

# Procedure For Determining NO<sub>2</sub> Monitor Background Values (Design Values) For Use in Calculating NAAQS Compliance

## Purpose:

The purpose of this guidance document is to ensure a consistent method is used to calculate NO<sub>2</sub> background values (design value) for each monitoring sites within the San Joaquin Valley.

## Applicability:

The following procedure applies when addressing New Source Review (NSR Rule 2201) requirements and will apply to all monitors used to determine a source's compliance with the NO<sub>2</sub> National Ambient Air Quality Standard (NAAQS) and should **not** be used to determine NAAQS Attainment, SIP demonstrations, or other Planning modeling / exercises.

## Background:

On February 9, 2010, EPA published a new primary NAAQS for Nitrogen Dioxide (NO<sub>2</sub>) of 100 parts per billion (ppb) with an effective date of April 12, 2010. The new primary NAAQS is based on a 3yr average of the 98<sup>th</sup> percentile of the annual distribution of daily 1-hour maximum. At the same time EPA published amendments to Append S which established procedures for determining a monitor's background value (design value).

## Determining a Monitor's Background Value:

The District will follow the procedure outlined in Append S to determine a monitor's background value as described below. Please note that EPA has established two procedures which must be evaluated to determine a monitor's background value. The higher value of the two procedures is considered the background for a given monitoring site.

## Procedure 1:

### Minimum Requirements:

- It encompasses three consecutive calendar years of complete data.
  - A year meets data completeness requirements when all 4 quarters are complete.
    - A quarter is complete when at least 75 percent of the sampling days for each quarter have complete data.
      - A sampling day has complete data if 75 percent of the hourly concentration values (18 hours), including state-flagged data affected by exceptional events which have been approved for exclusion by the Administrator, are reported.

Once a dataset is determined to meet the above criteria or it meets the requirements of 3.2(c)(ii)(A) & (B) the background value is calculated. A site's background value is a 3 yr average of the 98<sup>th</sup> percentile of the annual distribution of the daily 1-hour maximum concentration (monitored values).

### Background Value Calculation:

1. Determine # of valid days, for the year, to compare to column 1 of Table 1, see below, to find the nth maximum value to use to determine the 98th percentile value.
2. Determine the daily maximum 1-hour monitoring value for each valid day determined above
3. Arrange all valid daily 1-hour maximum values in descending order

4. Select the nth value, see step 1, to determine a given year's 98th percentile value from the list of valid daily 1-hour maximum values
5. Repeat steps 1-4 for each of the three years under review
6. Average the three 98th percentile value to derive the 3 yr average of the 98<sup>th</sup> percentile of the annual distribution of the daily 1-hour maximum value

This procedure is repeated for each site that has been determined to have valid years. Table 2 represents the 3 yr average of the 98<sup>th</sup> percentile of the annual distribution of the daily 1-hour Maximum concentration for all sites that have been determined to have valid data.

**Site Not Meeting Minimum Requirements May Still be Valid:**

If a given year does not pass the minimum requirements described above the District will implement the procedure outlined in section 3.2(c)(ii)(A) & (B) to determine if a given year can be considered valid. Monitoring years that have been validated are included in Appendix B. The following procedure is used to determine if a year is valid:

**Minimum Requirements**

- Determine if the number of days across the three matching quarters is  $\geq 200$  days.
  - Sum the valid days in the quarter under review for each of the three year
- At least 50% of the data for the quarter under review has been captured
  - Number of days in the quarter X 24 hours X 0.5

**Background Value Calculation:**

- Identify the maximum value for the quarter under review for each of the 3 yrs.
  - All hours should be used to identify the daily 1-hour maximum value
    - This includes days that do not meet the 75% capture level
- Substitute the daily 1-hour maximum value from each missing daily value to make the quarter 100% complete
  - This should be done for each quarter under review
- Recalculate the 3 yr average of the 98<sup>th</sup> percentile value
  - If the resulting value is below the NAAQS then
    - It is deemed to have passed the diagnostic test and the quarter under review is considered valid.
    - The original 3 yr average of the 98<sup>th</sup> percentile using the non-substituted data is also considered valid

