



**South Carolina State Ports  
Authority – Continuous Air  
Monitoring Station for the Union  
Pier Terminal**

Q1 2015 Quarterly Report

April 2015



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Union Pier Terminal**

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## **1. Introduction**

### **1.1 Scope**

ARCADIS U.S., Inc. (ARCADIS) was contracted in late October 2014 to provide Continuous Air Monitoring Services to the South Carolina State Ports Authority (SCSPA) at the Union Pier Terminal in Charleston, SC. ARCADIS has followed through on the planned schedule and activities since that award. The major accomplishments were to complete the Quality Assurance Project Plan (QAPP), purchase the instruments, complete the site setup, and then to begin acquiring data. Installation was completed in mid-February 2015 and data acquisition began on February 25. This report is the 1<sup>st</sup> quarterly data report (first quarterly report in year one of operations) and presents the data summaries requested by SCSPA and described in the work scope. This report encompasses a period corresponding to data taken during the period from February 25, 2015 through March 31, 2015.

### **1.2 Project Description**

SCSPA requested a system to provide ambient air quality data including particulate matter less than 2.5 microns ( $PM_{2.5}$ ),  $SO_2$ , and  $NO_2$  for a period of 2 years (to be decommissioned no later than February 15, 2017) at the Union Pier Terminal of the port of Charleston. ARCADIS will maintain the monitoring instruments, stock consumables such as filters and calibration gases, and order spare parts such that downtime will be minimized. ARCADIS has established standard operating procedures to perform daily downloads and to provide Level 1 data validation for the resulting data. This monitoring project setup was relatively straightforward and has proven to be reliable and is generating valid high quality data suitable for use in dispersion modeling or other potential purposes.

The QAPP may be updated periodically to reflect improvements to the basic operating procedures or to document changes in the air quality standards. This QAPP is written consistent with the current ambient air quality standards for PM,  $NO_x$  and  $SO_2$  as defined by the U.S. Environmental Protection Agency.



## 2. Quarterly Results

The 24-hr daily averages for PM<sub>2.5</sub>, NO, NO<sub>2</sub>, NO<sub>x</sub>, and SO<sub>2</sub> and the maximum daily values for NO<sub>2</sub> (1-hr average) and SO<sub>2</sub> (1-hr and 3-hr average) for this period are shown in Table 2-1. No exceedances were indicated this quarter. Quarterly statistics showing averages, minimums and maximums for all parameters are summarized in Table 2-2, with the corresponding NAAQS shown in Table 2-3. 24-hr averages for all constituents are also shown graphically in Figure 2-1. Maximum 1-hr averages for NO<sub>2</sub> and SO<sub>2</sub> are shown in Figure 2-2. Statistics are broken down by months and summarized in Table 2-4. Note that many of the NAAQS values are based on annual or 3-year monitoring periods and the quarterly data presented here should not be used for direct comparison.

