Iowa Air Monitoring Network Plan: A Proposal for a New Near Road Nitrogen Dioxide Monitor

Iowa Department of Natural Resources
Air Quality Bureau
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Overview
In 2010, the U.S. Environmental Protection Agency revised the nitrogen dioxide (NO\textsubscript{2}) health standards and the associated monitoring network requirements. This rule requires that a new NO\textsubscript{2} monitoring site be established near a busy roadway in Des Moines by January 2013. Air monitoring in Polk County is delegated to the Polk County Local Program, and the Iowa DNR requested that Polk County locate a site that meets the federal requirements. Polk County has proposed three sites\textsuperscript{1} that meet these requirements (Appendix A). Polk County believes that it is important to identify three sites at this time to account for the possibility that unforeseen circumstances (such as inability to secure site access) may disallow one of these sites. Federal monitoring rules require that States provide public notice when they intend to add long-term monitoring sites to the State’s ambient air monitoring network, and provide a detailed comparison of the sites to the federal requirements. This document is intended to fulfill these two requirements for a new near road NO\textsubscript{2} monitoring site in Des Moines.

Introduction
States and other agencies delegated to perform air monitoring under the Clean Air Act are required to examine their networks annually to insure that they meet federal requirements (Appendix B). These requirements include the number and type of monitors operated and the frequency of sampling. Certain monitors in the network, known as State and Local Air Monitoring Stations (SLAMS) are required by federal regulations, and modifications of the SLAMS monitoring network requires concurrence from EPA (Appendix C). Special purpose monitors (SPM’s) provide important additional air quality information (such as background concentrations for permitting activities\textsuperscript{2,3}) but changes to the SPM network do not require concurrence from EPA.

One of the requirements of the network plan is to provide specific information for monitors that produce data that may be compared with federal air standards. This information, along with information concerning NO\textsubscript{2} monitors operated in the Iowa air monitoring network, is contained in Appendix D and Appendix E.

Nitrogen Dioxide Monitoring Network Analysis
On January 22, 2010, the U.S. Environmental Protection Agency revised the nitrogen dioxide (NO\textsubscript{2})\textsuperscript{4} NAAQS (reproduced in Appendix F). The rule requires one monitor in any MSA with a population of 1 million or more to measure community-wide concentrations. Iowa does not contain or share any MSA’s with populations this large (Appendix G) and no community-wide monitoring stations are required at this time.

NO\textsubscript{2} levels are expected to be highest near major roadways, and the NAAQS includes a requirement to install a microscale near-roadway monitor in each MSA with a population of 500,000 or more, by January 2013. Iowa will be required to operate one near roadway monitor in the Des Moines MSA, and shares the responsibility for monitoring in the Omaha MSA with Nebraska. The majority of the population and traffic in the Omaha MSA is on the Nebraska side. The Nebraska network plan includes a potential location for a near-roadway monitor in Omaha.\textsuperscript{5}

The rule requires an additional near-roadway monitor in MSA’s with populations of 2,500,000 or greater as well as in MSA’s that contain roadway segments with average daily traffic counts of 250,000 or more. Iowa does not have MSA’s of this size, or road segments with traffic counts that are this large, so additional near-road monitors are not

\textsuperscript{1} Polk County submitted an earlier proposal for a near roadway site that suggested two potential locations along Interstate 235, one at 939 25\textsuperscript{th} St in Des Moines and the other at 6525 Center St in Windsor Heights. The department posted this proposal on its website for 30 days, beginning on 1/13/2012. During the public input period, Polk County notified the department that because of public opposition, it would be unable to secure the building permit required to place a monitor at the 939 25\textsuperscript{th} St location. After the close of the public input period, Polk County provided the department with 2 additional locations and requested that the department take public input on a new proposal that included the 6525 Center St location from the earlier proposal and the two new alternate locations. This document contains Polk County’s new proposal.

\textsuperscript{2} For examples of the way monitoring data is used to develop background concentrations for permitting activities, see the discussions of PM\textsubscript{2.5}, NO\textsubscript{2} and SO\textsubscript{2} at: http://www.epa.gov/ttn/scram/guidance_clarificationmemos.htm.

\textsuperscript{3} The federal statute that requires baseline ambient air quality data in an area before initiating construction of a new “major source” of air pollution is available here: http://www.law.cornell.edu/uscode/html/uscode42/usc_sec_42_00007475----000-.html.

\textsuperscript{4} 75 FR 6474, February 9, 2010

\textsuperscript{5} 2011 Ambient Air Monitoring Network Plan
Iowa’s current NO$_2$ monitors are listed in Appendix E and displayed in Appendix H. The candidate near road monitoring sites, including GPS coordinates and a proposed EPA (AQS) ID for the sites, are indicated in Appendix I.

Appendix J shows an aerial photo of the candidate sites from which a final site will be selected.
Proposal:
Near-Road NO₂ Monitoring Candidate Site Selection

Polk County Air Quality
Ambient Air Monitoring Personnel

February 24, 2012
1. **Background**
In February of 2010, the EPA revised the minimum monitoring requirements for the nitrogen dioxide (NO$_2$) monitoring network in support of a new 1-hour NO$_2$ national Ambient Air Quality Standards (NAAQS) (75 FR 6474, Feb. 9, 2010). State and local agencies are required to install a near-road NO$_2$ monitoring station where peak hourly NO$_2$ concentrations are most likely to occur. The site selection process should include consideration of traffic volume, fleet mix, congestion, roadway design, terrain, and meteorology. Population exposure and site logistics are also important determining factors in the site selection process. In addition, the monitoring site needs to be placed within 50 meters of the roadway. It must also be large enough to expand the monitoring network to include, but is not limited to: carbon monoxide, sulfur dioxide, ozone and particulates. The near-road NO$_2$ monitoring site must be established by January 1, 2013.

2. **Core Based Statistical Area (CBSA)**
According to the 40 CFR Part 58 Appendix D Section 4.3.2, a Core Base Statistical Area (CBSA) with a population of 500,000 or more is required to run one (1) microscale near-road NO$_2$ monitoring station. The U.S. Office of Management and Budget (OMB) defines a CBSA as “a geographic entity for use by Federal statistical agencies in collecting, tabulating, and publishing Federal statistics. The term “Core Base Statistical Area” is a collective term for both micropolitan and Metropolitan Statistical Areas (MSA).

2.1 Identifying Core Based Statistical Area Boundaries
As of December of 2009, the U.S. OMB’s official name for the Des Moines area CBSA is the Des Moines-West Des Moines MSA. The counties that make up this MSA are Polk, Dallas, Warren, Madison, and Guthrie. According to the 2010 census data from the U.S. Census Bureau, the population of the Des Moines-West Des Moines MSA is 569,633. Table 1 displays the 2010 census data for each county.

<table>
<thead>
<tr>
<th>County</th>
<th>Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Polk</td>
<td>430,640</td>
</tr>
<tr>
<td>Dallas</td>
<td>66,135</td>
</tr>
<tr>
<td>Warren</td>
<td>46,225</td>
</tr>
<tr>
<td>Madison</td>
<td>15,679</td>
</tr>
<tr>
<td>Guthrie</td>
<td>10,954</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>569,633</strong></td>
</tr>
</tbody>
</table>

2.2 Identifying Roadway Traffic Volumes in Excess of 250,000 AADT
The Des Moines-West Des Moines MSA contains no road segments in excess of 250,000 Annual Average Daily Traffic (AADT). Therefore, only one near-road NO$_2$ monitoring site will be required for this area.

3. **Selection of Candidate Road Segments for Near-Road NO$_2$ Monitoring**
The first step in identifying candidate near-road NO$_2$ monitoring sites is to collect and analyze traffic data. Traffic data was obtained from the Iowa Department of Transportation’s (DOT) website for the calendar year 2010.

