FY14-15
PGA FY14-01
Task 3.4.1
Amendment #2

Oil and Gas Production Emissions from Conventional Wells in AACOG Counties for 2012 and 2018

QUALITY ASSURANCE PROJECT PLAN (QAPP)

Category III

July 6, 2015
Revision 0

Prepared by:
Alamo Area Council of Governments

PREPARED UNDER A GRANT FROM THE
TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

The preparation of this report was financed through grants from the State of Texas through the Texas Commission on Environmental Quality.
The content, findings, opinions and conclusions are the work of the author(s) and do not necessarily represent the findings, opinions or conclusion of the TCEQ.

CONTRACT #582-14-40051

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APPROVAL SHEET

This document is a Quality Assurance Project Plan (QAPP) for Oil and Gas Production Emissions from Conventional Wells in AACOG Counties for 2012 and 2018.

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During the course of the project, any revision to the QAPP will be circulated to everyone on the distribution list. Paper copies need not be provided to individuals if equivalent electronic information systems can be used.

1 PROJECT DESCRIPTION AND OBJECTIVES

AACOG has prepared this Category III Quality Assurance Project Plan (QAPP) for the Texas Commission on Environmental Quality (TCEQ) following EPA guidelines. The nature of the technical analysis and tasks to be conducted as part of this project are consistent with quality assurance (QA) Category III – National Risk Management Research Laboratory (NRMRL) QAPP requirements for secondary data projects. This QAPP is in effect for the duration of this project, July 15, 2015 through March 15, 2016.

1.1 Purpose of Study

The Clean Air Act is the comprehensive federal law that regulates airborne emissions across the United States. The Clean Air Act charged the U.S. Environmental Protection Agency (EPA) to establish National Ambient Air Quality Standards (NAAQS) to protect public health. In response, the EPA has set standards for six common air pollutants that are associated with adverse effects on human health. The six pollutants are known as “criteria pollutants.” Criteria pollutants include ozone, particulate matter, carbon monoxide, nitrogen oxides, sulfur dioxide, and lead. Select air monitors in Texas are calibrated to measure official concentrations of ozone, and in Bexar County (San Antonio), ozone has been recorded in concentrations above the current 75 part per billion national standard. However, the timing of the violations in recent years was late enough in the NAAQS review cycle that the region has not been designated as a nonattainment area.

The purpose of this study is to provide local, current air quality information suitable for analysis, forecasting, and decision making. Local and state air quality planners need an accurate account of ozone pre-cursor emissions to conduct analysis that determines the emission reductions required to bring the area into compliance with the National Ambient Air Quality Standards. The compilation of oil and gas production emissions inventory will provide updates to the regional and state inventory, providing a greater understanding of the impact on local air quality. By understanding the various sources of ozone precursor pollutants, planners, political leaders, and citizens can work together to protect health and the environment.

1.2 Project Objectives

The objectives of this study include:

- Developing a 2012 base year and a 2018 projection for non-point air emissions inventory from conventional upstream onshore oil and gas production sites for AACOG’s 13 county region;
- Documenting data, procedures and results in a final technical report; and
- Creating baseline and future year electronic files appropriate for input into TCEQ-selected photochemical modeling episodes.

2 PROJECT ORGANIZATION AND RESPONSIBILITIES

2.1 Responsibilities of Project Participants

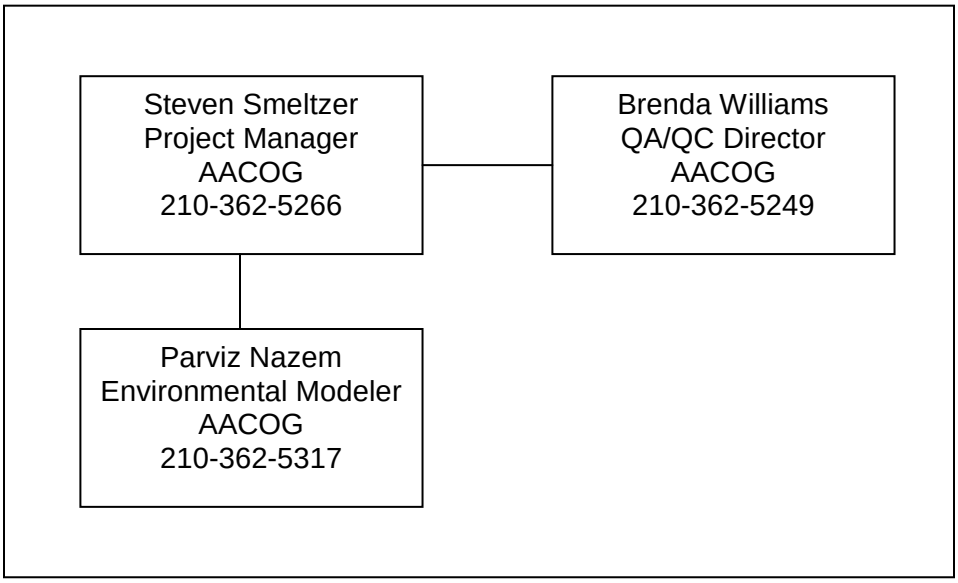
This study will be conducted by the Alamo Area Council of Governments (AACOG) under contract 582-14-40051-FY14-01 with the Texas Commission on Environmental Quality (TCEQ). Staff working on this project and their specific responsibilities are listed below. "The project manager is ultimately responsible for assessing whether the performance and acceptance criteria for the intended modeling use were met and works iteratively with the intended users of the results."[1]

Table 2-1: AACOG's project team participants and their responsibilities.