**Table 2-1. 24-Hour Averages and Daily Maximums**

| 24-hour Averages |   |             |                          |                          |                          | Daily Max<br>1-hr Avg.   |                          | Daily Max<br>3-hr Avg.   |
|------------------|---|-------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| Date             | PM <sub>2.5</sub><br>(µg/m <sup>3</sup> ) | NO<br>(ppb) | NO <sub>2</sub><br>(ppb) | NO <sub>x</sub><br>(ppb) | SO <sub>2</sub><br>(ppb) | NO <sub>2</sub><br>(ppb) | SO <sub>2</sub><br>(ppb) | SO <sub>2</sub><br>(ppb) |
| 2/25/15          | 7.53                                      | 2.40        | 6.52                     | 8.68                     | 0.56                     | 11.92                    | 3.32                     | 0.73                     |
| 2/26/15          | 6.52                                      | 1.50        | 6.96                     | 8.36                     | 0.19                     | 12.13                    | 0.86                     | 0.53                     |
| 2/27/15          | 10.73                                     | 1.26        | 4.45                     | 5.67                     | 0.28                     | 12.13                    | 1.61                     | 1.28                     |
| 2/28/15          | 13.91                                     | 0.90        | 4.27                     | 5.16                     | 0.08                     | 8.56                     | 0.47                     | 0.28                     |
| 3/1/15           | 13.19                                     | 1.65        | 6.84                     | 8.47                     | 1.03                     | 13.25                    | 5.40                     | 3.71                     |
| 3/2/15           | 7.79                                      | 4.08        | 6.11                     | 9.95                     | 0.32                     | 19.18                    | 4.35                     | 1.82                     |
| 3/3/15           | 11.11                                     | 1.91        | 6.26                     | 8.13                     | 0.06                     | 20.84                    | 0.14                     | 0.11                     |
| 3/4/15           | 7.89                                      | 1.87        | 2.93                     | 4.49                     | 0.08                     | 7.90                     | 0.44                     | 0.26                     |
| 3/5/15           | 7.55                                      | 1.96        | 2.80                     | 4.40                     | 0.20                     | 5.48                     | 0.90                     | 0.70                     |
| 3/6/15           | 5.04                                      | 1.56        | 4.86                     | 6.41                     | 0.23                     | 9.92                     | 0.91                     | 0.71                     |
| 3/7/15           | 9.24                                      | 1.49        | 7.04                     | 8.52                     | 0.46                     | 16.02                    | 1.76                     | 1.20                     |
| 3/8/15           | 9.37                                      | 0.81        | 6.41                     | 7.21                     | 0.42                     | 12.51                    | 1.64                     | 1.03                     |
| 3/9/15           | 7.07                                      | 6.25        | 10.00                    | 16.23                    | 0.26                     | 31.21                    | 2.50                     | 0.89                     |
| 3/10/15          | 5.11                                      | 2.59        | 5.12                     | 7.65                     | 0.00                     | 21.90                    | 0.01                     | 0.00                     |
| 3/11/15          | 5.78                                      | 3.09        | 4.01                     | 6.85                     | 0.02                     | 10.17                    | 0.07                     | 0.04                     |
| 3/12/15          | 8.55                                      | 1.84        | 5.17                     | 6.97                     | 0.01                     | 16.79                    | 0.03                     | 0.02                     |
| 3/13/15          | 8.00                                      | 1.02        | 2.12                     | 3.11                     | 0.31                     | 4.75                     | 0.55                     | 0.49                     |



| 24-hour Averages |   |             |                          |                          |                          | Daily Max<br>1-hr Avg.   |                          | Daily Max<br>3-hr Avg.   |
|------------------|---|-------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| Date             | PM <sub>2.5</sub><br>(µg/m <sup>3</sup> ) | NO<br>(ppb) | NO <sub>2</sub><br>(ppb) | NO <sub>x</sub><br>(ppb) | SO <sub>2</sub><br>(ppb) | NO <sub>2</sub><br>(ppb) | SO <sub>2</sub><br>(ppb) | SO <sub>2</sub><br>(ppb) |
| 3/14/15          | 9.03                                      | 0.79        | 4.09                     | 4.88                     | 0.25                     | 26.25                    | 0.37                     | 0.33                     |
| 3/15/15          | 7.20                                      | 0.85        | 3.36                     | 4.21                     | 0.47                     | 6.37                     | 1.64                     | 1.25                     |
| 3/16/15          | 8.21                                      | 4.80        | 8.18                     | 12.87                    | 0.51                     | 22.68                    | 1.11                     | 0.83                     |
| 3/17/15          | 17.47                                     | 4.51        | 10.24                    | 14.58                    | 0.73                     | 21.75                    | 2.52                     | 1.49                     |
| 3/18/15          | 9.79                                      | 0.40        | 3.05                     | 3.45                     | 0.32                     | 9.05                     | 0.51                     | 0.41                     |
| 3/19/15          | 5.95                                      | 0.65        | 3.37                     | 4.00                     | 0.48                     | 10.40                    | 1.91                     | 1.33                     |
| 3/20/15          | 10.30                                     | 2.35        | 6.97                     | 9.31                     | 0.83                     | 17.45                    | 3.96                     | 2.61                     |
| 3/21/15          | 8.20                                      | 1.18        | 3.49                     | 4.61                     | 0.21                     | 6.55                     | 0.45                     | 0.35                     |
| 3/22/15          | 8.61                                      | 0.59        | 4.63                     | 5.20                     | 0.15                     | 15.97                    | 0.51                     | 0.39                     |
| 3/23/15          | 5.17                                      | 0.40        | 2.98                     | 3.37                     | 0.11                     | 6.76                     | 0.17                     | 0.16                     |
| 3/24/15          | 7.76                                      | 1.01        | 4.20                     | 5.20                     | 0.15                     | 8.62                     | 0.30                     | 0.27                     |
| 3/25/15          | 8.44                                      | 1.34        | 4.44                     | 5.76                     | 0.07                     | 14.13                    | 0.20                     | 0.10                     |
| 3/26/15          | 6.93                                      | 1.31        | 4.21                     | 5.34                     | 0.10                     | 7.06                     | 0.46                     | 0.26                     |
| 3/27/15          | 5.49                                      | 3.19        | 5.75                     | 8.70                     | 0.07                     | 18.74                    | 0.29                     | 0.19                     |
| 3/28/15          | 5.96                                      | 3.25        | 7.61                     | 10.65                    | 0.07                     | 18.64                    | 0.34                     | 0.14                     |
| 3/29/15          | 6.46                                      | 0.20        | 2.97                     | 3.14                     | 0.20                     | 6.98                     | 0.38                     | 0.25                     |
| 3/30/15          | 6.72                                      | 1.99        | 6.68                     | 8.32                     | 0.11                     | 17.34                    | 0.33                     | 0.22                     |
| 3/31/15          | 12.20                                     | 2.63        | 6.61                     | 9.07                     | 0.18                     | 18.49                    | 1.16                     | 0.69                     |

