

## ***Section III: Regional Office Polling and Data Review:***

**E-DAS set-up;  
Retrieval, Review, Correction and Storage of Data;  
Report Submission; QA.**

### **QA Plan**

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## **2.8.3 Overview of “in-office” Procedures for Continuous Monitoring**

The Electronics and Calibration Branch (ECB) installs ESC/Agilaire model 8816 (or 8832), data loggers as primary and secondary data loggers at the initial set-up of all ambient monitoring sites. All continuous ambient monitors the state operates collect, store, and average various parameters using the primary data logger (PDL) and are accessible via modem from the regional offices using the electronic data acquisition system software more commonly referred to as “E-DAS”. The hourly averages, along with daily auto cal/span/zero tables can and should be downloaded from the PDL for review by the regional chemist and site operators on a daily basis. This download information can be the first step in tracking instrument deterioration and/or responding to operational problems. The goal of this document is to establish a method of reliably attaining, reviewing, storing, and reporting these records.

### **2.8.3.1 E-DAS Set-Up for Regional Office Polling**

The electronic data acquisition system (E-DAS) software used to access the monitoring sites is produced by Agilaire (formerly ESC-Environmental Systems Corporation). The software needs to be loaded onto a suitable computer with a modem and access to a phone line. Refer to the ESC/Agilaire instructions for compatibility and loading the software.

In ESC/Agilaire parlance, sites are set up (created), then instruments are setup. Once a single site has been successfully set up it can be copied and edited to form new sites. Similarly, once an instrument has been set up, it can also be copied to a new site, and edited to form new instruments (parameters). To setup a site, from the “E-DAS Menu” select:

<**Setup Site Information**> window name “Ambient Configure Site Information “  
Logger ID = *unique two letter code* (sometimes the PDL, or BUDL, see appendix for list)  
Site Enabled = **X** (yes)  
Logger Type = **8816** (with few exceptions)  
Baud Rate = **2400** (some sites 9600 and 19200)  
Time Zone = **05**  
Actual ID = usually, but not always the PDL (must match the “actual” ID code of the instrument that will be polled, *see appendix for listing*)  
Long Site Name = *the real descriptive site name*  
Base Average = **100**  
Extended Average = **75**  
Digital Settings *all blank*  
Dig In Norm Open = **X** (yes)  
Dig Out Norm Open = **X** (yes)

To setup an instrument, select;

<**Setup Instrument Information**> window name “E-DAS Instrument Information”  
select the **site**

select the **parameter**  
select <**OK**>  
refer to the tables below for specific parameter options

Options \ Parameter	TMP	O3	CPS	SO2	25M	25C	25F	CO
Instrument Enabled	<b>X</b>	<b>X</b>	<b>X</b>	<b>X</b>	<b>X</b>	<b>X</b>	<b>X</b>	<b>X</b>
Base Average Enabled	<b>X<sup>1</sup></b>	<b>X<sup>1</sup></b>	<b>X<sup>1</sup></b>	<b>X<sup>1</sup></b>				<b>X<sup>1</sup></b>
Avg. #1 Avg. Enabled								
Avg. #2 Avg. Enabled	<b>X</b>	<b>X</b>	<b>X</b>	<b>X</b>	<b>X</b>	<b>X</b>	<b>X</b>	<b>X</b>
Units	<b>DGC</b>	<b>ppm</b>	<b>ppm</b>	<b>ppm</b>	<b>L/M</b>	<b>Ug/m3</b>	<b>%</b>	<b>ppm</b>
Base Avg. Interval	<b>001M</b>	<b>001M</b>	<b>001M</b>	<b>001M</b>	<b>001M</b>	<b>001M</b>	<b>001M</b>	<b>001M</b>
Base Storage Time	<b>003D</b>	<b>003D</b>	<b>003D</b>	<b>003D</b>	<b>000S</b>	<b>000S</b>	<b>000S</b>	<b>003D</b>
#1 Avg. Interval	<b>015M</b>	<b>015M</b>	<b>015M</b>	<b>015M</b>	<b>015M</b>	<b>015M</b>	<b>015M</b>	<b>015M</b>
#1 Avg. Storage Time	<b>000S</b>	<b>000S</b>	<b>000S</b>	<b>000S</b>	<b>000S</b>	<b>000S</b>	<b>000S</b>	<b>000S</b>
#2 Avg. Interval	<b>001H</b>	<b>001H</b>	<b>001H</b>	<b>001H</b>	<b>001H</b>	<b>001H</b>	<b>001H</b>	<b>001H</b>
#2 Avg. Storage Time	<b>028D</b>	<b>028D</b>	<b>028D</b>	<b>028D</b>	<b>028D</b>	<b>028D</b>	<b>028D</b>	<b>028D</b>
Decimal	<b>0</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>1</b>	<b>1</b>	<b>1</b>

