

**Technical Support Document for Determination that  
the Cowntown Monitor is Ineligible for Comparison with  
the Annual PM<sub>2.5</sub> NAAQS**

U.S. EPA

Region 9

April 26, 2010

## Cowtown and the Annual PM<sub>2.5</sub> NAAQS

EPA has concluded that data from the PM<sub>2.5</sub> monitor at the Cowtown monitoring station (AQS ID: 04-021-3013) in Pinal County should not be compared to the annual PM<sub>2.5</sub> NAAQS.

40 CFR 58.30(a) states that “(1) PM<sub>2.5</sub> data that are representative, not of areawide but rather, of relatively unique population-oriented microscale, or localized hot spot, or unique population-oriented middle-scale impact sites are only eligible for comparison to the 24-hour PM<sub>2.5</sub> NAAQS” and “(2) There are cases where certain population-oriented microscale or middle scale PM<sub>2.5</sub> monitoring sites are determined by the Regional Administrator to collectively identify a larger region of localized high ambient PM<sub>2.5</sub> concentrations. In those cases, data from these population-oriented sites would be eligible for comparison to the annual PM<sub>2.5</sub> NAAQS.”

For example, if the PM<sub>2.5</sub> monitoring site is adjacent to a unique dominating local PM<sub>2.5</sub> source or can be shown to have unique annual average concentrations representative of a smaller than neighborhood spatial scale, then data from a monitor at the site would only be eligible for comparison to the 24-hour PM<sub>2.5</sub> NAAQS.<sup>1</sup> However, if there are potentially many such small scale impacts throughout the monitoring region, then the established monitoring site may be judged to be representative of community-wide exposure and eligible for comparison to the annual standard.

EPA has evaluated the comparability of data from the Cowtown site to the annual PM<sub>2.5</sub> standard on four criteria: the population oriented monitoring, the spatial scale, localized hot spot conditions, and the uniqueness of the site,

### **Population-oriented monitoring:**

40 CFR 58.1 states that “population-oriented monitoring (or sites) means residential areas, commercial areas, recreational areas, industrial areas where workers from more than one company are located, and other areas where a substantial number of people spend a significant fraction of their day”.

There are four different feedlot facilities in the area: Sawyer Cattle Company, OK Cattle Co., Maricopa Feedyard LLC, and Pinal Feeding Co.<sup>2,3</sup> Also, there is an ethanol/ grain processing facility and a commercial composting facility located nearby. The Cowtown site is representative of the conditions that workers from these various facilities may be exposed to and thus can be considered “population-oriented.” The Pinal County 2009 annual network plan states that the site’s type is “population/source impact”. This is an appropriate description of the

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<sup>1</sup> 40 CFR 58.30 (a) (1)

<sup>2</sup> Dun & Bradstreet Agricultural Data

<sup>3</sup> See Figure 1

situation at hand and is consistent with EPA guidance which states that “a site may be population-oriented and at the same time be source oriented or reflective of maximum concentration”.<sup>4</sup>

### **Spatial Scale:**

The preamble to the 2006 monitoring regulations states: “In practice, the majority of PM<sub>2.5</sub> monitors are deployed at neighborhood scale and larger, meaning that they are located far enough from large emission sources that they represent the fairly uniform air quality across an area with dimensions of at least a few kilometers and thus can be considered community oriented”.<sup>5</sup> In addition, the CFR states, specifically for PM<sub>2.5</sub>, that a neighborhood scale site would represent “conditions throughout some reasonably homogenous urban sub-region with dimensions of a few kilometers”.<sup>6</sup> Based on available evidence, EPA believes that the area of reasonably homogenous concentrations around this monitor is considerable smaller than a few kilometers in diameter or width. Moreover, the area around the monitor, even extending out several kilometers, is definitely not associated with community-wide exposure.