**Table 2-2. Quarterly Statistics**

| 24-hour Averages |   |             |                          |                          |                          | Daily Max<br>1-hr Avg.   |                          | Daily Max<br>3-hr Avg.   |
|------------------|---|-------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| Date             | PM <sub>2.5</sub><br>(µg/m <sup>3</sup> ) | NO<br>(ppb) | NO <sub>2</sub><br>(ppb) | NO <sub>x</sub><br>(ppb) | SO <sub>2</sub><br>(ppb) | NO <sub>2</sub><br>(ppb) | SO <sub>2</sub><br>(ppb) | SO <sub>2</sub><br>(ppb) |
| Average          | 8.41                                      | 1.93        | 5.28                     | 7.11                     | 0.27                     | 13.94                    | 1.19                     | 0.72                     |
| Minimum          | 5.04                                      | 0.20        | 2.12                     | 3.11                     | 0.00                     | 4.75                     | 0.01                     | 0.00                     |
| Maximum          | 17.47                                     | 6.25        | 10.24                    | 16.23                    | 1.03                     | 31.21                    | 5.40                     | 3.71                     |

**Table 2-3. National Ambient Air Quality Standards**

| Pollutant         | Primary/<br>Secondary    | Averaging<br>Time | Level                 | Form   |
|-------------------|--------------------------|-------------------|-----------------------|--|
| NO <sub>2</sub>   | Primary                  | 1-hour            | 100 ppb               | 98th Percentile, averaged over 3 years   |
|                   | Primary and<br>Secondary | Annual            | 53 ppb <sup>(1)</sup> | Annual Mean  |
| SO <sub>2</sub>   | Primary                  | 1-hour            | 75 ppb <sup>(2)</sup> | 99th Percentile of 1-hour daily maximum<br>concentrations, averaged over 3 years |
|                   | Secondary                | 3-hour            | 0.5 ppm               | Not to be exceeded more than once per<br>year                                    |
| PM <sub>2.5</sub> | Primary                  | Annual            | 12 µg/m <sup>3</sup>  | Annual mean, averaged over 3 years   |
|                   | Secondary                | Annual            | 15 µg/m <sup>3</sup>  | Annual mean, averaged over 3 years   |
|                   | Primary and<br>Secondary | 24-hour           | 35 µg/m <sup>3</sup>  | 98th Percentile, averaged over 3 years   |

- (1) The official level of the annual NO<sub>2</sub> standard is 0.053 ppm, equal to 53 ppb, which is shown here for the purpose of clearer comparison to the 1-hour standard.
- (2) Final rule signed June 2, 2010. The 1971 annual and 24-hour SO<sub>2</sub> standards were revoked in that same rulemaking. However, these standards remain in effect until one year after an area is designated for the 2010 standard, except in areas designated nonattainment for the 1971 standards, where the 1971 standards remain in effect until implementation plans to attain or maintain the 2010 standard are approved.