Options \ Parameter	2NO	NOx	xN2	NH3	NO	NO2	NOy	SO2tle
Instrument Enabled	<b>X</b>	<b>X</b>	<b>X</b>	<b>X</b>	<b>X</b>	<b>X</b>	<b>X</b>	<b>X</b>
Base Average Enabled	<b>X<sup>1</sup></b>	<b>X<sup>1</sup></b>	<b>X<sup>1</sup></b>	<b>X<sup>1</sup></b>	<b>X<sup>1</sup></b>	<b>X<sup>1</sup></b>	<b>X<sup>1</sup></b>	<b>X<sup>1</sup></b>
Avg. #1 Avg. Enabled								
Avg. #2 Avg. Enabled	<b>X</b>	<b>X</b>	<b>X</b>	<b>X</b>	<b>X</b>	<b>X</b>	<b>X</b>	<b>X</b>
Units	<b>ppb</b>	<b>ppb</b>	<b>ppb</b>	<b>ppb</b>	<b>ppb</b>	<b>ppb</b>	<b>ppb</b>	<b>ppb</b>
Base Avg. Interval	<b>001M</b>	<b>001M</b>	<b>001M</b>	<b>001M</b>	<b>001M</b>	<b>001M</b>	<b>001M</b>	<b>001M</b>
Base Storage Time	<b>003D</b>	<b>003D</b>	<b>003D</b>	<b>003D</b>	<b>003D</b>	<b>003D</b>	<b>003D</b>	<b>003D</b>
#1 Avg. Interval	<b>015M</b>	<b>015M</b>	<b>015M</b>	<b>015M</b>	<b>015M</b>	<b>015M</b>	<b>015M</b>	<b>015M</b>
#1 Avg. Storage Time	<b>000S</b>	<b>000S</b>	<b>000S</b>	<b>000S</b>	<b>000S</b>	<b>000S</b>	<b>000S</b>	<b>000S</b>
#2 Avg. Interval	<b>001H</b>	<b>001H</b>	<b>001H</b>	<b>001H</b>	<b>001H</b>	<b>001H</b>	<b>001H</b>	<b>001H</b>
#2 Avg. Storage Time	<b>028D</b>	<b>028D</b>	<b>028D</b>	<b>028D</b>	<b>028D</b>	<b>028D</b>	<b>028D</b>	<b>028D</b>
Decimal	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>

<sup>1</sup> ESC/AGILAIRE dataloggers generally allow a 1-minute base average. If it is *enabled*, then one-minute averages can be captured by polling and displayed in E-DAS reports. However, we do not recommend polling the minute data.

The command / tool, **<Copy Site Information>** is useful in setting up new sites by using an existing site as a template.

select the **site** to copy from  
input new site information (logger ID, site name, long site name, etc)  
select the configurations to copy  
Site Configuration = **X**  
Instrument Configuration = **X**  
Calibration Configuration = **X**

**<Copy Instrument Information>** is useful when adding monitors to existing sites or moving monitors between sites. It is probable that instruments will need to be deleted and/or moved to accomplish ‘copy instrument’ tasks successfully.

select the **site** and **instrument** to copy *from*  
select the **site** and **channel** to copy *to*

**<Setup Calibration>** If the calibration routines are copied along with the site and instrument information, then editing the calibration may be all that is needed.

select the **site**  
select the **<New or Change or Delete>**  
from “Change”, select the sequence (ex **O3CAL A** for ozone)

Start time = a date, *backdate* this to a point before the monitor was installed  
Interval = **001D**  
Affected Channels = *data logger channel number(s)* (for ozone usually 02 and 03, “O3” and “CPS”)  
Recovery Time = **005M**

select **<Add Phase or Delete Phase or Modify Phase>**  
from “Modify Phase” select a phase name (all instrument calibration phases are “ZERO”, “LEVEL1”, “LEVEL2”, “LEVEL3”, up to “LEVEL4” if needed)  
Phase Duration = **014M** or **010M** (depending on instrument type)  
Phase Data = **005M** (most instruments type)  
Digital Output = *instrument dependent* (always a pair of numbers, ozone uses “05” and “06” for the “zero”, then “05” and “0#” where # equals the level number. Ex. 05, 03 would be for Level 2 cal)

### 2.8.3.2 Data Review and Correction

To minimize travel, some site operational checks must be made by telephone. Site calls are recommended every working day, and are required 3 times per week at a minimum. Calls to a site can be made at any time; however calling during the first 30 minutes of an hour may disrupt the calls made by the automated polling process of the DMSSB headquarters computer. At a minimum, request the current day's data, and yesterday's data. If calling on a Monday, obtain the Friday and Saturday data as well.