**Procedure 2:**

**Background Value Calculation:**

- Determine the number of days with at least one hourly value.
- Compare number of days to column 1 of Table 1, see below, to find the nth maximum value to use to determine the 98th percentile value
- Determine the daily maximum 1-hour monitoring value for each day with at least one hourly value
- Arrange all valid daily 1-hour maximum values in descending order
- Select the nth value to determine a given year's 98th percentile value from the list of daily 1-hour maximum values
- Repeat steps 1-4 for each of the three years under review

- Average the three 98th percentile value to derive the 3 yr average of the 98<sup>th</sup> percentile of the annual distribution of the daily 1-hour maximum value

Annual number of days with valid data for year "y" (cny)	$P_{0.98, y}$ is the nth maximum value of the year, where n is the listed number
1-50	1
51-100	2
101-150	3
151-200	4
201-250	5
251-300	6
301-350	7
351-366	8

**Table 1**

## Summary of NO<sub>2</sub> Monitoring Data In The San Joaquin Valley Unified APCD

County FIP	Site ID	County	Site Name	3yr Ave. of the 98th percentile of the annual distribution of the daily 1 hour max ppb / ug/m <sup>3</sup>
19	7	Fresno	Fresno-Drummond Street	61.00 / 115.10
19	8	Fresno	Fresno-1st Street	56.67 / 106.92
19	242	Fresno	Fresno-Sierra Skypark #2	45.67 / 85.31
19	4001	Fresno	Parlier	39.33 / 74.21
19	5001	Fresno	Clovis-N Villa Avenue	58.67 / 110.70
29	7	Kern	Edison	40.00 / 75.47
29	10	Kern	Bakersfield-Golden State Highway	60.00 / 113.21
29	14	Kern	Bakersfield-5558 California Avenue	61.00 / 115.10
29	5001	Kern	Arvin-Bear Mountain Blvd	31.67 / 59.76
29	6001	Kern	Shafter-Walker Street	53.33 / 100.62
31	1004	Kings	Hanford-S Irwin Street	53.00 / 100.00
39	4	Madera	Madera-Pump Yard	40.33 / 76.10
47	3	Merced	Merced-S Coffee Avenue	43.33 / 81.76
77	1002	San Joaquin	Stockton-Hazelton Street	57.67 / 108.81
77	3005	San Joaquin	Tracy-Airport	38.67 / 72.96
99	6	Stanislaus	Turlock-S Minaret Street	48.67 / 91.83
107	2002	Tulare	Visalia-N Church Street	61.33 / 115.72

**Table 2** (A detailed summary of the data used is to develop table 2 is included in Appendix A)

**Appendix A  
Detailed Summary of  
NO<sub>2</sub> Background Values**

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# Detailed Summary of NO<sub>2</sub> Monitoring Data

County: **Fresno**

FIP ID: 19

Site Name: **Fresno-Drummond Street**

FIP ID: 7

Year	98th	Valid	Percentile	# Valid Days	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr
	Percentile	Days	Description					
2009	57	339	301-350 valid Days 7th Max Value	70	87	92	90	
2008	66	361	351-366 valid Days 8th Max Value	87	91	92	91	
2007	60	348	301-350 valid Days 7th Max Value	88	87	92	81	
	<b>61.00</b>		<b>3yr average of the 98<sup>th</sup> percentile</b>					

Site Name: **Fresno-1st Street**

FIP ID: 8

Year	98th	Valid	Percentile	# Valid Days	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr
	Percentile	Days	Description					
2009	53	363	351-366 valid Days 8th Max Value	90	91	90	92	
2008	61	351	351-366 valid Days 8th Max Value	91	84	88	88	
2007	56	360	351-366 valid Days 8th Max Value	89	90	90	91	
	<b>56.67</b>		<b>3yr average of the 98<sup>th</sup> percentile</b>					

Site Name: **Fresno-Sierra Skypark #2**

FIP ID: 242

Year	98th	Valid	Percentile	# Valid Days	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr
	Percentile	Days	Description					
2007	44	353	351-366 valid Days 8th Max Value	85	90	87	91	
2006	44	344	301-350 valid Days 7th Max Value	90	76	92	86	
*2005	49	365	351-366 valid Days 8th Max Value					
	<b>45.67</b>		<b>3yr average of the 98<sup>th</sup> percentile</b>					