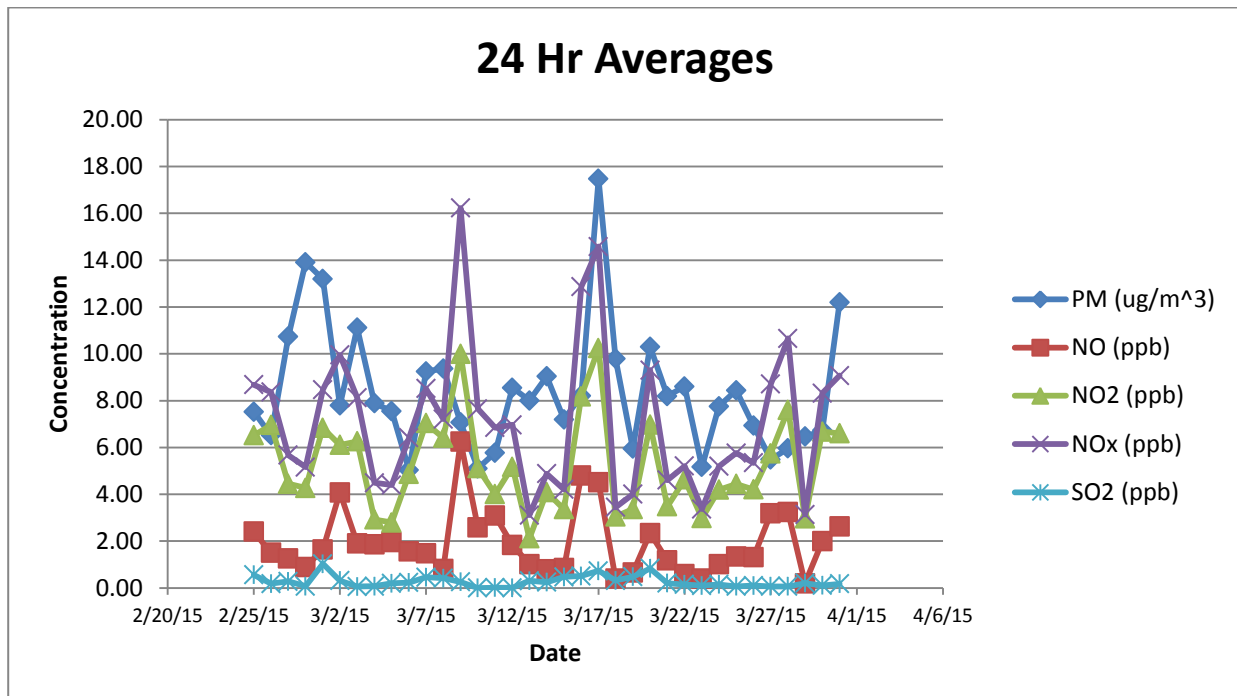


Figure 2-1. 24-hour Averages

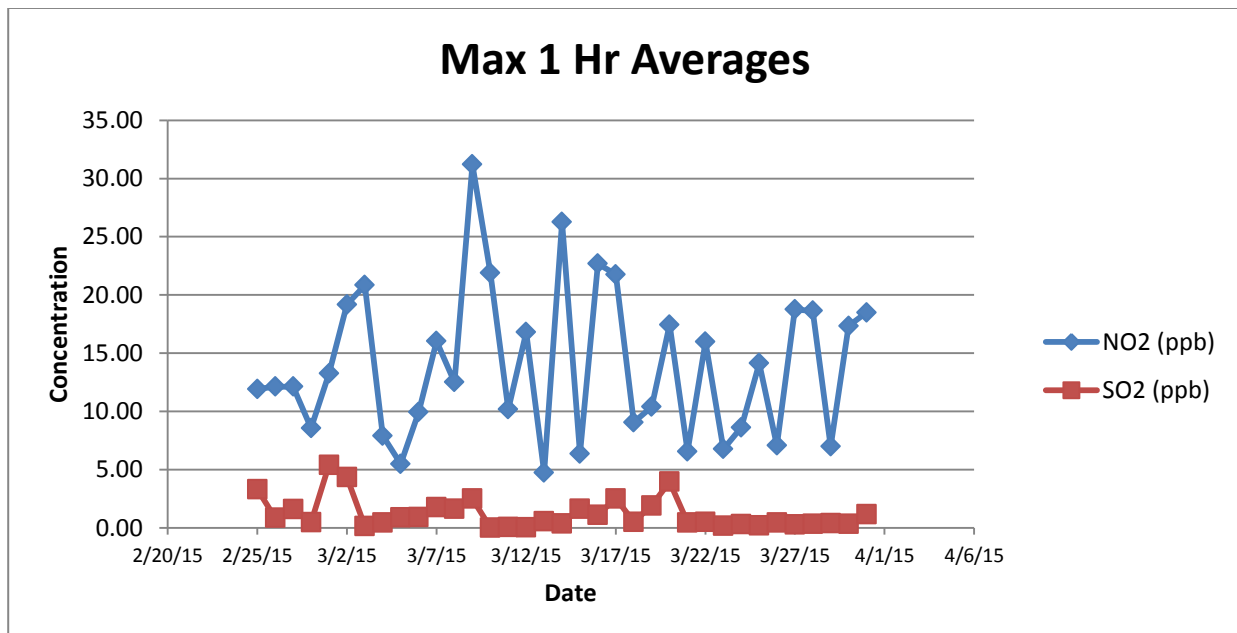


Figure 2-2. Max 1-hour Averages





**Table 2-4. Monthly Statistics**

| Monthly Averages |   |             |                          |                          |                          | Monthly Daily Max<br>1-hr Avg. |                          | Daily<br>Max 3-hr<br>Avg. |
|------------------|---|-------------|--------------------------|--------------------------|--------------------------|--------------------------------|--------------------------|---------------------------|
| Month            | PM <sub>2.5</sub><br>(µg/m <sup>3</sup> ) | NO<br>(ppb) | NO <sub>2</sub><br>(ppb) | NO <sub>x</sub><br>(ppb) | SO <sub>2</sub><br>(ppb) | NO <sub>2</sub><br>(ppb)       | SO <sub>2</sub><br>(ppb) | SO <sub>2</sub><br>(ppb)  |
| February 2015    | 9.67                                      | 1.51        | 5.55                     | 6.97                     | 0.28                     | 11.18                          | 1.57                     | 0.71                      |
| March 2015       | 8.24                                      | 1.99        | 5.24                     | 7.13                     | 0.27                     | 14.29                          | 1.14                     | 0.72                      |

## 2.1 Specific Data Notes

Normal maintenance and instrument calibration procedures were performed several times this quarter. Additional notes can be found in the QA/QC Daily Comment Sheet summary shown in Table 3-1.



### 3. Quality Assurance/Quality Control

QA/QC procedures applied to this project are described in a QAPP titled *South Carolina State Ports Authority–Continuous Air Monitoring Station for the Union Pier Terminal* (February 2015, Revision 0).

#### 3.1 Daily QC/Validation

According to the QAPP prepared for this work, results were reviewed for anomalies and validated on a daily basis. These validations are recorded on QA/QC Daily Comment Sheets and are summarized in Table 3-1. This table contains a description of any anomalies that occurred over the past quarter along with a record of normal calibration and maintenance activities and the date of occurrence.