**Note:** Make sure the modem speed (BAUD rate) is set correctly for the corresponding site (i.e. if set to 300 BAUD it will not work usually on a 2400 BAUD). If you are uncertain as to what speed modem your site is operating, call the ECB or DMSSB for assistance. Often times a site operator can call a site if it is set to the incorrect BAUD rate, and the site will NOT respond. This is a common problem and can easily be avoided by making sure the rate(s) correspond.

#### 2.8.3.2.1 Daily Data Retrieval

Data can be retrieved by manually initiating a retrieval sequence or by automatically scheduling the procedure to occur. The automated procedure can be set up in the <Setup> window under the heading <Setup Polling Tasks> and is described in further detail below. The Data Management and Statistical Services Branch (DMSSB) at the Raleigh central office automatically polls all monitoring sites statewide at least every other hour for updating regional AIRNow files and forecasting needs. If an automatic polling routine is selected by the regional office, please limit its frequency to twice a day. In most cases a single polling will suffice.

Two types of remote data retrieval will be most useful to Regional offices, a direct "Link to Logger", and a simple "Manual Poll". Both routines are initiated from the ESC/AGILAIRE Main Menu (window name "E-DAS Ambient Menu" – Tabs: Setup, Reports, Editors, CEM, Graphs, Utilities, Exit). After logging into the E-DAS system, for the **Manual Poll** use the following procedure:

```
select <UTILITIES>
select <MANUAL POLL>
select the site(s) to be polled by highlighting the name in the window at the left
select the data to be returned by checking the appropriate boxes in the center pane of the
window (a minimum of useful information are "Hourly Data", "Calibration Data", and
"Power Failures".
select the "Day" and "Time" to begin and end from the right side of the window
leave the "Acknowledge Data" and "Synchronize Time" boxes unselected (the
'synchronize time' function will cause the site computer to reset to the office/polling
computer, and eventually result in a mis-match between the site computer and
PDL/BUDL).
select <POLL>
```

The system will now dial up the sites and poll the selected sites for the operational parameters assigned to them. If the connection and download window is not visible on the "Desktop" it can probably be found and opened in the Windows Taskbar at the bottom of the screen. Information such as:

"Calling Data Logger : *(name)*"  
"Resetting modem."  
"Initializing modem."  
"Dialing : *site phone number*"  
"Connecting at : *baud rate*"

Followed by:

This is the command string sent to logger:

"@*some string letters numbers symbols letters numbers symbols*"  
"copying strings to database"  
"Response strings written *number of strings* (repeated for each hour downloaded)"  
  
"Hanging up modem"

**Note:** if the telephone line is 'bad' or the modem is not responding, a message of "NACK received from data logger" will appear in the reset/initialize modem phase of the dial up (Nack = not acknowledged).

To begin a direct **Link to Logger** session, log into the E-DAS system and use the following procedure:

select <UTILITIES>  
select <LINK TO LOGGER>  
select the site code of the site to be contacted by highlighting the name in the window.  
select <OK>  
when the communication link is established, the 8816 data logger menu will be displayed. Log in to the data logger :

8816 Home Menu:

Press "L" or use ↓↑ key to highlight **Login / Set User Level** and press <ENTER>  
Press "O" or use ↓↑ key to highlight **Log out / exit** and press <ENTER>

8816 Login Screen:

Enter Password and press <ENTER>

8816 Home Menu:

- H help screen
- L login / set user level
- C configuration menu
- D real time display menu
- R report generation menu
- G graph generation menu
- S status menu
- O log out / exit
- X serial comm to port

Press "C" or use ↓↑ key to highlight **Configuration Menu** and press "Enter" to:

- P set passwords
- S configure system parameters
- D configure (data) channels
- C configure calibrations
- A configure alarms
- O configure analog outputs
- K configure math constants
- E configure dig. event program
- R configure digital I / O
- 1 configure serial protocols

Press "D" or use ↓↑ key to highlight **Real-Time Display Menu** and press "Enter" to:

- V display raw readings
- R display readings w/ units
- F display readings w/ flags
- B last base avg
- C continuous avg report
- L show large text display
- I display digital inputs
- O display digital outputs
- A display analog outputs

To disconnect from the 8816 data logger, press "O" from the "HOME Menu" or use ↓↑ key to highlight **Log out / exit** and press <ENTER>

To schedule an **automated polling** from the “E-DAS Ambient Menu” follow the procedure below:

select <SETUP>  
select <SETUP POLLING TASKS>  
select <NEW> and designate a unique name for the routine  
select the “site(s)” to be polled  
select the “**data type(s)**” to be returned (a minimum of useful information are “**Hourly Data**”, “**Calibration Data**”, and “**Power Failures**”).  
select the “**day(s)**” of the week to run the poll (selecting all days will eliminate the possibility of having ‘holes’ in the data over the weekend)  
polling window : **00:00** to **23:59**  
designate a “last polling time” at which point the computer will stop trying to poll if it is unsuccessful (ex 05:30)  
leave the “**Acknowledge Data**”, “**Synchronize Time**”, “**Pager Enable**” etc, boxes *unselected* (the ‘synchronize time’ function will cause the site computer to reset to the office/polling computer, and eventually result in a mis-match between the site computer and PDL/BUDL).  
If desired, a report to send the data to can be specified here. The report itself will have to be created in the <Report> section of E-DAS.