3.1 Road Segments Ranked According to AADT Data
According to the 40 CFR Part 58 Appendix D Section 4.3.2(a)(1), candidate near-road monitoring sites will be selected by ranking all road segments within a CBSA by Annual Average Daily Traffic (AADT), then identifying locations adjacent to those with the highest rankings. AADT is a measure of the total volume of traffic on a roadway segment (in both directions) for one year divided by the number of days in the year. This includes both light-duty (LD) passenger vehicles and heavy-duty (HD) trucks. This parameter can be used to identify the relative traffic activity and corresponding potential for pollutant emissions experienced along roads. Data from the Iowa Department of Transportation is
representative of a length or stretch of roadway, not a single point location, and uses both estimated and measured road segments. Table 2 identifies the top 20 AADT counts for Polk County in 2010. These road segments were evaluated for candidate near-road NO₂ monitoring sites.

Table 2: Top 20 Road Segments Ranked According to Annual Average Daily Traffic (AADT)

<table>
<thead>
<tr>
<th>Interstate</th>
<th>FROM</th>
<th>TO</th>
<th>Section Length (Miles)</th>
<th>AADT</th>
<th>AADT RANK</th>
</tr>
</thead>
<tbody>
<tr>
<td>I-235</td>
<td>42ND STREET</td>
<td>56TH STREET</td>
<td>1.009</td>
<td>115100</td>
<td>1</td>
</tr>
<tr>
<td>I-235</td>
<td>31ST STREET</td>
<td>42ND STREET</td>
<td>0.802</td>
<td>110500</td>
<td>2</td>
</tr>
<tr>
<td>I-235</td>
<td>COTTAGE GROVE</td>
<td>31ST STREET</td>
<td>0.636</td>
<td>109700</td>
<td>3</td>
</tr>
<tr>
<td>I-235</td>
<td>56TH STREET</td>
<td>63RD STREET</td>
<td>0.507</td>
<td>107900</td>
<td>4</td>
</tr>
<tr>
<td>I-235</td>
<td>73RD/8TH STREET</td>
<td>22ND STREET</td>
<td>1.08</td>
<td>104900</td>
<td>5</td>
</tr>
<tr>
<td>I-235</td>
<td>63RD STREET</td>
<td>73RD/8TH STREET</td>
<td>0.61</td>
<td>104800</td>
<td>6</td>
</tr>
<tr>
<td>I-80/I-35</td>
<td>HICKMAN AVENUE</td>
<td>SOUTH LIMITS OF CLIVE</td>
<td>0.997</td>
<td>104600</td>
<td>7</td>
</tr>
<tr>
<td>I-80/I-35</td>
<td>DOUGLAS AVENUE</td>
<td>HICKMAN</td>
<td>1.007</td>
<td>104200</td>
<td>8</td>
</tr>
<tr>
<td>I-235</td>
<td>22ND STREET</td>
<td>35TH STREET</td>
<td>0.819</td>
<td>96200</td>
<td>9</td>
</tr>
<tr>
<td>I-80/I-35</td>
<td>IA 141/GRIMES</td>
<td>DOUGLAS AVENUE</td>
<td>1.397</td>
<td>90900</td>
<td>10</td>
</tr>
<tr>
<td>I-235</td>
<td>E 6TH ST &amp; PENN AVENUE</td>
<td>3RD AVENUE</td>
<td>0.489</td>
<td>90200</td>
<td>11</td>
</tr>
<tr>
<td>I-80/I-35</td>
<td>IA 415/2ND AVENUE</td>
<td>MERLE HAY ROAD</td>
<td>3.791</td>
<td>89000</td>
<td>12</td>
</tr>
<tr>
<td>I-80/I-35</td>
<td>SOUTH LIMITS OF CLIVE</td>
<td>UNIVERSITY AVENUE</td>
<td>0.568</td>
<td>88100</td>
<td>13</td>
</tr>
<tr>
<td>I-80/I-35</td>
<td>MERLE HAY ROAD</td>
<td>86TH STREET</td>
<td>2.008</td>
<td>87300</td>
<td>14</td>
</tr>
<tr>
<td>I-235</td>
<td>19TH STREET</td>
<td>COTTAGE GROVE</td>
<td>0.271</td>
<td>86800</td>
<td>15</td>
</tr>
<tr>
<td>I-235</td>
<td>KEO WAY</td>
<td>19TH STREET</td>
<td>0.339</td>
<td>86800</td>
<td>15</td>
</tr>
<tr>
<td>I-235</td>
<td>35TH STREET</td>
<td>51ST STREET</td>
<td>0.738</td>
<td>86700</td>
<td>16</td>
</tr>
<tr>
<td>I-80/I-35</td>
<td>86TH STREET</td>
<td>IA 141/GRIMES</td>
<td>1.976</td>
<td>83300</td>
<td>17</td>
</tr>
<tr>
<td>I-80/I-35</td>
<td>US 69/NE 14TH STREET</td>
<td>IA 415/2ND AVENUE</td>
<td>1.248</td>
<td>80100</td>
<td>18</td>
</tr>
<tr>
<td>I-80/I-35</td>
<td>I 80 &amp; I 235 EAST INTERCHANGE</td>
<td>US 69/NE 14TH STREET</td>
<td>1.293</td>
<td>75900</td>
<td>19</td>
</tr>
<tr>
<td>1-235</td>
<td>9TH STREET INTERCHANGE</td>
<td>KEO WAY</td>
<td>0.286</td>
<td>75500</td>
<td>20</td>
</tr>
</tbody>
</table>

3.2 Congestion Pattern Considerations

It is important to consider congestion patterns when selecting a near-road NO₂ monitoring site. Stop-and-go traffic may lead to an increase in emissions per vehicle as compared to vehicles operating at steady-state highway speeds. The level of service (LOS) metric system was used to analyze congestion patterns. LOS uses information including time-resolved traffic counts, traffic speeds, and the relative frequency of occurrence of congested conditions to determine the congestion level of a particular road segment. LOS uses a letter grading system from A to F, with F representing the most congested road segments. According to the 2010 data provided by the Des Moines Area Metropolitan Planning Organization (DMAMPO), in the Des Moines-West Des Moines MSA, the worst interstate segments were characterized by LOS D, and are indicated by the parallel black lines connected by black bars.

In addition, the volume-to-capacity (V/C) ratio compares peak traffic volumes on a road segment with the capacity of the road based on the number of lanes. This calculation accounts for the larger size of HD vehicles and focuses on traffic conditions during peak hours of operation. Figure 1 displays the color coding used to denote the different ratios displayed on the map in Figure 2. Ratios in the highest category of 0.93 to 1.17 are designated by a thick red line. Table 3 displays road segments ranked for highest V/C ratios. Only those in the highest two categories (red and yellow) are displayed.
Figure 1: Legend for 2010 Congestion Ratings Based on LOS and V\C Ratios

Figure 2: 2010 LOS and V\C Congestion Ratings of the Major Road Segments in the Des Moines-West Des Moines MSA
Table 3: Road Segments Ranked According to the Volume-to-Capacity Ratio