The Cowtown monitor is surrounded by agricultural fields and cattle feedlots, and does not represent the conditions expected in urban sub-regions or community-wide population PM<sub>2.5</sub> exposure. Furthermore, the CFR gives an example of a neighborhood scale site: “such a site would likely be located in a residential or commercial area having a high overall PM<sub>2.5</sub> emission density but not in the vicinity of any single dominant source”.<sup>7</sup> The preamble also states “The EPA is presently aware of fewer than ten PM<sub>2.5</sub> monitors that are sited in relatively unique population-oriented microscale areas, localized hot spots, or unique population-oriented middle-scale areas. Such sites may have higher concentrations than neighborhood scale sites on at least some days because they may be close to and downwind of large emission sources, but the number of people exposed to such concentrations is not large relative to the surrounding communities”.<sup>4</sup> It is very clear that the Cowtown monitor is located in the vicinity of a dominant source and does not meet this definition of neighborhood scale and community-wide exposure.

When determining the appropriate spatial scale for a particular site, the homogeneity of the particulate matter concentrations, land use, and land surface characteristics must also be considered. The Cowtown site is located near a

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<sup>4</sup> Guidance for Network Design and Optimum Site Exposure for PM<sub>2.5</sub> and PM<sub>10</sub>: EPA-454/R-99-022

<sup>5</sup> 61264 Federal Register / Vol. 71, No. 200 / Tuesday, October 17, 2006 / Rules and Regulations

<sup>6</sup> 40 CFR App. D 4.7.1 (c) (3)

<sup>7</sup> 40 CFR App. D 1.2 (d)

number of cattle feedlots that have been shown, through chemical speciation<sup>8</sup>, to contribute to elevated PM<sub>2.5</sub> concentrations at the site. Analysis of wind and pollution roses during exceedance days also shows that the Cowtown monitor is significantly influenced by the cattle feedlots located upwind. The majority of the elevated concentrations occur during periods when there are light winds ( $\leq 8$  mph) from the South and Southeast.<sup>9</sup>

Due to the close proximity of a known source, the PM<sub>2.5</sub> concentrations measured at the Cowtown site are higher in magnitude than surrounding areas and do not represent homogenous particulate concentrations in an area of a few kilometers<sup>10</sup>. In fact, modeling studies show that there are very sharp gradients within several km of an emission sources.<sup>11</sup> EPA guidance further explains that “neighborhood scale monitors do not show significant differences in particulate concentrations with spacing of a few kilometers”.<sup>12</sup> This suggests that a similar monitor located a few kilometers away should experience the similar levels of particulate matter. Again, due to the close proximity of a known source, it is reasonable to assume that PM<sub>2.5</sub> concentrations a few kilometers away may be significantly different than those measured at the Cowtown site. Based on the available information, the Cowtown monitor can be considered to be representative of an area smaller than a neighborhood spatial scale and does not represent community-wide exposure. As stated in the Pinal County 2009 annual network plan, the Cowtown monitor is representative of a microscale environment.

### **Localized Hot Spot:**

The monitoring regulations have limited discussion about “hot-spots”. The term is generally associated with areas of highest concentrations whether it be from mobile or multiple stationary sources. Microscale and middlescale monitors are mentioned.<sup>13</sup> For the purpose of this discussion, we will treat hot-spot as synonymous with monitoring locations representing either a micro or middlescale environment.

### **Uniqueness:**

PM<sub>2.5</sub> concentrations recorded at this site are consistently higher in magnitude than all surrounding sites in the county. Also, preliminary analysis shows that

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<sup>8</sup> Pinal County Air Quality Control District Source Apportionment Study: July 29, 2005

<sup>9</sup> See Figure 2 and Figure 3

<sup>10</sup> See Figure 1 and 4

<sup>11</sup> Brode, Review of TRC Comments on PM NAAQS (2006).

<sup>12</sup> EPA-454/R-99-022

<sup>13</sup> Federal Register / Vol. 71, No. 200 / Tuesday, October 17, 2006 / Rules and Regulations



PM<sub>2.5</sub> measurements at the Cowtown site are not correlated to any other sites in the area.