Site Name: **Parlier**

FIP ID: 4001

Year	98th	Valid	Percentile	# Valid Days	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr
	Percentile	Days	Description					
2009	40	307	301-350 valid Days 7th Max Value	54	90	88	75	
2008	36	348	301-350 valid Days 7th Max Value	89	84	89	86	
2007	42	360	351-366 valid Days 8th Max Value	90	89	89	92	
	<b>39.33</b>		<b>3yr average of the 98<sup>th</sup> percentile</b>					

Site Name: **Clovis-N Villa Avenue**

FIP ID: 5001

Year	98th	Valid	Percentile	# Valid Days	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr
	Percentile	Days	Description					
2008	58	347	301-350 valid Days 7th Max Value	82	89	84	92	
2007	58	350	301-350 valid Days 7th Max Value	88	91	80	91	
2006	60	362	351-366 valid Days 8th Max Value	89	90	91	92	
	<b>58.67</b>		<b>3yr average of the 98<sup>th</sup> percentile</b>					

\* = 98<sup>th</sup> percentile was derived using Procedure 2

## Detailed Summary of NO<sub>2</sub> Monitoring Data

County: **Kern**

FIP ID: 29

Site Name: **Edison**

FIP ID: 7

Year	98th	Valid	Percentile	# Valid Days			
	Percentile	Days	Description	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr
2009	37	355	351-366 valid Days 8th Max Value	88	88	87	92
2008	41	361	351-366 valid Days 8th Max Value	88	91	91	91
2007	42	362	351-366 valid Days 8th Max Value	89	91	90	92
<b>40.00 3yr average of the 98<sup>th</sup> percentile</b>							

Site Name: **Bakersfield-Golden State Highway**

FIP ID: 10

Year	98th	Valid	Percentile	# Valid Days			
	Percentile	Days	Description	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr
2009	59	342	301-350 valid Days 7th Max Value	86	82	87	87
*2008	62	366	351-366 valid Days 8th Max Value				
2007	59	356	351-366 valid Days 8th Max Value	89	91	91	85
<b>60.00 3yr average of the 98<sup>th</sup> percentile</b>							

Site Name: **Bakersfield-5558 California Avenue**

FIP ID: 14

Year	98th	Valid	Percentile	# Valid Days			
	Percentile	Days	Description	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr
2009	58	359	351-366 valid Days 8th Max Value	89	88	92	90
2008	65	359	351-366 valid Days 8th Max Value	88	91	91	89
2007	60	356	351-366 valid Days 8th Max Value	89	85	90	92
<b>61.00 3yr average of the 98<sup>th</sup> percentile</b>							

Site Name: **Arvin-Bear Mountain Blvd**

FIP ID: 5001

Year	98th	Valid	Percentile	# Valid Days			
	Percentile	Days	Description	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr
2009	34	342	301-350 valid Days 7th Max Value	79	87	85	91
2008	27	302	301-350 valid Days 7th Max Value	90	63	79	70
2007	34	357	351-366 valid Days 8th Max Value	88	91	88	90
<b>31.67 3yr average of the 98<sup>th</sup> percentile</b>							

Site Name: **Shafter-Walker Street**

FIP ID: 6001

Year	98th	Valid	Percentile	# Valid Days			
	Percentile	Days	Description	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr
2009	43	363	351-366 valid Days 8th Max Value	89	90	92	92
2008	52	361	351-366 valid Days 8th Max Value	90	89	91	91
2007	65	360	351-366 valid Days 8th Max Value	89	89	92	90
<b>53.33 3yr average of the 98<sup>th</sup> percentile</b>							

\* = 98<sup>th</sup> percentile was derived using Procedure 2

# Detailed Summary of NO<sub>2</sub> Monitoring Data

County: **Kings**

FIP ID:31

Site Name: **Hanford-S Irwin Street**

FIP ID: 1004

Year	98th Percentile	Valid Days	Percentile Description	# Valid Days			
				1st Qtr	2nd Qtr	3rd Qtr	4th Qtr
2007	50	299	251-300 valid Days 6th Max Value	87	91	92	29
2006	52	359	351-366 valid Days 8th Max Value	90	91	91	87
2005	57	361	351-366 valid Days 8th Max Value	89	90	90	92
<b>53.00    3yr average of the 98<sup>th</sup> percentile</b>							