<table>
<thead>
<tr>
<th>Interstate</th>
<th>FROM</th>
<th>TO</th>
<th>Section Length (Miles)</th>
<th>AADT</th>
<th>AADT RANK</th>
<th>LOS</th>
<th>Average V/C Ratio 2010</th>
<th>V/C Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>I-235</td>
<td>56TH ST</td>
<td>63RD ST</td>
<td>0.507</td>
<td>107900</td>
<td>4</td>
<td>D</td>
<td>1.14</td>
<td>1</td>
</tr>
<tr>
<td>I-235</td>
<td>19TH ST</td>
<td>COTTAGE GROVE</td>
<td>0.271</td>
<td>86800</td>
<td>15</td>
<td>D</td>
<td>1.14</td>
<td>1</td>
</tr>
<tr>
<td>I-235</td>
<td>63RD ST</td>
<td>73RD / 8TH ST</td>
<td>0.61</td>
<td>104800</td>
<td>6</td>
<td>D</td>
<td>0.98</td>
<td>2</td>
</tr>
<tr>
<td>I-80/I-35</td>
<td>IA 415/2ND AVE</td>
<td>MERLE HAY RD</td>
<td>3.791</td>
<td>89000</td>
<td>12</td>
<td>C</td>
<td>0.975</td>
<td>3</td>
</tr>
<tr>
<td>I-80/I-35</td>
<td>I 80 &amp; I 235 WEST INTERCHANGE</td>
<td>MILLS CIVIC PKWY</td>
<td>2.282</td>
<td>56900</td>
<td>37</td>
<td>C</td>
<td>0.945</td>
<td>4</td>
</tr>
<tr>
<td>I-235</td>
<td>I 35 &amp; I 80 EAST INTERCHANGE</td>
<td>EUCLID</td>
<td>1.054</td>
<td>61500</td>
<td>36</td>
<td>C</td>
<td>0.915</td>
<td>5</td>
</tr>
<tr>
<td>I-235</td>
<td>KEO WAY</td>
<td>19TH ST</td>
<td>0.339</td>
<td>86800</td>
<td>16</td>
<td>C</td>
<td>0.91</td>
<td>6</td>
</tr>
<tr>
<td>I-235</td>
<td>42ND ST</td>
<td>56TH ST</td>
<td>1.009</td>
<td>115100</td>
<td>1</td>
<td>C</td>
<td>0.885</td>
<td>7</td>
</tr>
<tr>
<td>I-235</td>
<td>31ST ST</td>
<td>42ND ST</td>
<td>0.802</td>
<td>110500</td>
<td>2</td>
<td>C</td>
<td>0.875</td>
<td>8</td>
</tr>
<tr>
<td>I-80/I-35</td>
<td>MERLE HAY RD</td>
<td>86TH ST</td>
<td>2.008</td>
<td>87300</td>
<td>14</td>
<td>C</td>
<td>0.87</td>
<td>9</td>
</tr>
<tr>
<td>I-235</td>
<td>COTTAGE GROVE</td>
<td>31ST ST</td>
<td>0.636</td>
<td>109700</td>
<td>3</td>
<td>C</td>
<td>0.87</td>
<td>9</td>
</tr>
<tr>
<td>I-235</td>
<td>E 6TH ST &amp; PENN AVE</td>
<td>3RD AVE</td>
<td>0.489</td>
<td>90200</td>
<td>11</td>
<td>C</td>
<td>0.845</td>
<td>10</td>
</tr>
<tr>
<td>I-80/I-35</td>
<td>DOUGLAS AVE</td>
<td>HICKMAN</td>
<td>1.007</td>
<td>104200</td>
<td>8</td>
<td>C</td>
<td>0.84</td>
<td>11</td>
</tr>
<tr>
<td>I-80/I-35</td>
<td>86TH ST</td>
<td>IA 141/GRIMES</td>
<td>1.976</td>
<td>83300</td>
<td>18</td>
<td>C</td>
<td>0.835</td>
<td>12</td>
</tr>
<tr>
<td>I-235</td>
<td>73RD / 8TH ST</td>
<td>22ND ST</td>
<td>1.08</td>
<td>104900</td>
<td>5</td>
<td>C</td>
<td>0.795</td>
<td>13</td>
</tr>
<tr>
<td>I-80/I-35</td>
<td>MILLS CIVIC PKWY</td>
<td>GRAND AVE</td>
<td>1.243</td>
<td>44800</td>
<td>40</td>
<td>C</td>
<td>0.78</td>
<td>14</td>
</tr>
</tbody>
</table>

*Color coding corresponds with the different rankings displayed in the legend in Figures 2 and 3

3.3 Population Exposure

Population Exposure was considered in the selection process for Polk County Air Quality Division’s near-road NO₂ monitoring site. Census data from the U.S. Census bureau 2010 Population Profile Maps was used to determine the most population dense locations. Figure 3 shows the 2010 census profile for Iowa.

More specifically, Figure 4 displays the population density layered over the I-35/I-80 and I-235 corridors. Polk County Air Quality Division attempted to focus our near-road NO₂ monitoring site search to the most population-dense area along I-235, which also experienced the highest congestion patterns.
3.4 Meteorology

Figure 5 displays the average monthly 30-year wind speeds and directions for Des Moines provided by the National Climate Data Center (NCDC). There is a definite trend in wind direction out of the Northwest during the winter months,
when inversions are most likely to occur. Wind direction is predominantly out of the South during the summer months. Considering that the EPA recommends downwind monitoring, it is Polk County Air Quality Division’s goal to select a site on the south side of the interstate, where highest concentrations of NO\(_2\) are most likely to be observed.

![Figure 5: 30-Year Trends in Wind Speed and Wind Direction for Des Moines, IA](image)

### 3.5 Other Considerations
Ultimately, the determining factor in Polk County Air Quality Division’s near-road NO\(_2\) monitoring site selection process came down to feasibility. Sites were evaluated for land availability, safety of site, and accessibility. Two sites were selected that would allow for the establishment of a permanent near-road shelter for NO\(_2\) monitoring. These sites will be safe and easily accessible by Polk County Air Quality Staff year-round.

### 4. Proposed Candidate Near-Road NO\(_2\) Site 1
Polk County Air Quality Division’s first candidate near-road NO\(_2\) monitoring site is located at 6525 Center Street, Windsor Heights, IA. This is commercial property owned by Budget Storage. This site is located along the I-235 within the road segment from 63\(^{rd}\) Street to 73\(^{rd}/8\(^{th}\) Street. This road segment has a AADT of 104,800 with a rank of 6. According to the 2010 congestion data, this road segment has a LOS rating of D and V/C ratio of 0.98. This road segment has the second highest congestion ranking for the Des Moines-West Des Moines MSA.

#### 4.1 Physical Components
Figure 6 displays an aerial view of Polk County Air Quality Division’s proposed candidate near-road NO\(_2\) site. The Budget Storage site is South of I-235. Figure 7 displays the topography map with site elevations. The monitoring shelter will be below-grade of the south edge of I-235 by approximately 10 feet. It is located within 50 meters of an exit ramp. The only barrier present is a chain link fence. Vegetation includes a typical maintained grass roadside. Appendix A contains a complete site description.
4.2 Siting of Shelter
Polk County Air Quality Division proposes to site the shelter on the Northwest corner of the property. Assuming the probe will be located at the fence line, the probe will be 38 meters from the nearest lane of traffic.

4.3 Conclusions
The advantages to the Budget Storage site include:

- It is located next to one of the most congested road segments in the Des Moines- West Des Moines MSA.
- It is located close to an exit ramp.
- The site would be on the south side of the interstate.
- The site is in a secure location with 24-hour access.

Note that detailed site plans have been submitted to the city of Windsor Heights. The feasibility of this site is still pending their approval.
5. Proposed Candidate Near-Road NO2 Site 2
Polk County Air Quality Division’s second candidate near-road NO$_2$ monitoring site is located at 6011 Rollins Avenue. This is open land owned by the DOT. This site is located along I-235 within the road segment from 56th to 63rd Street. This road segment has an AADT of 107,900 with a rank of 4. According to the 2010 congestion data, this road segment has a LOS rating of D and V/C ratio of 1.14, giving this road segment a congestion ranking of 1.
5.1 Physical Components
Figure 8 displays an aerial view of Polk County Air Quality Division’s proposed candidate near-road NO$_2$ site two. The Rollins Avenue site is South of I-235. Figure 9 displays the topography map with site elevations. The monitoring shelter will be located below-grade of the south edge of I-235 by approximately 12-14 feet. The only barrier present is a chain link fence. Vegetation includes a typical maintained grass roadside. Appendix B contains a complete site description.

5.2 Siting of Shelter
Polk County proposes to site the shelter 10 feet off the fence line. A security fence will be installed around the shelter. Assuming the probe will be located at the fence line, the probe will be approximately 14 meters from the nearest lane of traffic.