There are seven<sup>14</sup> feedlots in Pinal County, and most are in the vicinity of Cowtown. However, the Cowtown monitor may be representative of a relatively unique source of emissions. The monitor is immediately downwind of the “Cowtown Complex” which consists of four different cattle feedlot facilities: Sawyer Cattle Company, OK Cattle Co., Maricopa Feedyard LLC, and Pinal Feeding Co<sup>15</sup>. This accounts for a total of approximately 424 acres of feedlot facilities. Also, there is an ethanol/grain processing facility and a commercial composting facility located nearby. This source mix represents a relatively unique situation in Pinal County.

The remaining feedlots are located in the areas to both the East and West Stanfield and South of Picacho Peak near the border of Pima County.<sup>16</sup> The only comparable situation to that of Cowtown is the “Red River Complex” west of Stanfield, which has approximately 278 acres of feedlot facilities that are in close proximity to a number of dairies. This location may be considered different than Cowtown: the feedlot sources are smaller and the overall source mix is considerably different. Dairies have been shown to have lower PM<sub>10</sub> emissions than those of cattle feedlots.<sup>17</sup> Also, the data show that the Stanfield PM<sub>10</sub> monitor located approximately 4 km from the nearest feedlot, records much lower PM<sub>10</sub> concentrations: the 2006-2008 average PM<sub>10</sub> expected exceedances at the Cowtown station is approximately 10 times higher than the Stanfield monitor.<sup>18</sup> It is reasonable to assume that this location also experiences lower PM<sub>2.5</sub> concentrations than the Cowtown monitor. This is reinforced by the Pinal County Source Apportionment Study that showed there was little contribution from the cattle feedlots at the Stanfield monitoring station for both PM<sub>10</sub> and PM<sub>2.5</sub>.<sup>19</sup>

The areas to the East of Stanfield and to the South of Picacho Peak contain feedlots of much lesser size. The total areas of these locations, the “Benedict Spread” and the “Red Rock Feedlot”, are approximately 186 and 70 acres, respectively. While there are other feedlots within Pinal County, it appears that the Cowtown monitor represents a relatively unique monitoring location due to the size and composition of the nearby sources.

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<sup>14</sup> Pinal County Advanced Notice of Proposed Rule Making: April 9, 2009

<sup>15</sup> Dun & Bradstreet Agricultural Data

<sup>16</sup> See Figure 5

<sup>17</sup> <http://www.arb.ca.gov/ei/areasrc/arbmiscproccresfarmop.htm>

<sup>18</sup> 2009 Pinal County Annual Network Plan

<sup>19</sup> See Figure 6

## Conclusion

40 CFR 58.30 – states that a “relatively unique population-oriented microscale, or localized hot spot, or unique population-oriented middle-scale impact sites” is only eligible for comparison to the 24-hour  $PM_{2.5}$  NAAQS, not the annual  $PM_{2.5}$  NAAQS. Based on the analysis above, the Cowtown site should be considered a relatively unique, population-oriented, microscale site. Furthermore, the monitoring site is located in close proximity to a “unique dominating local  $PM_{2.5}$  source” and is likely to have “concentrations representative of a smaller than neighborhood spatial scale.” Therefore, the  $PM_{2.5}$  data from the Cowtown site in Pinal County should not be compared to the annual  $PM_{2.5}$  NAAQS.