**Table 3-1. QA/QC Daily Comment Sheet**

| Date             | Comment  |
|------------------|--|
| 2/25/2015        | Insufficient data 2:00 - 6:00, 10:00 - 11:00, and 14:00 - 16:00 due to SO <sub>2</sub> and NO <sub>x</sub> calibrations. |
| 2/26/2015        | Insufficient data 2:00 - 6:00 due to SO <sub>2</sub> and NO <sub>x</sub> calibrations.                                   |
| 2/27/2015        | Insufficient data 2:00 - 6:00 due to SO <sub>2</sub> and NO <sub>x</sub> calibrations.                                   |
| 3/5/2015         | Insufficient data 2:00 - 6:00 due to SO <sub>2</sub> and NO <sub>x</sub> calibrations.                                   |
| 3/7/2015         | Insufficient data 4:00 - 6:00 due to NO <sub>x</sub> calibration.  |
| 3/9/2015         | Insufficient data 2:00 - 6:00 due to SO <sub>2</sub> and NO <sub>x</sub> calibrations.                                   |
| 3/10/2015        | Insufficient data 2:00 - 6:00 due to SO <sub>2</sub> and NO <sub>x</sub> calibrations.                                   |
| 3/11/2015        | Insufficient data 2:00 - 6:00 due to SO <sub>2</sub> and NO <sub>x</sub> calibrations.                                   |
| 3/13/2015        | Insufficient data 2:00 - 6:00 due to SO <sub>2</sub> and NO <sub>x</sub> calibrations.                                   |
| 3/16/2015        | Insufficient data 4:00 - 6:00 due to NO <sub>x</sub> calibration.  |
| 3/18/2015        | Insufficient data 2:00 - 4:00 due to SO <sub>2</sub> calibration.  |
| 3/23 – 3/31/2015 | Problem with weather transmitter communication module.   |



### **3.2 Quarterly Data Validation**

The quarterly data were assessed as follows: 100% of the validated Quarter 1 data were flagged as “good”. Percent completeness for Quarter 1 was calculated by dividing the number of hours flagged by the macro as “Insufficient Data” for any parameter by the total number of hours in the quarter. Percent completeness for Quarter 1 was 98.02%.