![Figure 8: Candidate Near-Road NO$_2$ Site Located On Rollins Avenue](image)

5.3 Conclusions
The advantages of the Rollins Avenue Site include:

- It is located within the 4th highest ranked road segments for AADT.
- It is located next to the most congested road segment in the Des Moines-West Des Moines MSA.
- It is located close to access ramps.
- It is located on the south side of the interstate.
- The probe would be located within 20 meters of the interstate.

Note that detailed site plans have been submitted to the City of Des Moines. The feasibility of this site is still pending their approval.
6. Proposed Candidate Near-Road NO2 Site 3
Polk County Air Quality Division’s third candidate near-road NO2 monitoring site is located at the Southeast corner of Polk Boulevard and Center Street, District/Parcel: 090/08158-001-000. This is a sanitary water lift station owned by the City of Des Moines. This site is located along I-235 within the road segment from 42nd to 56th Street. This road segment has an AADT of 115,100 with a rank of 1. According to the 2010 congestion data, this road segment has a LOS rating of C and V/C ratio of 0.885, giving this road segment a congestion ranking of 7.

6.1 Physical Components
Figure 10 displays an aerial view of Polk County Air Quality Division’s proposed candidate near-road NO2 site three. The Polk Boulevard Site is North of I-235. Figure 11 displays the topography map with site elevations. The monitoring station will be located above-grade of the north edge of I-235 by approximately 14 feet. The only barrier present is a retaining
wall. Vegetation includes a typical maintained grass roadside. Appendix C contains a complete site description.

6.2 Siting of Shelter
Polk County will place their monitoring equipment within the existing sanitary water lift station. Assuming the probe will be located at the fence line, the probe will be approximately 18 meters from the nearest lane of traffic.

![Figure 10: Candidate Near-Road NOx Site Located Near Polk Boulevard](image)

6.3 Conclusions
The advantages of the Polk Boulevard Site include:

- It is located within the highest ranked road segments for AADT.
- An existing building is already in place.
- The probe would be located within 20 meters of the interstate.

Note that detailed site plans have been submitted to the City of Des Moines. The feasibility of this site is still pending their approval.
7. The Monitoring Shelter

The structure housing the monitoring equipment will be a 10’ by 18’ shelter designed specifically for air monitoring purposes. A detailed description of the monitoring shelter can be found in Appendix D. A clean, dry, secure and temperature controlled space is required so that the sampling equipment can operate properly. Careful thought and planning is required in locating a monitoring station. For shelter installation, Polk County Air Quality will consider the following:

- Proximity to the nearest power source. A 120 VAC source is required for operation of the near-road NO₂
monitoring instruments.

- The shelter where the equipment is housed must maintain a temperature range of 20-30°C. This usually requires the need for an air conditioner and a heater controlled by a thermostat.
- The accessibility of the equipment to the operator. The operator must be able to safely access the equipment during regular business hours.
- The security of the equipment. Monitoring instruments are expensive. They must be placed in a location where security can be assured.
- Contracts for rental of space or power. Contracts need to be signed with the owner of the property where the instruments are to be located.
- Ethernet lines for data transmission to a central computer.
- Local building codes. In most cases, the contractor installing the power, structure, concrete, etc. knows the local building codes.

8. Probe Placement

Once the location of the station has been identified, the individual responsible for the installation must be familiar with the criteria for locating the probe. The location of the sample probe is critical and individuals performing the installation must follow specific guidelines for microscale near-road NO₂ monitoring sites involving:

- The distance of the probe inlet from nearby obstructions (buildings and trees) must be greater than 10 meters
- The vertical and horizontal distance of the probe inlet from the ground and support structure must be greater than 1 meter
- The height from the ground to the probe inlet must be within 2 – 7 meters
- The distance of the probe inlet from nearby roads must be less than 50 meters

For specific information on probe placement refer to 40 CFR Part 58 Appendix E.

9. References

Des Moines Area Metropolitan Planning Organization, 2010: Travel Model Outputs Including LOS and V/C. Provided by Nokil Park, Senior Transportation System Modeler.

Iowa Department of Transportation, 2010: Vehicle Classification Distribution of Annual Average Daily Traffic. [Link]


U.S. Census Bureau, Population Division, December, 2009: Metropolitan and Micropolitan Statistical Areas and Metropolitan Divisions Defined by the office of Management and Budget. [Link]

U.S. Census Bureau, 2010: 2010 Census Population Profile Maps. [Link]


Appendix A: Complete Site Description of the Budget Storage Candidate Site
SITE PLAN
FOR
POLK COUNTY PUBLIC WORKS
AIR QUALITY 2011 MONITORING SITE

INDEX OF SHEETS
1. TITLE SHEET
2-3. PROJECT INFORMATION
4. SITE LAYOUT

CONSTRUCTION DRAWINGS
SITE PLAN
APPROVED
APPROVED WITH CONDITIONS

IN ACCORDANCE WITH THE STANDARD CONSTRUCTION DOCUMENTATION CODE, ALL AMENDMENTS TO THE PLANS MUST BE APPRROVED IN WRITING BY THE PLANNING DIRECTOR OR HIS DESIGNATE.

DATE
PLANNING DIRECTOR

I hereby certify that this plan was prepared by me or under my supervision and that I am a duly licensed professional engineer under the laws of the state of Florida.

Signature
Date

Pages in sheets covered by this seal
1
SITE PLAN
FOR
POLK COUNTY PUBLIC WORKS
AIR QUALITY MONITORING SITE

INDEX OF SHEETS
1. TITLE SHEET
2-3. PROJECT INFORMATION
4. SITE LAYOUT

VICINITY MAP

Certificate Statement:
SITE PLAN
APPROVED □  APPROVED WITH CONDITIONS □

IN ACCORDANCE WITH SECTION 13.202 (2) DES MOUNTS MUNICIPAL CODE AS AMENDED. NO CHANGES TO THIS PLAN UNLESS APPROVED IN WRITING FROM THE PLANNING DIRECTOR OR NEW AMENDMENTS TO THIS PLAN.

DATE: __________________________ PLANNING DIRECTOR: __________________________

I hereby certify that this plan was prepared by me or under my supervision and that I am a duly licensed Professional Engineer under the laws of the State of Iowa.

Number: __________________________ Date: __________________________

No kar karicin ne shi ne December 31, 2013

Sheet 1 of 4
SITE PLAN
FOR
POLK COUNTY PUBLIC WORKS
AIR QUALITY MONITORING SITE

INDEX OF SHEETS
1. TITLE SHEET
2. PROJECT INFORMATION
3. SITE LAYOUT

I hereby certify that this plan was prepared by me or under my supervision and that I am a duly licensed Professional Engineer under the laws of the State of Iowa.