Figure 1: PM<sub>2.5</sub> Design Values

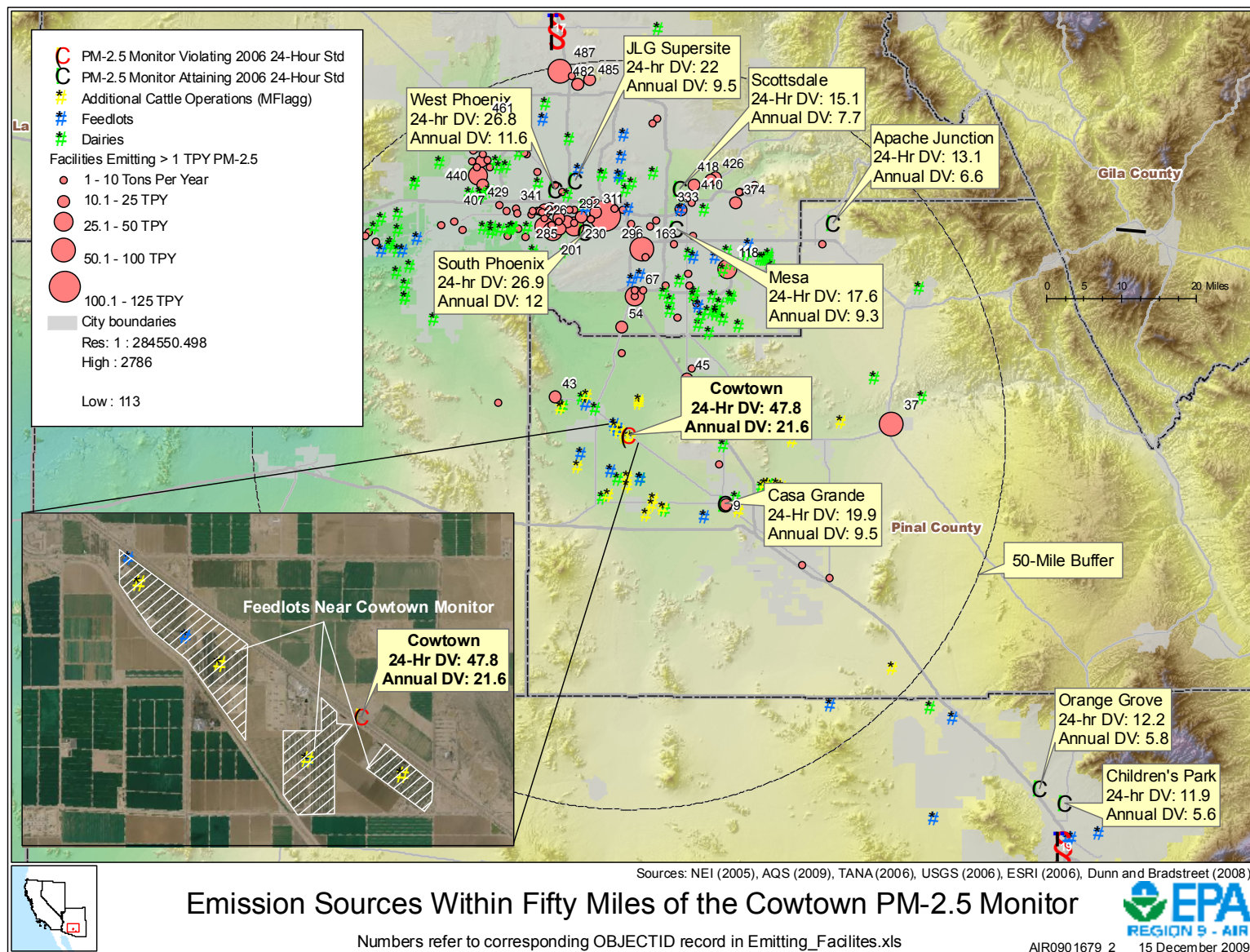




Figure 2: Cowntown Pollution Rose<sup>20</sup>



Figure 3: Cowntown Wind Roses

<sup>20</sup> The different colors correspond to various levels of  $PM_{2.5}$ : Blue  $\leq 30 \mu g/m^3$ , Yellow  $30-35 \mu g/m^3$ , Red  $35-40 \mu g/m^3$ , and Black  $\geq 40 \mu g/m^3$ . Also, values measured between October-April are shown as triangles, and values measured between May-September are shown as circles.

