APPENDIX A
EXAMPLE AUDIT REPORT

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EXAMPLE AUDIT REPORT

The audit report includes a summary of the findings from assessing the data, procedures, and results from the interviews held with the inventory project team members. Recommendations for corrective actions are discussed immediately after the audit; however, a formal report which summarizes the auditor's activities and findings should be distributed within two weeks. The example shows the format and information that could be included in a technical systems audit report which summarizes the findings from a site visit and QA training session.

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AUDIT REPORT

TO: Project Team

FROM: Auditor's name

DATE:

SUBJECT: **Technical Systems Audit and Quality Assurance Training of State Air Agency's Ozone and Carbon Monoxide Point Sources Emissions Inventory Development Program**

1.0 INTRODUCTION/BACKGROUND

Under the Clean Air Act Amendments (CAAA) of 1990, state and local air pollution agencies are required to inventory emissions contributing to National Ambient Air Quality Standards nonattainment, including ozone and carbon monoxide (CO), using 1990 as the base year. Because the data will serve as the basis for State Implementation Plans (SIPs), the inventories must be accurate and complete.

On *date*, a technical systems audit and quality assurance (QA) training session were conducted by the Project Quality Assurance Coordinator (QAC) at the state air agency office. The audit and training are part of the QA program designed to help produce an accurate and complete point sources inventory.

The state air agency works with contract personnel on the development of the point sources inventory. The state collects data from permitted sources, assesses its accuracy, and determines seasonal adjustments of total emissions. Contractors perform the same tasks for nonpermitted sources. The data collected by the state air agency are then entered into the

State Implementation Plan Air Pollution Inventory Management System (SAMS) database for range checking and emissions calculations. The emissions data from both the contractor and the agency are combined to yield a final point sources emissions inventory report.

A draft of the QA Plan for the state was discussed with the State Emissions Inventory Development Manager and approved a week prior to the audit. Because the QA Plan was not approved and distributed to the inventory development team prior to commencing the inventory activities, the auditor did not expect to find complete compliance with the approved quality control (QC) procedures. However, the QC and documentation procedures in use at the time of the audit were assessed and compared to the QA requirements established by the United States Environmental Protection Agency (EPA) for emissions inventory development work. The ultimate goals of the QA/QC program developed for emissions inventory development are data accuracy, procedural consistency, and good documentation of the data and all inventory development activities. When the potential for problems or deficiencies in the QC program were found, recommendations were made by the auditor for improvements.

2.0 AUDIT PROCEDURE

The technical systems audit was the first of two audits to be conducted in the state. The objective of this audit was to review and assess the effectiveness of the QC procedures established and implemented in the following areas:

- Data collection;
- Data analysis;
- Data documentation;
- Data management;

- Personnel training; and
- Senior technical supervision.

All survey forms received from permitted facilities are forwarded to the State Emissions Inventory Development Manager and maintained in a master data file. The survey forms are later forwarded to the inventory staff members. Each person prioritizes the data and focuses more attention on data from those facilities known to be high emitters. The information recorded on the survey forms are assessed for completeness and reasonableness. Calls are made to the submitter, if needed, to request or clarify data prior to making seasonal adjustments and totaling emissions results.

During the audit, the auditor met with each person involved in permitted sources inventory development and asked them to describe the procedures followed after data are forwarded from the State Emissions Inventory Development Manager. Some personnel were asked to review, analyze, and enter data into the SAMS database. While this was being done, the auditor assessed each person's experience using the database and ease in assessing the information recorded on the forms. Data documentation procedures, data management procedures, and use of senior technical resources were also evaluated. The findings from these individual assessments and the recommendations to improve the QC procedures are presented in the next section of this report.

3.0 AUDIT FINDINGS

The auditor confirmed the use of sufficient adequately trained personnel and the presence of sufficient senior technical supervision to develop an accurate point sources inventory. However, additional trained personnel would help the staff meet the tight deadline imposed by EPA and provide a more objective validation of the data.

Data documentation procedures could be improved to facilitate referencing data obtained via telephone or added/corrected as a result of engineering judgement. The improvement in data documentation would also facilitate reconstruction of inventory development activities and thus provide a means to more thoroughly assess data quality and the accuracy of the inventory.

The data produced by each inventory staff member are not peer reviewed. According to the State Emissions Inventory Development Manager, limited time and personnel resources will not allow this objective validation of the data; therefore, more effort is being placed on technical over-sight during inventory development.

Although the audit findings do not suggest major deficiencies in the QC program, recommendations for improvement were made to further verify the accuracy of the results and integrity of the data.

4.0 RECOMMENDATIONS TO IMPROVE THE QUALITY CONTROL PROGRAM

As a result of the audit findings, recommendations are being made to improve the QC program. These recommendations will be discussed with the State Emissions Inventory Development Manager and the EPA Project Officer prior to implementing any revised procedures. Upon agreement, the procedural changes needed to provide the quality of data and level of documentation expected by EPA will be implemented by the staff and verified by the auditor during the next audit.