Sheet 1 of 3
<table>
<thead>
<tr>
<th>Item #</th>
<th>Description</th>
<th>Manufacturer</th>
<th>Model Number/Part #</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>30189 1 Model C Shelter, 10W (OD) x 15L (ID) x 9H (ID)</td>
<td>Shelter One</td>
<td>C10189</td>
</tr>
<tr>
<td>2</td>
<td>1554/P305D 1 LOAD. CENTER. 150 A. 1PH. 30 POS. NEMA 1. 50/60HZ</td>
<td>Square D</td>
<td>DD13530150/00C35065</td>
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<tr>
<td>3</td>
<td>HVAC2401 1 H.V.A.C. 24K BTU, 85% STAN. EFF. DISC SW. &amp; GFCI RECEPT.</td>
<td>Bard</td>
<td>M2A-A05XPA4SXJ</td>
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<td>4</td>
<td>PANIC 1 1 VR. DEP. INR. PANIC</td>
<td>York Deplin</td>
<td>3800-3600PS8 / 3900L 608 1-1/4 26412</td>
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<tr>
<td>5</td>
<td>CLOSER2 1 Automatic Closer w/holdopen</td>
<td>Norton</td>
<td>B301H</td>
</tr>
<tr>
<td>6</td>
<td>BH300 2 Bulkhead panel Removable plate 15&quot;x12&quot;</td>
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<td>SF-0084</td>
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<td>7</td>
<td>2025U02 2 Ground Pad Aluminum NEMA 2-hole</td>
<td>Lithuania</td>
<td>WC-1000NL M4</td>
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<td>8</td>
<td>2 EXT. MH. 150 W. 120 V light</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>SMOKEHEAT 1 SMOKE &amp; HEAT DETECTOR. 120 VAC W. RELAY</td>
<td>Gentex</td>
<td>9120TF</td>
</tr>
<tr>
<td>10</td>
<td>FE3025 1 FIRE EXT. 86-1GDO</td>
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<td></td>
</tr>
<tr>
<td>11</td>
<td>PNR1 2 Receptacle, Duplex Roof Mount, Primary</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>SPECIAL1 1 Ethernet Entry Point; (3) Interior Ceiling &amp; (1) Wall Jack</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>WALKPA02 8 Roof Safety Walk Pad 5X5X</td>
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<td>14</td>
<td>R175-1 1 Hammond Rack</td>
<td>Hammond Rack</td>
<td>CFP1978238K1/PMR0454</td>
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<tr>
<td>15</td>
<td>SPECIAL 1 Install Customer Supplied rack</td>
<td>Shelter One</td>
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</tr>
<tr>
<td>16</td>
<td>TL1 2 Receptacle, Single, Twist Lock. Primary</td>
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<td></td>
</tr>
<tr>
<td>17</td>
<td>PAUL1015 1 Roof Parimeter rating: 15X15; OSHA / PE Engineered</td>
<td></td>
<td></td>
</tr>
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<td>18</td>
<td>GATE 1 Hand Rail Safety Gate</td>
<td>Fabenco</td>
<td>A71-21FC</td>
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<td>19</td>
<td>SA-0052 1 Ladder Std Duty</td>
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<tr>
<td>20</td>
<td>CLOSET 1 Closet, 9&quot;x4&quot; x 30&quot; Door / Pure Receipts / Light / Sound Alten.</td>
<td>Shelter One</td>
<td></td>
</tr>
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<td>21</td>
<td>CTRAY 28 Cable Tray (california), 12&quot;, Per Foot</td>
<td>Cabo Flofil</td>
<td>CF 30/300</td>
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Load Calculations

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<th>Unit VA</th>
<th>Continuous VA</th>
<th>Non-Cont. VA</th>
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<td>180</td>
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<td>HVAC</td>
<td>11520</td>
<td></td>
<td>11520</td>
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<td>Lights</td>
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<tr>
<td>Total Continuous VA</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Non-Continuous VA</td>
<td>900</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total VA</td>
<td>15750</td>
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<td></td>
<td></td>
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<tr>
<td>Total Amp load @ 240 V, 1/4</td>
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</table>
Appendix B: 40 CFR Part 58 Requiring Annual Network Plans

§ 58.10 Annual monitoring network plan and periodic network assessment.

(a) (1) Beginning July 1, 2007, the State, or where applicable local, agency shall adopt and submit to the Regional Administrator an annual monitoring network plan which shall provide for the establishment and maintenance of an air quality surveillance system that consists of a network of SLAMS monitoring stations including FRM, FEM, and ARM monitors that are part of SLAMS, NCore stations, STN stations, State speciation stations, SPM stations, and/or, in serious, severe and extreme ozone nonattainment areas, PAMS stations, and SPM monitoring stations. The plan shall include a statement of purposes for each monitor and evidence that siting and operation of each monitor meets the requirements of appendices A, C, D, and E of this part, where applicable. The annual monitoring network plan must be made available for public inspection for at least 30 days prior to submission to EPA.

(2) Any annual monitoring network plan that proposes SLAMS network modifications including new monitoring sites is subject to the approval of the EPA Regional Administrator, who shall provide opportunity for public comment and shall approve or disapprove the plan and schedule within 120 days. If the State or local agency has already provided a public comment opportunity on its plan and has made no changes subsequent to that comment opportunity, and has submitted the received comments together with the plan, the Regional Administrator is not required to provide a separate opportunity for comment.

(3) The plan for establishing required NCore multipollutant stations shall be submitted to the Administrator not later than July 1, 2009. The plan shall provide for all required stations to be operational by January 1, 2011.

(4) A plan for establishing Pb monitoring sites in accordance with the requirements of appendix D to this part shall be submitted to the EPA Regional Administrator no later than July 1, 2009 as part of the annual network plan required in paragraph (a)(1) of this section. The plan shall provide for the required source-oriented Pb monitoring sites to be operational by January 1, 2010, and for all required non-source-oriented Pb monitoring sites to be operational by January 1, 2011. Specific site locations for the sites to be operational by January 1, 2011 are not required as part of the July 1, 2009 annual network plan, but shall be included in the annual network plan due to be submitted to the EPA Regional Administrator on July 1, 2010.

(5) A plan for establishing NO2 monitoring sites in accordance with the requirements of appendix D to this part shall be submitted to the Administrator by July 1, 2012. The plan shall provide for all required monitoring stations to be operational by January 1, 2013.

(b) The annual monitoring network plan must contain the following information for each existing and proposed site:

(1) The AQS site identification number.

(2) The location, including street address and geographical coordinates.

(3) The sampling and analysis method(s) for each measured parameter.

(4) The operating schedules for each monitor.

(5) Any proposals to remove or move a monitoring station within a period of 18 months following plan submittal.

(6) The monitoring objective and spatial scale of representativeness for each monitor as defined in appendix D to this part.

(7) The identification of any sites that are suitable and sites that are not suitable for comparison against the annual PM2.5 NAAQS as described in § 58.30.

(8) The MSA, CBSA, CSA or other area represented by the monitor.

(9) The designation of any Pb monitors as either source-oriented or nonsource- oriented according to Appendix D to 40 CFR part 58.

(10) Any source-oriented monitors for which a waiver has been requested or granted by the EPA Regional Administrator as allowed for under paragraph 4.5(a)(ii) of Appendix D to 40 CFR part 58.

(11) Any source-oriented or nonsource- oriented site for which a waiver has been requested or granted by the EPA Regional Administrator for the use of Pb-PM10 monitoring in lieu of Pb-TSP monitoring as allowed for under paragraph 2.10 of Appendix C to 40 CFR part 58.

(12) The identification of required NO2 monitors as either near-road or area-wide sites in accordance with appendix D, section 4.3 of this part.

(c) The annual monitoring network plan must document how States and local agencies provide for the review of changes to a PM2.5 monitoring network that impact the location of a violating PM2.5 monitor or the creation/change to a community monitoring zone, including a description of the proposed use of spatial averaging for purposes of making comparisons to the annual PM2.5 NAAQS as set forth in appendix N to part 50 of this
The affected State or local agency must document the process for obtaining public comment and include any comments received through the public notification process within their submitted plan.

(d) The State, or where applicable local, agency shall perform and submit to the EPA Regional Administrator an assessment of the air quality surveillance system every 5 years to determine, at a minimum, if the network meets the monitoring objectives defined in appendix D to this part, whether new sites are needed, whether existing sites are no longer needed and can be terminated, and whether new technologies are appropriate for incorporation into the ambient air monitoring network. The network assessment must consider the ability of existing and proposed sites to support air quality characterization for areas with relatively high populations of susceptible individuals (e.g., children with asthma), and, for any sites that are being proposed for discontinuance, the effect on data users other than the agency itself, such as nearby States and Tribes or health effects studies. For PM2.5, the assessment also must identify needed changes to population-oriented sites. The State, or where applicable local, agency must submit a copy of this 5-year assessment, along with a revised annual network plan, to the Regional Administrator. The first assessment is due July 1, 2010.