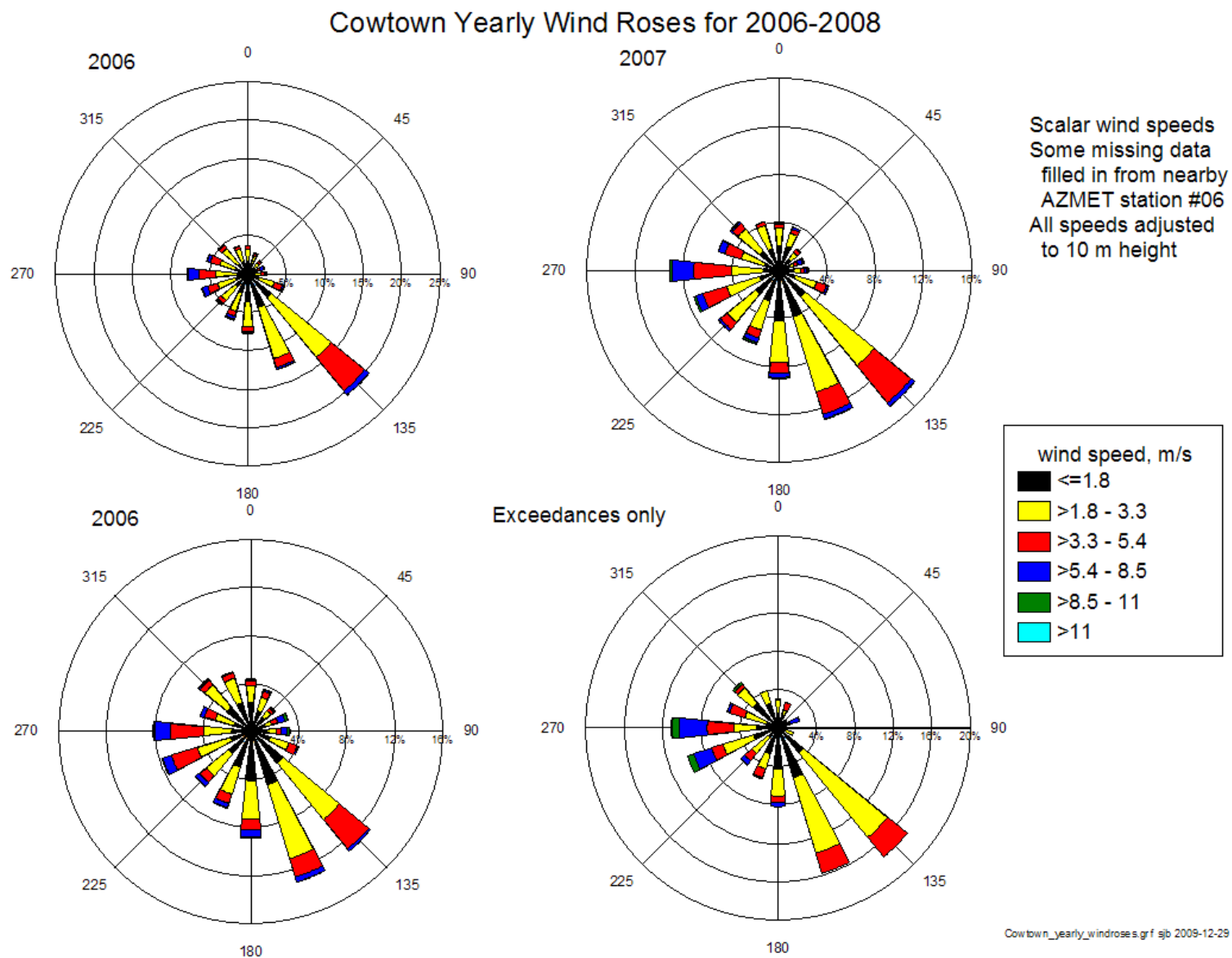


Figure 4: Spatial Scale



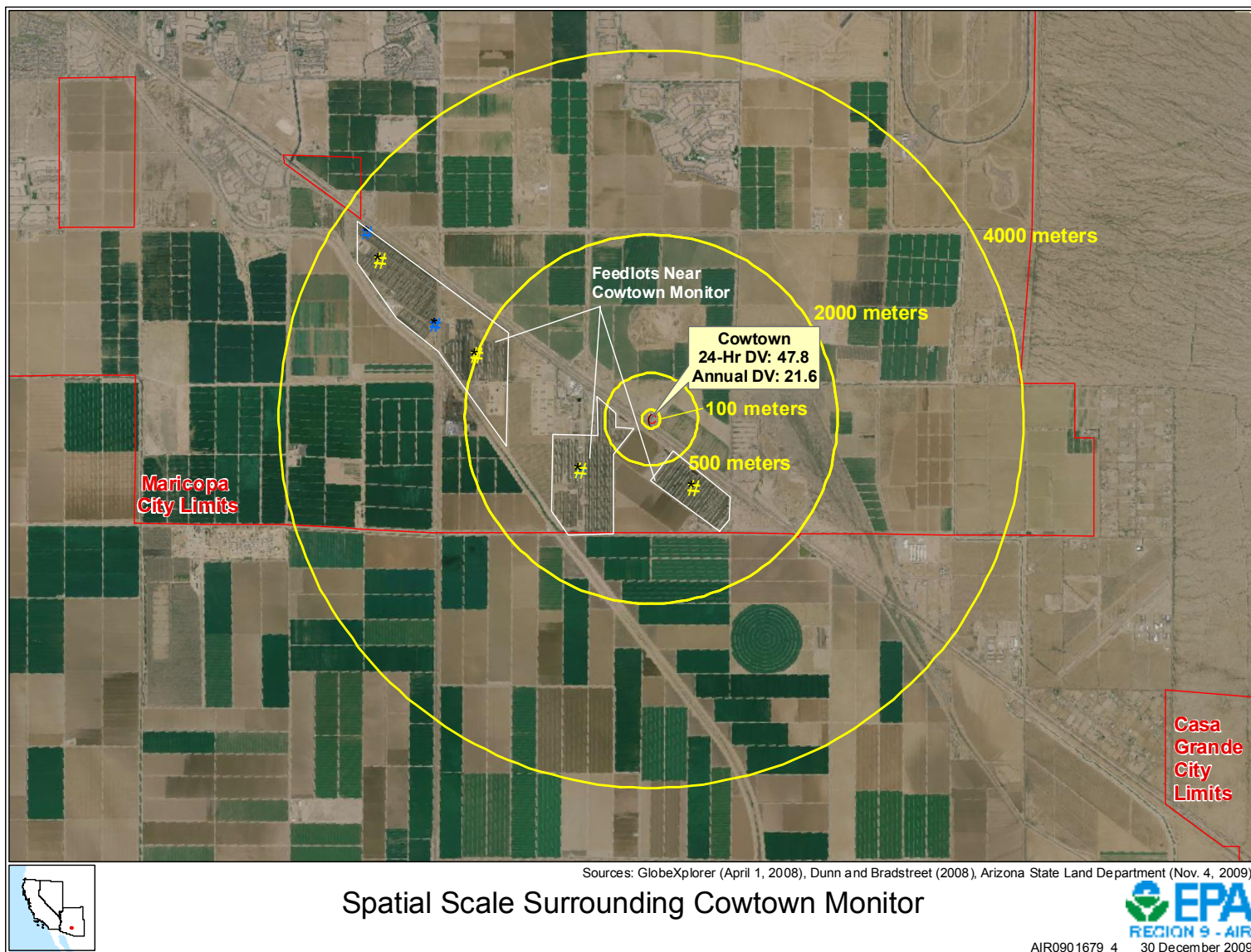