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# Detailed Summary of NO<sub>2</sub> Monitoring Data

County: **Madera**

FIP ID:39

Site Name: **Madera-Pump Yard**

FIP ID: 4

Year	98th Percentile	Valid Days	Percentile Description	# Valid Days			
				1st Qtr	2nd Qtr	3rd Qtr	4th Qtr
2009	36	365	351-366 valid Days 8th Max Value	90	91	92	92
2008	45	340	301-350 valid Days 7th Max Value	89	75	84	92
2007	40	354	351-366 valid Days 8th Max Value	90	81	91	92
<b>40.33 3yr average of the 98<sup>th</sup> percentile</b>							

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\* = 98<sup>th</sup> percentile was derived using Procedure 2  
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# Detailed Summary of NO<sub>2</sub> Monitoring Data

County: **Merced**

FIP ID: 47

Site Name: **Merced-S Coffee Avenue**

FIP ID: 3

Year	98th Percentile	Valid Days	Percentile Description	# Valid Days			
				1st Qtr	2nd Qtr	3rd Qtr	4th Qtr
2009	40	339	301-350 valid Days 7th Max Value	65	91	92	91
2008	48	340	301-350 valid Days 7th Max Value	81	87	80	92
2007	42	357	351-366 valid Days 8th Max Value	87	90	88	92
<b>43.33 3yr average of the 98<sup>th</sup> percentile</b>							

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# Detailed Summary of NO<sub>2</sub> Monitoring Data

County: **San Joaquin**

FIP ID: 77

Site Name: **Stockton-Hazelton Street**

FIP ID: 1002

Year	98th Percentile	Valid Days	Percentile Description	# Valid Days			
				1st Qtr	2nd Qtr	3rd Qtr	4th Qtr
2009	54	350	301-350 valid Days 7th Max Value	90	82	87	91
2008	63	364	351-366 valid Days 8th Max Value	90	91	91	92
2007	56	355	351-366 valid Days 8th Max Value	88	87	91	89
<b>57.67 3yr average of the 98<sup>th</sup> percentile</b>							

Site Name: **Tracy-Airport**

FIP ID: 3005

Year	98th Percentile	Valid Days	Percentile Description	# Valid Days			
				1st Qtr	2nd Qtr	3rd Qtr	4th Qtr
2009	35	349	301-350 valid Days 7th Max Value	90	77	92	90
2008	40	365	351-366 valid Days 8th Max Value	91	91	91	92
2007	41	345	301-350 valid Days 7th Max Value	88	91	92	74
<b>38.67 3yr average of the 98<sup>th</sup> percentile</b>							

# Detailed Summary of NO<sub>2</sub> Monitoring Data

County: **Stanislaus**

FIP ID:99

Site Name: **Turlock-S Minaret Street**

FIP ID: 6

Year	98th Percentile	Valid Days	Percentile Description	# Valid Days			
				1st Qtr	2nd Qtr	3rd Qtr	4th Qtr
2009	48	353	351-366 valid Days 8th Max Value	84	89	92	88
2008	52	350	301-350 valid Days 7th Max Value	82	88	88	92
2007	46	361	351-366 valid Days 8th Max Value	88	91	92	90
<b>48.67    3yr average of the 98<sup>th</sup> percentile</b>							

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\* = 98<sup>th</sup> percentile was derived using Procedure 2  
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# Detailed Summary of NO<sub>2</sub> Monitoring Data

County: **Tulare**

FIP ID: 107

Site Name: **Visalia-N Church Street**

FIP ID: 2002

Year	98th Percentile	Valid Days	Percentile Description	# Valid Days			
				1st Qtr	2nd Qtr	3rd Qtr	4th Qtr
2009	57	364	351-366 valid Days 8th Max Value	90	90	92	92
2008	68	364	351-366 valid Days 8th Max Value	90	91	91	92
2007	59	359	351-366 valid Days 8th Max Value	90	87	91	91
<b>61.33 3yr average of the 98<sup>th</sup> percentile</b>							

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**Append B**  
**Data Validation using**  
**Section 3.2 (c)(ii)(A) & (B)**  
**Of Append S of Part 50**

Year: **2009**  
 County: **Fresno**  
 County FIP ID: **19**  
 Site Name: **Parlier**  
 Site ID: **4001**