### **Polling for Minute Data**

In addition to hourly averages, “minute data” can be useful for diagnosing system irregularities or determining the sequence of events that may have led to a problem. Before viewing minute data, it must be retrieved. Remember that the PDL will only retain minute data for a few days before overwriting it, after the data has been overwritten the only access to minute data is by visiting the site and downloading/copying the BUDL. Due to the sheer volume of data present in even a few hours, it is best to narrow the search window as much as possible. Begin by initiating a manual retrieval sequence similar to the ‘daily – hour averages’ described above.

select <UTILITIES>  
select <MANUAL POLL>  
select the site(s) to be polled by highlighting the name in the window at the left  
select the data to be returned by checking the appropriate boxes in the center pane of the window ( “**Minute Data**” )  
select the “**Day**” and “**Time**” to begin and end from the right side of the window  
leave the “**Acknowledge Data**” and “**Synchronize Time**” boxes *unselected* (synchronize time, will cause the site computer to reset to the office/polling and eventually result in a mis-match between the site computer and PDL/BUDL).  
select <POLL>

The system will now dial up the site(s) and poll for the operational parameters assigned to them. If the connection and download window is not visible on the “Desktop” it can probably be found and opened the Windows Taskbar at the bottom of the screen. (see “Viewing Minute Data” at the end of the following section for accessing the data).

### 2.8.3.2.2 Viewing the Data

To view data the <REPORTS> option should be selected from the Main ESC/AGILAIRE menu. Only data that have been downloaded can be viewed. The simplest useful report is the “**Daily Summary Report**”.

select <REPORTS>  
select <DAILY SUMMARY REPORTS>  
select the **site(s)** to be viewed  
select the report’s time-frame type <DAY or MONTH or QUARTER or RANGE> and the actual <DATE>  
select the type of data <“AUXILIARY” or “HOURLY” or “Hly-n-Cal” (= hourly and calibration)>  
select <“VALIDATED” or “RAW”> (essentially the same data set at this point)  
select <VIEW> (look at the data first, multiple sites and/or days will generate significant volumes of paper)  
select <OK>

Other useful reports from the <REPORTS> menu :

“**Flag Report**” - good for “back-constructing” when problems or issues began.

select <REPORTS>  
select <FLAG REPORT>  
select the **parameter** (site and measurement)  
select the **flag type(s)**  
select <OK>

“**Hourly Summary Report**” - useful in comparing sites’ concentration values side-by-side (during an exceedance for example). **Note:** *ALL of the sites* listed in a particular polling computer are returned for the hour and day specified (provided the data have been downloaded.)

Flags are assigned to data to indicate their validity. If no flag follows a value, the datum is assumed accurate and valid. These data are used in all appropriate averages. Compare any flagged data with what is expected to occur (i.e. low data at times of low source emissions, missing data during auto zero/span times). If any of the flagged data appear unusual make a note to check the back up data system during the next site visit. If several values are invalid, a site visit may be needed. If a channel is incorrectly marked **D** (down) (by a previous incorrect action), the data may be valid and you will need to notify headquarters of any valid data to be reported.

- Compare the monitor zero results to the zero for each day.
- Compare the monitor span results to the known calibrator output for each day.
- Review the power failure report.
- Review the log for temperature inside the building.

See the section on “flags” in section 2.8.3.2.3 (correcting data) for complete flag descriptions and review procedures.

### Viewing Minute Data

To view minute data, the minutes must be first polled from the site (Polling for Minute Data in previous section 2.8.3.2.1). From the <REPORTS> option in the Main ESC/AGILAIRE menu there are two avenues for viewing minute type data, “Minute Averages” and “Data Reports”. The simplest report is the “Minute Averages Report” however the more *useful* report is derived from the “Data Reports” selection.

```
select <REPORTS>
select <DATA REPORTS>
select the site(s) to be viewed (must have minutes already downloaded)
select <MINUTE AVERAGES with ALL FLAGS> (do not select “minute averages” the
format for the “... with ALL FLAGS” option is probably more useful than the plain “...averages”
format)
select the report’s time-frame type <DAY or MONTH or QUARTER or RANGE> and the
actual <DATE> (limit requests to a few hours, ranges provide copius quantities of data)
select / check the box “INCLUDE INVALID DATA AVERAGES”
select <“VALIDATED” or “RAW”> (essentially the same data set at this point)
select <VIEW> (look at the data first, multiple sites and/or days will generate significant
volumes of paper)
select <OK>
```

The “Minute Averages with All Flags” generated from “Data Reports” provides access to the otherwise invalid minutes recorded during operations such as audits, calibration checks, and automated nightly calibration routines. The “Minutes Averages Report” and plain “Minute Averages” option will not show the invalid or downed minutes.