Figure 5: Main Feedlot Locations

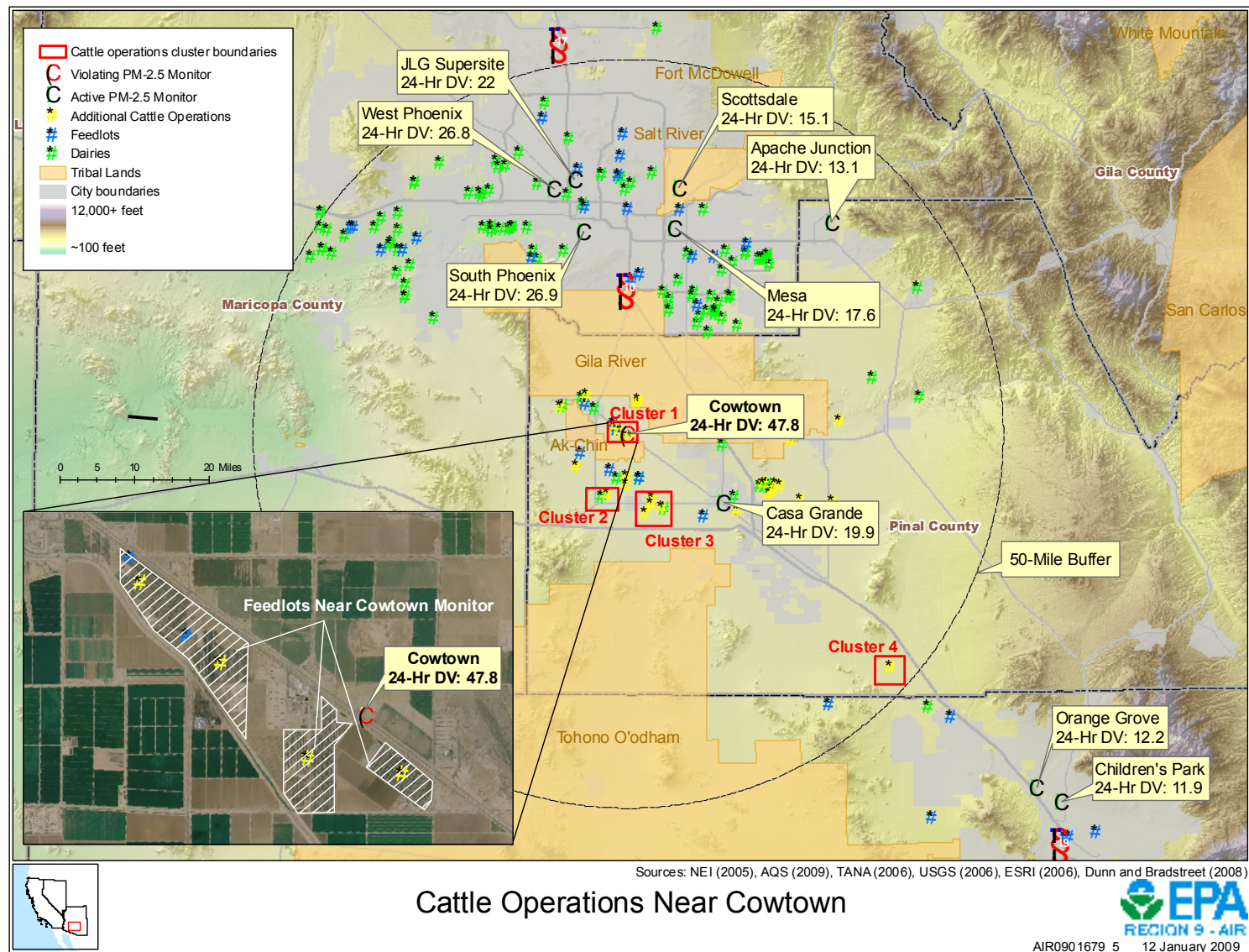


Figure 6: 2003 Speciation Results



# 2003 Modeled Source Apportionment 10/3/2003 - 11/8/2003