(e) All proposed additions and discontinuations of SLAMS monitors in annual monitoring network plans and periodic network assessments are subject to approval according to § 58.14. [71 FR 61298, Oct. 17, 2006, as amended at 72 FR 32210, June 12, 2007; 73 FR 67059, Nov. 12, 2008; 73 FR 77517, Dec. 19, 2008; 75 FR 6534, Feb. 9, 2010]

EFFECTIVE DATE NOTE: At 75 FR 35601, June 22, 2010, § 58.10 was amended by adding paragraph (a)(6), effective Aug. 23, 2010. For the convenience of the user, the added text is set forth as follows:
§ 58.10 Annual monitoring network plan and periodic network assessment.

(a) * * * * *

(6) A plan for establishing SO2 monitoring sites in accordance with the requirements of appendix D to this part shall be submitted to the EPA Regional Administrator by July 1, 2011 as part of the annual network plan required in paragraph (a) (1). The plan shall provide for all required SO2 monitoring sites to be operational by January 1, 2013. * * * * *
Appendix C: SLAMS Network Modification

(a) The State, or where appropriate local, agency shall develop and implement a plan and schedule to modify the ambient air quality monitoring network that complies with the findings of the network assessments required every 5 years by §58.10(e). The State or local agency shall consult with the EPA Regional Administrator during the development of the schedule to modify the monitoring program, and shall make the plan and schedule available to the public for 30 days prior to submission to the EPA Regional Administrator. The final plan and schedule with respect to the SLAMS network are subject to the approval of the EPA Regional Administrator. Plans containing modifications to NCORE Stations or PAMS Stations shall be submitted to the Administrator. The Regional Administrator shall provide opportunity for public comment and shall approve or disapprove submitted plans and schedules within 120 days.

(b) Nothing in this section shall preclude the State, or where appropriate local, agency from making modifications to the SLAMS network for reasons other than those resulting from the periodic network assessments. These modifications must be reviewed and approved by the Regional Administrator. Each monitoring network may make or be required to make changes between the 5-year assessment periods, including for example, site relocations or the addition of PAMS networks in bumped-up ozone nonattainment areas. These modifications must address changes invoked by a new census and changes due to changing air quality levels. The State, or where appropriate local, agency shall provide written communication describing the network changes to the Regional Administrator for review and approval as these changes are identified.

(c) State, or where appropriate, local agency requests for SLAMS monitor station discontinuation, subject to the review of the Regional Administrator, will be approved if any of the following criteria are met and if the requirements of appendix D to this part, if any, continue to be met. Other requests for discontinuation may also be approved on a case-by-case basis if discontinuance does not compromise data collection needed for implementation of a NAAQS and if the requirements of appendix D to this part, if any, continue to be met.

1. Any PM$_{2.5}$, O$_3$, CO, PM$_{10}$, SO$_2$, Pb, or NO$_2$ SLAMS monitor which has shown attainment during the previous five years, that has a probability of less than 10 percent of exceeding 80 percent of the applicable NAAQS during the next three years based on the levels, trends, and variability observed in the past, and which is not specifically required by an attainment plan or maintenance plan. In a nonattainment or maintenance area, if the most recent attainment or maintenance plan adopted by the State and approved by EPA contains a contingency measure to be triggered by an air quality concentration and the monitor to be discontinued is the only SLAMS monitor operating in the nonattainment or maintenance area, the monitor may not be discontinued.

2. Any SLAMS monitor for CO, PM$_{10}$, SO$_2$, or NO$_2$ which has consistently measured lower concentrations than another monitor for the same pollutant in the same county (or portion of a county within a distinct attainment area, nonattainment area, or maintenance area, as applicable) during the previous five years, and which is not specifically required by an attainment plan or maintenance plan, if control measures scheduled to be implemented or discontinued during the next five years would apply to the areas around both monitors and have similar effects on measured concentrations, such that the retained monitor would remain the higher reading of the two monitors being compared.

3. For any pollutant, any SLAMS monitor in a county (or portion of a county within a distinct attainment, nonattainment, or maintenance area, as applicable) provided the monitor has not measured violations of the applicable NAAQS in the previous five years, and the approved SIP provides for a specific, reproducible approach to representing the air quality of the affected county in the absence of actual monitoring data.

4. A PM$_{2.5}$ SLAMS monitor which EPA has determined cannot be compared to the relevant NAAQS because of the siting of the monitor, in accordance with §58.30.

5. A SLAMS monitor that is designed to measure concentrations upwind of an urban area for purposes of characterizing transport into the area and that has not recorded violations of the relevant NAAQS in the previous five years, if discontinuation of the monitor is tied to start-up of another station also characterizing transport.

6. A SLAMS monitor not eligible for removal under any of the criteria in paragraphs (c)(1) through (c)(5) of this section may be moved to a nearby location with the same scale of representation if logistical problems beyond the State’s control make it impossible to continue operation at its current site.
## Appendix D: Iowa Ambient Air Monitoring Sites for NO$_2$

<table>
<thead>
<tr>
<th>City</th>
<th>Site</th>
<th>Address</th>
<th>County</th>
<th>MSA</th>
<th>Latitude</th>
<th>Longitude</th>
<th>AQS Site ID</th>
<th>Responsible Agency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Davenport</td>
<td>Jefferson School</td>
<td>10th St. &amp; Vine St.</td>
<td>Scott</td>
<td>DMR</td>
<td>41.53001</td>
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<td>191630015</td>
<td>DNR</td>
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<tr>
<td>Des Moines</td>
<td>Health Dept.</td>
<td>1907 Carpenter</td>
<td>Polk</td>
<td>DSM</td>
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<td>-</td>
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<td>24430 Lacey Trl, Keosauqua</td>
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<td>-</td>
<td>40.69508</td>
<td>-92.00632</td>
<td>191770006</td>
<td>DNR</td>
</tr>
</tbody>
</table>
Site Table Definitions

**City** – the city closest to the monitor location.

**Site** – the name of the monitoring site.

**Address** – an intersection or street address close to the monitoring site.

**County** – the county where the monitoring site resides.

**MSA** – Metropolitan Statistical Area. Iowa’s Metropolitan Statistical Areas (MSA’s) according to July, 2009 U.S. Census Bureau estimates:

<table>
<thead>
<tr>
<th>U.S. Census Geographic area</th>
<th>Abbreviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Omaha-Council Bluffs, NE-IA</td>
<td>OMC</td>
</tr>
<tr>
<td>Des Moines-West Des Moines, IA</td>
<td>DSM</td>
</tr>
<tr>
<td>Davenport-Moline-Rock Island, IA-IL</td>
<td>DMR</td>
</tr>
<tr>
<td>Cedar Rapids, IA</td>
<td>CDR</td>
</tr>
<tr>
<td>Waterloo-Cedar Falls, IA</td>
<td>WTL</td>
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<tr>
<td>Sioux City, IA-NE-SD</td>
<td>SXC</td>
</tr>
<tr>
<td>Iowa City, IA</td>
<td>IAC</td>
</tr>
<tr>
<td>Dubuque, IA</td>
<td>-</td>
</tr>
<tr>
<td>Ames, IA</td>
<td>-</td>
</tr>
</tbody>
</table>


Maximum ozone concentrations are typically measured 10-30 miles downwind of an MSA. The site intended to record the maximum ozone concentration resulting from a given MSA may be located outside the MSA boundaries. Sites intended to measure background levels of pollutants for an MSA may also be located upwind and outside of that particular MSA.

**Latitude** – the latitude of a monitoring site, given in decimal degrees using the WGS (World Geodetic System) 84 datum.

**Longitude** – the longitude of a monitoring site, given in decimal degrees using the WGS (World Geodetic System) 84 datum.

**AQS Site ID** – The identifier of a monitoring site used in the US EPA Air Quality System (AQS) database. It has the form XX-XXX-XXXX where the first two digits specify the state (19 for Iowa), the next set of three digits the county, and the last four digits the site.