### Graphing Minute Data

Graphing the minute data is an excellent way to establish the short term trends of an instrument. The data must of course first be polled (see ‘Polling for Minute Data’ in previous section 2.8.3.2.1). The data can be viewed directly using the <GRAPHS> option in the Main ESC/AGILAIRE menu provided there are no flags associated with the data. If “cal” flags, or channel “downed” flags are present they must be removed in order to be plotted by the graph. In some cases the “Instrument Set-up” will have to be updated on the polling computer to support capturing the data (Base Average, Average #1, Average #2) and displaying it (graph scales).

To graph a data set:

select <**GRAPHS**>  
select <**GRAPHS**>  
select the **site** to be viewed (must have minutes already downloaded)  
select <**DATE**>  
select <**1M am**> or <**1M pm**> for a 12 hour graph of the morning or afternoon points  
select <**GRAPH**> (wait for the graph to retrieve and populate the dataset)

The resulting graph will show a trace of the downloaded minutes. If blocks of data are not visible because of flags associated with them (ex. calibration or downed status), the flags can be removed by editing the block of data from the main ESC/AGILAIRE window.

select <**EDITORS**>  
select <**BATCH EDIT DATA AND FLAGS**>  
select the **site-parameter-interval** that needs to be edited (a single parameter; ex. O3, can have more than one interval; ex. 001M is minute data, 001H is hour data)  
enter the **Date** and **Time** span to edit / correct  
select <**REMOVE THESE FLAGS**> button from the window  
select the flags to remove (ex. “**C**”, “**D**”, “<”, “**I**” )  
select <**OK**>

Return to the Graphing menu and “re-Graph” the points.

### Updating Instrument Set-Up

If a site has not captured minute data previously, or if the set-up file was not updated after sites were converted from SUMX to 8816 data loggers, it may be necessary to update the file before downloading minute data. A ‘set-up’ or ‘site/instrument format’ error message will appear when trying to graph the data. Items in the “**Instrument Set-Up**” to check are:

Base Avg Interval = **001M**  
Avg #1 Interval = **015M**  
Avg #2 Interval = **001H**  
Base Avg Enabled = **X** (yes)  
Avg #1 Enabled = **\_\_** (no)  
Avg #2 Enabled = **X** (yes)  
select <**MORE**> to move to the next window  
enter appropriate scale numbers for that channel (ex. .000 to .250 for ozone, 15 to 40 for building temperature, etc.)  
select **Truncate**  
select <**RETURN**>  
select <**OK**> if “OK” is not selected the changes will not be saved in the set up file

Download the minute data again, view it, and re-graph it.

### 2.8.3.2.3 Correcting Data

The regional office is responsible for data validity. On the first workday of each month, after updating the E-DAS, the DMSSB staff will create the monthly data review report for each pollutant and site. The DMSSB staff will mail the reports to the appropriate regional offices for review and update the tracking file to indicate the data has been sent to the regions. The actions required by the regional staff are:

- to report reasons for missing data;
- to identify invalid data;
- to identify data to be changed by headquarters;
- to validate the data and;
- document any unusual monitor performance.

The Regional Chemist is responsible for assuring that as much hourly data are reported as possible. When the primary data logger does not collect data or the data are invalid for a reason related to the primary data logger, the regional chemist should review the backup data logger data and any associated memo flags (i.e. open, chart stamp, and calibration memos). The BUDL minute data (downloaded from the sites twice a month using E-DAS software) shall be used to reconstruct as many hours as possible for reporting site compliance.

Hourly data must be reported in Eastern Standard Time. (EST). Hourly data are reported at the start of the hour (1:00-2:00 is reported as 1:00).

The regional operator must account for periods of missing or invalid data by identifying the reasons for missing or invalid data on an appropriate data form, generally the monthly data review form. When the data logger data do not meet the acceptance criteria, data are reported manually by the operator using monthly data review reports or revised AQ-42 form.

The regions should submit monthly data review forms to Headquarters within 10 days from the end of the collection month and must submit them within 15 workdays. The Regional Chemist signs, dates, and submits the monthly data review form to Headquarters.

Completeness - Data are considered complete if 75% or more of the total possible number of observations are present. Continuous measurement criteria for completeness are shown below:

<u>Time Interval</u>	<u>Continuous Minimum Number of Observations</u>
Hour Average	45 minute averages
3-hour average	3 consecutive hourly observations
8-hour running block	6 hourly observations of block average
24-hour	18 hourly observations
Monthly	21- 24 daily averages
Quarterly	3 consecutive monthly averages

*Yearly* 9 month average with at least 2 monthly averages per quarter for monitors that run 12 month seasonal for monitors that operate less than 12 months, at least 2/3 of the data for each quarter operated during the monitoring season should be available

*3 year* 90% of the ozone data

Representativeness - Data collected must be representative of the conditions existing at the time of the sample collection. The notes of unusual conditions made by the operator should be considered in validating questionable data. The integrity of the sample delivery system is extremely important in determining the representativeness of the data.