<b>Minimum Requirements</b>		
<b>Passed</b>	<b>Value</b>	<b>Data Check</b>
	1 <sup>st</sup>	Non-valid Quarter
Y	231	≥200 days across the three matching Qtrs.
Y	59.3%	≥50% and <75% of data captured
<b>Performance Test (3.2(c)(ii)(A) &amp; (B) of Appendix S)</b>		
	2009: 49 2008: 37 2007: 50	Identify Max value for ea. qtr under review for ea. of the 3 yrs <ul style="list-style-type: none"> <li>All hours should be used to identify the max value</li> </ul>
	50	Substitute the max for ea. missing value
Y	42.67	Recalculate 3yr 98 <sup>th</sup> percentile <ul style="list-style-type: none"> <li>If below NAAQS               <ul style="list-style-type: none"> <li>Original 3yr 98<sup>th</sup> percentile (non-substituted) value is valid</li> <li>Else not valid</li> </ul> </li> </ul>
Comments: The 1 <sup>st</sup> qtr of 2009 was determined not to be valid with only 58 valid days. A Performance test was conducted to determine the validity of the data. Based on the results of the performance test the 1 <sup>st</sup> qtr of 2009 would be considered valid. Therefore, the original value of 40ppb will be used to calculate the 3yr average of the 98 <sup>th</sup> percentile.		

Year: **2009**  
 County: **Merced**  
 County FIP ID: **47**  
 Site Name: **Merced South Coffee Avenue**  
 Site ID: **3**

<b>Minimum Requirements</b>		
<b>Passed</b>	<b>Value</b>	<b>Data Check</b>
	1 <sup>st</sup>	Non-valid Quarter
Y	233	≥200 days across the three matching Qtrs.
Y	71%	≥50% and <75% of data captured
<b>Performance Test (3.2(c)(ii)(A) &amp; (B) of Appendix S)</b>		
	2009: 43 2008: 43 2007: 50	Identify Max value for ea. qtr under review for ea. of the 3 yrs <ul style="list-style-type: none"> <li>All hours should be used to identify the max value</li> </ul>
	50	Substitute the max for ea. missing value
Y	46.67	Recalculate 3yr 98 <sup>th</sup> percentile <ul style="list-style-type: none"> <li>If below NAAQS               <ul style="list-style-type: none"> <li>Original 3yr 98<sup>th</sup> percentile (non-substituted) value is valid</li> <li>Else not valid</li> </ul> </li> </ul>
Comments: The 1 <sup>st</sup> qtr of 2009 was determined not to be valid with only 65 valid days. A Performance test was conducted to determine the validity of the data. Based on the results of the performance test the 1 <sup>st</sup> qtr of 2009 would be considered valid. Therefore, the original value of 40ppb will		

be used to calculate the 3yr average of the 98<sup>th</sup> percentile.

Year: **2008**

County: **kern**

County FIP ID: **29**

Site Name: **Arvin Bear Mtn Blvd**

Site ID: **5001**

<b>Minimum Requirements</b>		
<b>Passed</b>	<b>Value</b>	<b>Data Check</b>
	2 <sup>nd</sup>	Non-valid Quarter
Y	241	≥200 days across the three matching Qtrs.
Y	69%	≥50% and <75% of data captured
<b>Performance Test (3.2(c)(ii)(A) &amp; (B) of Appendix S)</b>		
	2009: 35 2008: 32 2007: 35	Identify Max value for ea. qtr under review for ea. of the 3 yrs <ul style="list-style-type: none"><li>• All hours should be used to identify the max value</li></ul>
	35	Substitute the max for ea. missing value
Y	34.33	Recalculate 3yr 98 <sup>th</sup> percentile <ul style="list-style-type: none"><li>• If below NAAQS<ul style="list-style-type: none"><li>○ Original 3yr 98<sup>th</sup> percentile (non-substituted) value is valid</li><li>○ Else not valid</li></ul></li></ul>
Comments: The 2 <sup>nd</sup> qtr of 2008 was determined not to be valid with only 63 valid days. A Performance test was conducted to determine the validity of the data. Based on the results of the performance test the 2 <sup>nd</sup> qtr of 2008 would be considered valid. Therefore, the original value of 27ppb will be used to calculate the 3yr average of the 98 <sup>th</sup> percentile.		