   136.07   250.63     0.00    1-HR  ALL        8TH                      0.00000     3342.84078
* AERMOD ( 12060): Example 1-hour NOx NAAQS PVMRM                                  11/28/12
* MODELING OPTIONS USED:                                                           09:11:35
* NonDFAULT CONC                                          ELEV                                                                      PVMRM
*        MAXDCONT FILE OF   9TH-HIGHEST MAX DAILY  1-HR VALUES AVERAGED OVER   1 YEARS FOR SOURCE GROUP: ALL      ; ABOVE THRESH =     100.00000
*        FOR A TOTAL OF      1 RECEPTORS AND    2 SOURCE GROUPS;  WITH CONTRIBUTIONS FROM OTHER SOURCE GROUPS PAIRED IN TIME & SPACE
*        FORMAT: (3(1X,F13.5),3(1X,F8.2),2X,A6,2X,A8,2X,A5,5X,A8,2X,   2(F13.5,2X:))
*       X            Y       AVERAGE CONC    ZELEV    ZHILL    ZFLAG    AVE     GRP      RANK     NET ID   CONT EXAMPLE   CONT ALL
*
 733500.00000 4229000.00000    3328.47452   136.07   250.63     0.00    1-HR  ALL        9TH                      0.00000     3328.47452
* AERMOD ( 12060): Example 1-hour NOx NAAQS PVMRM                                  11/28/12
* MODELING OPTIONS USED:                                                           09:11:35
* NonDFAULT CONC                                          ELEV                                                                      PVMRM
*        MAXDCONT FILE OF  10TH-HIGHEST MAX DAILY  1-HR VALUES AVERAGED OVER   1 YEARS FOR SOURCE GROUP: ALL      ; ABOVE THRESH =     100.00000
*        FOR A TOTAL OF      1 RECEPTORS AND    2 SOURCE GROUPS;  WITH CONTRIBUTIONS FROM OTHER SOURCE GROUPS PAIRED IN TIME & SPACE
```

CONT Example = Impact from the facility.

CONT All = Impact from all modeled sources.

Since CONT Example < Significant Impact Level, no further analysis is necessary.

The MAXDCONT file contains information on the receptor, the concentration that is predicted to occur based upon rank and the contribution from each source group specified in the source pathway of the input run script. If the impact from the proposed project, EXAMPLE in this case, is less than the significant impact level, no further analysis is necessary.

Based upon the space and time comparison, Facility A did not have a significant impact at the same time that a violation occurred; as such, no further analysis is necessary and NAAQS compliance for the 1-hour averaging period has been demonstrated.