Flags - Symbol/abbreviation flags are assigned to data to indicate their validity. If no flag follows a value, the datum is assumed accurate and valid. These data are used in calculating all appropriate statistics. Flags that do not invalidate data are as follows:

<u>Flag</u>	<u>Meaning</u>
<	Less than 75% data
H,h	"High-high" or "high" alarm
L,l	"Low-low" or "low" alarm
R	"Rate-of-change" alarm

Flags used to indicate invalid data are as follows:

<u>Flag</u>	<u>Meaning</u>	<u>Priority</u>
P	"Power Failure"	Highest
D	"Disabled"	
B	"Bad status input"	
C	"Calibration"	
T	"ouT of Control"	
U	"Analog Under range"	Lowest

Data accumulated under the above conditions will be flagged and considered invalid. If bad data from "D", "B" and "C" indications exceed the threshold level, the average data for that time interval will be also flagged and not used in calculating the next valid larger time interval. The auditor needs to validate these hours by checking that the backup data logger's values are similar and thus the data appears valid. If one of these flags shows up and there are more than 45 valid minutes, invalidate only the minute data.

Data Flag Definitions

< Less than 75% required for valid average, shows a power interruption of less than 15 minutes or less, does not meet requirement for valid average

**H,h** high-high or high alarm limit exceeded, main flow and/or auxiliary flow outside limits, numerical value; if average is equal to or exceeds this value

**L,I** low-low or low alarm limit exceeded, main flow and/or auxiliary flow outside limits, numerical value; if average is equal to or less than this value

**R** rate of change limit exceeded, numerical value; if difference between the previous reading and the current reading is equal to or exceeds this value

**P** power failure of > 15 minutes

**D** channel disabled (marked offline), maintenance and repairs, includes filter change, precision checks, and audits

**B** bad status detected, power to monitor is out for a short time, data logger is still working

**C** maintenance and repairs, includes filter change, precision checks, and audits

**T** out-of-control tolerance exceeded (calibration data), equipment malfunction

**U** analog under range, signal is reading below low signal input/output set range (4 – 20Ma), data not included in the averaging

**I** Invalid, shows up in conjunction with data that, for example, may not satisfy 75% completeness (ex. an hourly average given and flagged “C” as well during an audit)

### **2.8.3.3 Reports and Back-Up Data Archive**

The Regional offices are required to submit reports verifying and correcting data on monthly and quarterly schedules. There are also responsibilities for “backing-up” the data collected at the monitoring site and storing (archiving) it at the regional office.

#### **2.8.3.3.1 Precision Reports**

Precision checks are performed and reported to Headquarters’ (AQ 98 forms) by the regional staff. 40 CFR 58 Appendix A requires at least one check every two weeks (14 days). At the end of the quarter, the operator will complete a precision report form (AQ 98) and forward the form to the regional chemist for further review and submittal to Headquarters. The operator must review the precision findings and take appropriate actions based on the Operator’s section of this procedure. The regional chemist must submit the precision forms to central office 10-15 working days after the end of the quarter.

For the continuous monitors CO and NO<sub>y</sub>, the operators must not perform manual checks or calibrations between 6:00 AM and 9:00AM “Local Standard Time”. This is an important data collection period. For ozone monitors, the operator must not perform manual checks or calibrations after 11:00 AM “Local Standard Time”.

#### **2.8.3.3.2 Exceedance Reports**

The Ambient Monitoring Section, Practices and Procedures Branch staff reviews the hourly data and maximum averages for each continuous site daily. **If any averages are found to exceed the daily National Ambient Air Quality Standards**, the Regional Chemist will be notified that a potential exceedance has occurred at a site.

The Regional staff is required to collect, verify, and provide the monitoring data and supportive instrument performance checks for the date or dates that the potential exceedance(s) occurred. The Regional Staff will provide data from the PDL, BUDL, and copies of logbook pages attached to an AQ-124 Exceedance Report. The required information includes:

1. Copy of the immediate previous Calibration (Logbook).
2. Copy of the immediate previous Calibration Check (logbook).
3. Copy of the daily auto-calibration; immediately previous to, and following, the exceedance day.
4. 1-Hour average data printout for the entire 24-hour day of the potential exceedance.
5. Complete the AQ-124, keep a copy of the report, and **send the original to DAQ Ambient Monitoring within three weeks** of receipt of a request for the Exceedance Report.

These exceedance reports with accompanying data are part of the permanent records maintained by the DAQ for each monitoring site.