**Responsible Agency** – The agency responsible for performing ambient air monitoring at a monitoring site. The Polk County Local Program operates sites in or near Polk County. The Linn County Local Program operates sites in or near Linn County. The Department of Natural Resources (DNR) contracts with the State Hygienic Laboratory at the University of Iowa (SHL) to operate monitoring sites not operated by the Polk or Linn County Local Programs.
## Appendix E: Iowa Ambient Air NO$_2$ Monitors

<table>
<thead>
<tr>
<th>Site Name</th>
<th>Pollutants Measured</th>
<th>Monitor Type</th>
<th>Sampling Method</th>
<th>Operating Schedule</th>
<th>Primary Monitoring Objective</th>
<th>Spatial Scale</th>
<th>NAAQS Comparable?</th>
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<tr>
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<td>NO$_2$, SPM</td>
<td>Chemiluminescence</td>
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<td>Des Moines, Health Dept.</td>
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<td>Chemiluminescence</td>
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<td>Population Exposure</td>
<td>Neighborhood</td>
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</tr>
<tr>
<td>Keosauqua, Lake Sugema</td>
<td>NO$_2$, SLAMS</td>
<td>Chemiluminescence</td>
<td>Continuous</td>
<td>Population Exposure</td>
<td>Neighborhood</td>
<td>Yes</td>
<td></td>
</tr>
</tbody>
</table>
Monitor Table Definitions:

**Site Name** – a combination of the city and site name from the previous table

**Pollutants Measured** – indicates the pollutant, or set of pollutants, measured by each monitor
- NO₂ – nitrogen dioxide

**Monitor Type** – This column indicates how the monitor is classified in the AQS database.
- IMPROVE – a speciation monitor developed by the IMPROVE program to identify and quantify the chemical components of PM₂·₅.
- Proposed NCore – monitors operated at a site which has been proposed for inclusion in EPA’s national network of long term multi-pollutant sites (NCore).
- SLAMS – State and Local Air Monitoring Stations. SLAMS make up the ambient air quality monitoring sites that are primarily needed for NAAQS comparisons, but may serve other data purposes. SLAMS exclude special purpose monitor (SPM) stations and include NCore, and all other State or locally operated stations that have not been designated as SPM stations.
- SPM – means a monitor that is designated as a special purpose monitor in the monitoring network plan and in EPA’s AQS database. SPM monitors do not count when showing compliance with minimum SLAMS requirements for monitor numbers and siting.
- Supplemental Speciation – a speciation site with monitors that are operated according to CSN protocols, but not contained in the STN Network.

**Sampling Method** – Indicates how the sample is collected. This column also shows how the sample is analyzed, if it is analyzed on site at the time of collection.
- Chemiluminescence – When a nitric oxide (NO) molecule collides with an ozone molecule, a nitrogen dioxide (NO₂) molecule and an oxygen (O₂) molecule result. The NO₂ molecule is in an excited state, and subsequently emits infrared light that can be measured by a photomultiplier tube. This property is the basis of the analytical method used to quantify NO. To measure NO₂, the NO₂ must first be converted to NO using a heated molybdenum converter. To measure Nitrate, the collected particulate is heated rapidly, and the vaporization/decomposition process converts the particulate nitrate contained in the collected sample to nitrogen oxides, which are quantified by the chemiluminescence method.

**Operating Schedule** – Continuous monitors run constantly and measure hourly average concentrations in real time. Manual samplers, such as PM filter samplers or toxics samplers, collect a single 24 hour sample from midnight to midnight on a particular day, which is quantified later in an analytical laboratory.

**Monitoring Objective** – the primary reason a monitor is operated at a particular location.
- General Background – The objective is to establish the background levels of a pollutant.
- Highest Conc. – The objective is to measure at a site where the concentration of the pollutant is highest.
- Max. Ozone Conc. – The objective is to record the maximum ozone concentration. Because ozone is a secondary pollutant, ozone concentrations are typically highest 10-30 miles downwind of an urban area.
- Population Exposure – The objective is to monitor the exposure of individuals in the area represented by the monitor.
- Regional Transport – The objective is to assess the extent to which pollutants are transported between two regions that are separated by tens to hundreds of kilometers.
- Source Oriented – The objective is to determine the impact of a nearby source.
- Transport – The objective is to assess the extent to which pollutants are transported from one location to another.
- Upwind Background – The objective is to establish the background levels of a pollutant, typically upwind of a source or urban area.

**Spatial Scale** – The scale of representativeness is described in terms of the physical dimensions of the air parcel nearest to a monitoring site throughout which actual pollutant concentrations are reasonably similar. Monitors are classified
according to the largest applicable scale below:

- **Microscale** - defines the concentrations in air volumes associated with area dimensions ranging from several meters up to about 100 meters.
- **Middle scale** - defines the concentration typical of areas up to several city blocks in size with dimensions ranging from about 100 meters to 0.5 kilometer.
- **Neighborhood scale** - defines concentrations within some extended area of the city that has relatively uniform land use with dimensions in the 0.5 to 4.0 kilometers range. The neighborhood and urban scales listed below have the potential to overlap in applications that concern secondarily formed or homogeneously distributed air pollutants.
- **Urban scale** - defines concentrations within an area of city-like dimensions, on the order of 4 to 50 kilometers. Within a city, the geographic placement of sources may result in there being no single site that can be said to represent air quality on an urban scale.
- **Regional scale** – usually defines a rural area of reasonably homogeneous geography without large sources, and extends from tens to hundreds of kilometers.

**NAAQS Comparable?** - This column shows whether the data from the monitor can be compared to the National Ambient Air Quality Standards (NAAQS). Entries under this column are Yes, No, and 24 Hour Only. For a monitor’s data to be eligible for comparison against the NAAQS, the type of monitor used must be defined as a federal reference method or federal equivalent method by EPA.
Appendix F: Federal Requirements for NO₂ Sites

Appendix D to Part 58—Network Design Criteria for Ambient Air Quality Monitoring
* * * * *

4.3 Nitrogen Dioxide (NO₂) Design Criteria

4.3.1 General Requirements
(a) State and, where appropriate, local agencies must operate a minimum number of required NO₂ monitoring sites as described below.

4.3.2 Requirement for Near-road NO₂ Monitors
(a) Within the NO₂ network, there must be one microscale near-road NO₂ monitoring station in each CBSA with a population of 500,000 or more persons to monitor a location of expected maximum hourly concentrations sited near a major road with high AADT counts as specified in paragraph 4.3.2(a)(1) of this appendix. An additional near-road NO₂ monitoring station is required for any CBSA with a population of 2,500,000 persons or more, or in any CBSA with a population of 500,000 or more persons that has one or more roadway segments with 250,000 or greater AADT counts to monitor a second location of expected maximum hourly concentrations. CBSA populations shall be based on the latest available census figures.
(1) The near-road NO₂ monitoring stations shall be selected by ranking all road segments within a CBSA by AADT and then identifying a location or locations adjacent to those highest ranked road segments, considering fleet mix, roadway design, congestion patterns, terrain, and meteorology, where maximum hourly NO₂ concentrations are expected to occur and siting criteria can be met in accordance with appendix E of this part. Where a State or local air monitoring agency identifies multiple acceptable candidate sites where maximum hourly NO₂ concentrations are expected to occur, the monitoring agency shall consider the potential for population exposure in the criteria utilized to select the final site location. Where one CBSA is required to have two near-road NO₂ monitoring stations, the sites shall be differentiated from each other by one or more of the following factors: fleet mix; congestion patterns; terrain; geographic area within the CBSA; or different route, interstate, or freeway designation.
(b) Measurements at required near-road NO₂ monitor sites utilizing chemiluminescence FRMs must include at a minimum: NO, NO₂, and NOX.