The auditor's recommendations are as follows:

4.1 Develop and standardize a procedure for rounding numbers in order to provide consistency in calculating and reporting results

During the audit, the auditor evaluated the calculation of seasonal data and other derivations by inventory development team members and found inconsistencies in the rounding of numbers. Although these inconsistencies will not grossly impact the accuracy of the final emission results, a consistent approach to rounding numbers is recommended. Clarity and consistency are data quality goals that are encouraged by EPA.

4.2 Develop and implement standard procedures for documenting and correcting data on the survey forms and in notebooks

The inventory staff members are documenting data very well; however, a set of guidelines for this documentation would improve data retrievals and help reconstruct inventory development activities. The following guidelines should be considered:

- **Document data in black ink because it photocopies well.** Several colors of ink and pencil are being used to record data in notebooks and on the survey forms. Data could be inadvertently lost if the raw data are copied because some ink colors and pencil entries do not reproduce well.

- **Distinguish between data recorded by the submitter and data recorded by the inventory staff members.** Data recorded on survey forms are not always initialed and dated when recorded by inventory staff members on the survey forms. It will be difficult to reconstruct inventory development activities if one cannot determine the source of the data entries. The validity of the data may also be questioned if the source of the information is unclear.

- **Do not obscure original entries when correcting data so that all inventory development activities can be reconstructed.** Some data corrections are made by using correction fluid or erasing pencil entries.

This practice may compromise the integrity of the data. Being able to determine the original entry, the reason for the correction, and the identity of the person revising the data enhances the validity of the correction. Corrections should be made by drawing a single line through the data and entering the correction next to, above, or below the original entry. If the data on a form includes entries by more than one person, corrections should be initialed and dated.

- **Assign book and page numbers to the notebooks used to record information received by telephone and information regarding other critical inventory development activities.** Data are currently documented in spiral stenographer notebooks. Because the books are not paginated and assigned unique identification numbers, it is difficult to reference the source of information when data are transcribed to the survey forms. Book and page numbers can be used as references on the survey forms when there is a need to verify data sources or provide clarifying comments.

- **For consistency, develop a standard procedure that describes the data to be recorded in the notebook and on the survey forms.** The type of information recorded in the notebooks and on the survey forms varies between the inventory staff members. If the type of data to be recorded in the notebooks and on the survey forms are clarified and standardized for all inventory staff members, it would be easier to validate the accuracy of the data that are finally entered into the database to calculate the emissions.

- **When information is received via telephone, document the name of the contact person and date the data are received.** Information received by telephone is often recorded on the survey form or in notebooks without providing the name of the person contacted or the date the information was received. To allow verification of the data, the source must always be provided. The date allows the reviewer to reconstruct the activities associated with data collection and analysis. The ability to reconstruct these activities will provide a means of further assessing data quality and accuracy.

4.3 Require the establishment of a file folder for each survey form as it is forwarded to the staff member and the maintenance of the survey form in the folder as the data are analyzed to help avoid data loss

Inventory staff members have devised different procedures for maintaining survey forms received from the State Emissions Inventory Development Manager. The organization of the data and handling practices ultimately determines how complete the master file will be after the inventory is developed. Forms kept loosely on a desk or in desk drawers could be easily misplaced. The maintenance of the forms in folders with the identification of the facility clearly marked will help improve data management procedures and help prevent data loss.

4.4 Document all inventory development training

Although the documentation of training may not be a state requirement, training records further qualify the data by verifying that the personnel developing the inventory are adequately trained to perform the duties assigned. According to the State Emissions Inventory Development Manager, training was provided by having less experienced persons work with a more experienced person until their performance was at a level that did not require direct supervision. Because this training further qualifies a staff member to make technical judgements, it should be verified in writing. The documentation should include the dated signatures of the trainer and trainee, a description of the training, training dates, and the date the trainee was considered to be performing at a level that allowed him/her to independently assume inventory development responsibilities.

5.0 DISCUSSION

A discussion of the findings related to data collection, data analysis, data documentation, data management, personnel training, and senior technical supervision are presented in this section of the audit report. As mentioned earlier, the audit findings and recommendations to improve the QC program were discussed with the State Emissions Inventory Development Manager immediately after the audit.

5.1 Data Collection

The survey forms are forwarded to the State Emissions Inventory Development Manager and the data receipt information is logged into a database. After the receipt of the data is documented, the data are assigned to personnel responsible for the geographical area within which the facility forwarding the survey form is located.

The database provides adequate tracking of the completeness of the responses from the permitted sources. The database can also be used to assess the completeness of the master data file. No recommendations for improving the existing data collection procedures were made.