Note: Ozone and PM2.5 exceedances in NC may be episodic (2-3 consecutive exceedance days). For ozone, the same Manual Adjusted Calibration and Unadjusted Calibration Precision Checks will encompass multiple exceedances.

Note: DAQ Ambient Monitoring may request additional checks to help validate any exceedances. The Regional Staff are required to respond to these requests as soon as possible. Requests may include site visits, on-site unadjusted calibrations, or other instrument checks for the reporting site.

#### **2.8.3.3.3      Systems Audit**

A systems audit report will be generated by the Project and Procedures Branch (PPB) once a year. Each regional office is expected to support the PPB in evaluating the monitoring activities of its region. Procedures will be checked for methods and equipment; installation of equipment; calibration; zero/span checks; operational checks, frequency of checks; control limits for zero, span, and other checks; maintenance, quality control for episodes; data validation and recording; and quality control documentation. The annual audit will then be submitted to EPA who will review the findings.

#### **2.8.3.3.4      Back-Up Data Archive**

The Regional staff should back up the secondary (BUDL) data loggers on permanent storage media (diskette, CD, zip-drive) twice a month, during routine site visits. Refreshing the back-up media at every site visit is preferred, but not required. Due to problems *reading* the back-up data after the fact, the site configuration files *must* be downloaded with data. This is *especially important* at larger, more complex sites where the configurations tend to change often.

The regions shall keep backup data for a minimum of 18 months. All media will be labeled so as to identify; the site, the month of data recorded, and the actual date the backup was created.

The regions do not need to send the backup diskettes to Raleigh Headquarters unless requested by the DMSSB. Every month, DMSSB initiates a data review by printing a raw data report for each field office. Each month, the Regional Offices *will be requested* to send the additional instances of BUDL data *that are needed beyond* what is needed by DMSSB for verifying the missing value imputations supplied by the field office. Whichever files are summoned will be FTP'd to the central office by the same deadline that is established for returning the raw data review.

Backup data loggers are to be stored to disk as follows:

- Open the BUDL window,
- Log in, password < [REDACTED] >.
- Select <Utilities>.
- Select <Copy File>.
- Select <Data Files>.
- Select <Minute Data>.
- Select <Range>.
- Select the <Start Date>.
- Select the <End Date>.
- Select the drive to copy the data to.
- Insert a disk / zip disk / usb drive, and
- Select <Copy>.
- If using a disk, label with the following information: site, month data was recorded, date backup was created, operator name.

#### **2.8.3.4 Laptop Computer and E-Logbook Archive**

The site operators shall keep the site-specific logbook current. All sites have a hardbound notebook to document site visits and activities. All data, including logbooks and supporting printouts must be kept for five years.

In addition to the “hard-copy” site logbook, the State is moving towards /has moved to implementing electronic logbooks (E-logs). E-log data, spreadsheets, site documents, and /or notes should be downloaded on a weekly or bi-weekly basis to either the operator’s desk PC (if the laptop is not their sole computing resource) or to the Region’s network. *All* E-log documentation *must be* downloaded at least bi monthly.

E-logs for PM2.5, Speciated PM2.5, PM10, TSP, TEOM, NOy, SO2, **SO2tle**, Ozone, CO, and HSCO can be found on the DAQ internal and external web pages. From the internal page scroll down to the “Ambient Monitoring Section”, click on “Quality Assurance Logbooks/Forms”, and

scroll down the table to find the document or logbook needed. Click on the file or spreadsheet to save/download it the location or file desired by the user.

*Further details will be provided as more logbooks and instruments are deployed.*

### **2.8.3.5 Quality Assurance Procedure Overview**

The major part of the monitoring technician's role in the Quality Assurance Program is the carrying out of his/her duties in accordance with the preceding operating procedures and performing the precision checks and timely data validation. This section is an overview of those responsibilities. Quality Assurance (QA) plans can be found on both the DAQ internal and external web pages. From the external page, scroll down to the "Monitoring Data" section, click on "more", scroll down and click "Quality Assurance Plans", and scroll down the table to find the document or logbook needed. Click on the file or spreadsheet to save/download it the location or file desired by the user.

**Precision checks.** Every two weeks (**EVERY 14 DAYS OR LESS**), a single point precision/calibration check in the specified range for the instrument/analyzer in question is required. Because a precision/calibration check is required every two weeks, the precision point from this calibration check is used. Document the precision point results on the appropriate data sheet or e-log and send the information to Headquarters for each quarter using the appropriate form.

The Regional Chemist should verify that all precision/calibration checks are conducted as required.

**Accuracy Auditing.** Accuracy audits will be performed by the ECB, at least once per year for each continuous monitor. Some monitors will be audited more frequently depending on the pollutant's NAMS, SLAMS status. The auditor (ECB) is not required to notify the site operator in advance, but may do so in order to avoid conflicts (with the operator's regularly scheduled precision check, for example).