4.3.3 Requirement for Area-wide NO₂ Monitoring
(a) Within the NO₂ network, there must be one monitoring station in each CBSA with a population of 1,000,000 or more persons to monitor a location of expected highest NO₂ concentrations representing the neighborhood or larger spatial scales. PAMS sites collecting NO₂ data that are situated in an area of expected high NO₂ concentrations at the neighborhood or larger spatial scale may be used to satisfy this minimum monitoring requirement when the NO₂ monitor is operated year round. Emission inventories and meteorological analysis should be used to identify the appropriate locations within a CBSA for locating required area-wide NO₂ monitoring stations. CBSA populations shall be based on the latest available census figures.

4.3.4 Regional Administrator Required Monitoring
(a) The Regional Administrators, in collaboration with States, must require a minimum of forty additional NO₂ monitoring stations nationwide in any area, inside or outside of CBSAs, above the minimum monitoring requirements, with a primary focus on siting these monitors in locations to protect susceptible and vulnerable populations. The Regional Administrators, working with States, may also consider additional factors described in paragraph (b) below to require monitors beyond the minimum network requirement.
(b) The Regional Administrators may require monitors to be sited inside or outside of CBSAs in which:
(i) The required near-road monitors do not represent all locations of expected maximum hourly NO₂ concentrations in an area and NO₂ concentrations may be approaching or exceeding the NAAQS in that area;
(ii) Areas that are not required to have a monitor in accordance with the monitoring requirements and NO₂ concentrations may be approaching or exceeding the NAAQS; or
(iii) The minimum monitoring requirements for area-wide monitors are not sufficient to meet monitoring objectives.
(c) The Regional Administrator and the responsible State or local air monitoring agency should work together
to design and/or maintain the most appropriate NO2 network to address the data needs for an area, and include all monitors under this provision in the annual monitoring network plan.

4.3.5 NO2 Monitoring Spatial Scales
(a) The most important spatial scale for near-road NO2 monitoring stations to effectively characterize the maximum expected hourly NO2 concentration due to mobile source emissions on major roadways is the microscale. The most important spatial scales for other monitoring stations characterizing maximum expected hourly NO2 concentrations are the microscale and middle scale. The most important spatial scale for area-wide monitoring of high NO2 concentrations is the neighborhood scale.

(1) **Microscale**—This scale represents areas in close proximity to major roadways or point and area sources. Emissions from roadways result in high ground level NO2 concentrations at the microscale, where concentration gradients generally exhibit a marked decrease with increasing downwind distance from major roads. As noted in appendix E of this part, near-road NO2 monitoring stations are required to be within 50 meters of target road segments in order to measure expected peak concentrations. Emissions from stationary point and area sources, and non-road sources may, under certain plume conditions, result in high ground level concentrations at the microscale. The microscale typically represents an area impacted by the plume with dimensions extending up to approximately 100 meters.

(2) **Middle scale**—This scale generally represents air quality levels in areas up to several city blocks in size with dimensions on the order of approximately 100 meters to 500 meters. The middle scale may include locations of expected maximum hourly concentrations due to proximity to major NO2 point, area, and/or non-road sources.

(3) **Neighborhood scale**—The neighborhood scale represents air quality conditions throughout some relatively uniform land use areas with dimensions in the 0.5 to 4.0 kilometer range. Emissions from stationary point and area sources may, under certain plume conditions, result in high NO2 concentrations at the neighborhood scale. Where a neighborhood site is located away from immediate NO2 sources, the site may be useful in representing typical air quality values for a larger residential area, and therefore suitable for population exposure and trends analyses.

(4) **Urban scale**—Measurements in this scale would be used to estimate concentrations over large portions of an urban area with dimensions from 4 to 50 kilometers. Such measurements would be useful for assessing trends in area-wide air quality, and hence, the effectiveness of large scale air pollution control strategies. Urban scale sites may also support other monitoring objectives of the NO2 monitoring network identified in paragraph 4.3.4 above.

4.3.6 NOy Monitoring
(a) NO/NOy measurements are included within the NCore multi-pollutant site requirements and the PAMS program. These NO/NOy measurements will produce conservative estimates for NO2 that can be used to ensure tracking continued compliance with the NO2 NAAQS. NO/NOy monitors are used at these sites because it is important to collect data on total reactive nitrogen species for understanding O3 photochemistry.

* * * * *
## Appendix G: Census Bureau Estimates for Iowa MSA’s

<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Omaha-Council Bluffs, NE-IA</td>
<td>865,350</td>
</tr>
<tr>
<td>Des Moines-West Des Moines, IA</td>
<td>569,633</td>
</tr>
<tr>
<td>Davenport-Moline-Rock Island, IA-IL</td>
<td>379,690</td>
</tr>
<tr>
<td>Cedar Rapids, IA</td>
<td>257,940</td>
</tr>
<tr>
<td>Waterloo-Cedar Falls, IA</td>
<td>167,819</td>
</tr>
<tr>
<td>Iowa City, IA</td>
<td>152,586</td>
</tr>
<tr>
<td>Sioux City, IA-NE</td>
<td>143,577</td>
</tr>
<tr>
<td>Dubuque, IA</td>
<td>93,653</td>
</tr>
<tr>
<td>Ames, IA</td>
<td>89,542</td>
</tr>
</tbody>
</table>

Appendix H: Iowa Ambient Air Monitoring Network Maps for NO\textsubscript{2}

The following maps show the locations for the criteria pollutant monitors in the state of Iowa, which are current as of January 1, 2012.
Appendix I: Network Change Tables

The DNR proposes to add one near road NO₂ monitoring site to the Des Moines MSA, as detailed below. A final selection between the three candidates is contingent upon getting the appropriate building permits and site license agreement from the property owner.

<table>
<thead>
<tr>
<th>City</th>
<th>Site</th>
<th>Address</th>
<th>County</th>
<th>MSA</th>
<th>Latitude</th>
<th>Longitude</th>
<th>AQS Site ID</th>
<th>Responsible Agency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Windsor Heights</td>
<td>Budget Storage</td>
<td>6525 Center St</td>
<td>Polk</td>
<td>DSM</td>
<td>41.59285</td>
<td>-93.70947</td>
<td>191530053</td>
<td>Polk Local Prog.</td>
</tr>
<tr>
<td>Des Moines</td>
<td>Rollins Ave</td>
<td>6011 Rollins Ave</td>
<td>Polk</td>
<td>DSM</td>
<td>41.59257</td>
<td>-93.70014</td>
<td>191530053</td>
<td>Polk Local Prog.</td>
</tr>
<tr>
<td>Des Moines</td>
<td>Polk Blvd</td>
<td>Polk Blvd and Center St</td>
<td>Polk</td>
<td>DSM</td>
<td>41.59203</td>
<td>-93.68129</td>
<td>191530053</td>
<td>Polk Local Prog.</td>
</tr>
</tbody>
</table>

See Appendix D for definitions of the elements in this table.

<table>
<thead>
<tr>
<th>Site Name</th>
<th>Pollutant</th>
<th>Monitor Type</th>
<th>Sampling Method</th>
<th>Operating Schedule</th>
<th>Primary Monitoring Objective</th>
<th>Spatial Scale</th>
<th>NAAQS Comparable?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Windsor Heights, Budget Storage</td>
<td>NO₂</td>
<td>SLAMS</td>
<td>Chemiluminescence</td>
<td>Continuous</td>
<td>Source Oriented</td>
<td>Microscale</td>
<td>Yes</td>
</tr>
<tr>
<td>Des Moines, Rollins Ave</td>
<td>NO₂</td>
<td>SLAMS</td>
<td>Chemiluminescence</td>
<td>Continuous</td>
<td>Source Oriented</td>
<td>Microscale</td>
<td>Yes</td>
</tr>
<tr>
<td>Des Moines, Polk Blvd</td>
<td>NO₂</td>
<td>SLAMS</td>
<td>Chemiluminescence</td>
<td>Continuous</td>
<td>Source Oriented</td>
<td>Microscale</td>
<td>Yes</td>
</tr>
</tbody>
</table>

See Appendix E for definitions of the elements in this table.
Appendix J: Aerial Photo of Proposed Near Road NO₂ Sites