5.2 Data Analysis

After receiving the data, each staff member assesses the completeness of the form and reviews the information provided for reasonableness. Seasonal adjustments are made and total emissions are manually calculated. The units are checked for consistency and compatibility with those used in the SAMS database. Calculated results are added to the survey form and the information required to calculate emissions is entered into the SAMS

database. If the results are out of range, they are not accepted by the system. Data appearing to be unreasonable are double-checked by calling the facility contact person. No recommendations were made to improve the data analysis procedures.

5.3 Data Documentation

As data are manually calculated or received via conversations with the submitter, inventory staff members record the information directly on the survey forms or in a spiral stenographer notebook. The notebooks are not uniquely numbered or paginated. The information recorded in the notebook or on the survey forms varied between the inventory staff members. Some inventory staff members recorded the information received by telephone in the notebook and then transferred it to the survey forms. Others recorded the information directly on the survey forms. Others only recorded information from telephone conversations held with permitted source personnel in the notebook.

Additional data documentation concerns that led to recommendations for improvement included:

- Not always including the source, date, and initials of the person adding data to the survey forms;
- Using correction fluid; and
- Not using black indelible ink to record data.

Recommendations were made to standardize the data documentation procedures so that data are easy to review and calculated results are easily verified. Recommendations were made to help validate the accuracy and integrity of the data used to calculate emissions results and facilitate the reconstruction of emissions development

activities. The auditor also recommended the use of bound rather than spiral notebooks for future work to help avoid data loss.

5.4 Data Management

Data are managed by each staff member in his/her designated office area until they are filed in the master data file. Most of the survey forms are kept loosely in a desk drawer or mail tray. In order to help eliminate the possibility of the data being misplaced or lost and improve the completeness of the master data file, the auditor made recommendations to improve data handling and management procedures.

5.5 Personnel Training

All personnel appeared to be adequately trained to perform the tasks reviewed during the audit. The technical accuracy of engineering judgement and data analysis were not assessed; however, familiarity with the database, priority of the data, and use of EPA guidance material were verified to be acceptable. All personnel appeared to be readily able to use the database and move between screens when explaining how data entries were made.

The State Emissions Inventory Development Manager commented that the training conducted on his newest employee was not documented; therefore, a recommendation to document this training in the personnel files was made. Each staff member was very confident about his/her abilities to perform the tasks assigned.

5.6 Senior Technical Supervision/Peer Review

All staff members spoke very highly of the accessibility of senior technical advice from the State Emissions Inventory Development Manager. When there are questions about the acceptability of the data, the manager is asked to make the final decisions. No recommendations to improve the system were made because the staff members and the auditor agreed that adequate supervision is provided.

6.0 QUALITY ASSURANCE TRAINING

The QA training provided by the QAC included an overview of basic QC principles related to the inventory development process and a discussion of the sections of the project QA Plan that are applicable to point sources inventory development. The bulk of the presentation was taken from material developed by the auditor along with EPA's Emissions Inventory Branch, Technical Division. An EPA representative presented this material at an inventory development training session held last year. An outline of the presentation is included as Attachment A. The outline and over-heads were distributed during the training session.

The training session was attended by the State Emissions Inventory Development Manager and other inventory staff members. Based on the comments made by the staff members during the audit, the information provided was helpful, although it would have been more useful had it been presented during the planning phase of the work. Interest was also expressed in more EPA training on emissions inventory and QA program development.

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ATTACHMENT A

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OUTLINE: STATE AIR AGENCY SIP EMISSIONS INVENTORY DEVELOPMENT
QUALITY ASSURANCE TRAINING SESSION

Presenter: QAC

I. Introduction
- A. Objective of training session and systems audit
- B. Purpose of QA Plan and encouragement to implement it

II. Definition of key terms
- A. Quality assurance and quality control
- B. QA Plan
- C. QA Coordinator
- D. Systems audit

III. Purpose of Emissions Inventory QA Program
- A. Reduce Errors
- B. Maximize consistency in inventory preparation
- C. Improve data documentation, accuracy, and completeness
- D. Foster confidence in data
- E. Facilitate inventory review process
- F. Decrease inventory development cost

IV. Technical Considerations
- A. Planning
  1. Resources for QA
  2. Personnel training and project staffing
  3. Standardizing inventory development procedures
  4. Prioritizing data
  5. Development of data validation procedures
- B. Data Collection and Analysis
  1. Reputable data source
  2. Documentation of data reduction and calculations
  3. Senior Technical Review
  4. Completeness assessments
- C. Data Handling
  1. Logging upon receipt
  2. Maintenance of a master data file

3. Coding and tracing data to monitor completeness and facilitate retrievals
4. Data corrections

D. Reporting
E. Internal and External (EPA) Systems Audits

V. Previous Problems with Inventories
A. Double counting of point sources
B. Poor data organization
C. Incomplete inventory

VI. Successful Inventory Development Procedures
A. Use of standard forms
B. Documentation of validation procedures
C. Use of the EPA guidance to develop and implement a QA/QC program
D. Independence of the QA Coordinator from inventory development activities