**Interagency Auditing.** Interagency audits may take place between the DAQ and Local Programs. Also, U.S.E.P.A. Region IV may schedule audits for various parameters throughout the year. Personnel from the regional office, ECB, and PPB, should participate as requested.

#### **Audit Evaluation and Corrective Action.**

For the accuracy audit, corrective action should be initiated by the Project and Procedures Branch supervisor, and documented at the bottom of the AQ121 Audit Form. An investigation must be undertaken to determine the cause of unusually poor audit results when any result exceeds a  $\pm 15\%$  difference (or the window specified by a pollutant's particular QA requirements). Documentation of the correction will be provided to the Section Chief, with the QA report.

**Data Verification.** Data validation must be conducted by the operator on a routine basis according to section 2.8.3.4 of this QA plan. The Regional Chemist is responsible for the data verification activities as requested by headquarters.

**Systems Auditing.**

The regional technicians and chemists should participate in the annual systems audit and should complete any systems audit forms provided by headquarters. PPB staff will perform the audits either by pollutant (one PPB staff for assigned to a pollutant visiting all offices) or by regional office (one or more PPB staff visiting a regional office and reviewing all pollutants). Ozone will be 'system audited' as soon as reasonably possible after the ozone season ends to certify data for planning and modeling purposes, usually during November and December.

**Trace Level and NCore Monitoring.**

Some regional technicians and chemists will be participating in future rollouts of monitoring instruments that support National Core monitoring strategy (NCore). Some of this instrumentation is in its infancy in terms of development, and reflects an overall shift in the purpose of ambient monitoring. As a result, the quality assurance standards, the methods of operation and collection, and the methods of interpretation and review are changing to meet these new goals. Basic rules for review and ensuring high quality data still apply, but at this time the individual instruments' *QA Plan for OPERATION* should be consulted for details.

**Appendix for E-DAS Site Names, Logger Codes, and Actual ID's**

Site Name	Logger ID	Actual ID	Site Name	Logger ID	Actual ID
Lexington Airport	AL	LA	Legget	LG	LT
PCS Aurora	AP	PS	Lenoir (City)	LN	LR
Arrowood	AW	01	Latham Park	LP	LK
Bent Creek	BC	BC	LexingtonWaterTower	LX	LX
Board of Education	BE	BE	McLeansville	MC	MV
Bushy Fork	BF	BK	CSS Millbrook	MG	MF
Butner	BT	BR	Mendenhall	MH	MH
Bryson	BY	BN	Mt Mitchell 2006	MI	MI
Camden	CA	CN	E.Marion Middle Schl.	MJ	MJ
Crabtree	CB	CJ	Millbrook	ML	MK
Clinton Crops	CC	CR	Monroe Middle Schl.	MM	MR
Castle Hayne	CH	CT	Mt. Mitchell	MT	MI
Cooleemee	CM	CZ	Peters Creek	PC	PC
County Line [ 8832 ]	CO	03	Purchase Knob	PK	PN
Durham Health	DC	**	Pollirosa	PO	
Duke Street	DS	DT	Shiloh Church	SC	SC
Dillard School	DM	DM	Sophia	SO	SH
Duke Street	DS	DT	St. Augustine	ST	**
Fayetteville ABCStore	FA	FL	Barnett Knob	T1	T1
Fryingpan	FP	FN	Taylorville	TA	TL
Farmville	FV	FE	Bethany	UB	BH
Fairway	FW	FI	Cherry Grove	UC	CG
Golfview	GL	GW	Enochville	UE	NL
Grier Middle School	GM	GM	Franklinton	UF	FT
Gaston (Lake)	GN	**	Hattie Avenue (UAM)	UH	HV
Garinger H.S.	GR	18	Crouse	UL	CS
Gaston County	GS	**	Pittsboro	UP	PR
Hattie Avenue "A"	HA	HA	Fuquay	UQ	FY
Hattie Avenue "B"	HB	HB	Rockwell	UR	RL
Hickory	HC	HC	WRAL Tower	UT	WR
New Hanover	HN	NR	Union Cross	UX	UC
Joanna Bald	JB	JB	Clemmons Mdl. Schl.	VC	CM
Jamesville	JV	JE	Wade	WD	WA
West Johnston	JW	WS	Montclair [ 8832 ]	WE	20
Kenansville	KE	**	Waggin Trail	WG	WG
Lenoir Com.College	LC	LO	William Owen Schl.	WO	WO
Linville Falls	LF	LL	Waynesville	WV	WL

Sites are added and removed as needed and directed. Several sites on this list are no longer operating but are included for historical reference and future re-instatement. Also, sites that when last active used SUMX data loggers are listed in the Actual ID as "\*\*". Several sites are not state of North Carolina sites (Forsyth County and Mecklenburg County sites) but are polled by DMSSB for AQ Index and forecasting purposes.