Participant	Project Responsibility
Steven Smeltzer	Project manager and expert on developing emission inventories. He will ensure the project implementation follows all contract requirements and that project quality standards are met on all deliverables. He will assist in interactions with TCEQ as required.
Parviz Nazem	Expert on developing emission inventory and will be responsible for collecting and analyzing raw production data
Brenda Williams	Expert on emission inventory and will be responsible for implementing project review and quality assurance

In addition, TCEQ staff will participate in the review of the technical documentation generated during this project.

2.2 Project Organization Chart



[1] EPA, December, 2002. "Guidance for Quality Assurance Project Plans for Modeling EPA QA/G-5M". EPA/240/R-02/007. Washington, DC. Available online: http://www.epa.gov/quality/qs-docs/g5m-final.pdf. Accessed 02/13/2014.

2.3 Project Schedule

Emission inventory development will be performed in three steps: (1) update of a 2012 non-point upstream oil and gas production emissions inventory from conventional wells for AACOG's 13-county region, (2) update of a 2018 non-point upstream oil and gas production emissions inventory from conventional wells for AACOG's 13-county region, and (3) update of EPS3 format input files for the 2012 and 2018 non-point upstream oil and gas production emissions inventory. The table below shows the project's deliverable dates.

Table 2-2. Summary of project schedule and milestones.

Work Element	Deliverable Date
Deliverable 3.4.1: QAPP	
Drafts submitted to TCEQ for review and approval	July 15, 2015
Deliverable 3.4.2: Final Report	
Draft report	February 28, 2016
Final report	March 15, 2016
Deliverable 3.4.3: Electronic Input Files	
Draft EPS3 files	February 28, 2016
Final EPS3 files	March 15, 2016

3 SCIENTIFIC APPROACH

3.1 Methods

This study will include emissions related to upstream oil and gas production from conventional wells. This includes operating the wells that bring crude oil, natural gas and condensate to the surface. Once the product is collected from the well, emissions might be released at well sites from compressors, flares, heaters, and pneumatic devices. There can also be significant emissions from equipment leaks, storage tanks, and loading operations fugitives. The emissions inventory will not include well production resulting from horizontal drilling, which is used in shale formations. Upstream oil and gas production sources of emissions include:

- Wellhead compressors
- Artificial Lift (pumpjack) engines
- Flares
- Heaters
- Dehydrators Flash Vessels and Regenerator Vents
- Storage Tanks
- Fugitives (Leaks)
- Loading Fugitives
- Well Blowdowns
- Pneumatic Devices

3.2 Data Needed

Data used for this project will be as comprehensive as possible to include reliable sources such as surveys, reports, or databases that can be used to determine emissions from conventional oil and gas activities in the AACOG region.

Data needed include:

- Production quantities, location and type (oil or gas) of conventional wells
- Emissions sources
- Source-specific emission factors

3.2.1 Sources of Data to be Used

A variety of data sources will be used to estimate emissions for conventional oil and gas wells. The emissions estimates will be based on data used from methods developed by the Eastern Research Group (ERG) in their study *Characterization of Oil and Gas Production Equipment and Develop a Methodology to Estimate Statewide Emissions*[2], prepared for the Texas Commission on Environmental Quality (TCEQ) in 2010. ERG's 2010 study is based on TCEQ data from surveys or similar sources, ERG-derived data and the following publications' methods and data:

- *Natural Gas Compressor Engine Survey for Gas Production and Processing Facilities*[3] prepared for the Houston Advanced Research Center (HARC) by the Eastern Research Group (ERC);

[2] Pring, M., Hudson, D., Renzaglia, J., Smith, B., & Treimel, S. (November 24, 2010). Characterization of Oil and Gas Production Equipment and Develop a Methodology to Estimate Statewide Emissions, prepared for TCEQ (ERG No. 0227.03.026). Morrisville, NC: Eastern Research Group, Inc.
[3] Clinton, B., Heaney, M. (October 5, 2006). Natural Gas Compressor Engine Survey for Gas Production and Processing Facilities, prepared for HARC. Morrisville, NC: Eastern Research Group, Inc.

- *Recommendations for Improvements to the CENRAP States' Oil and Gas Emissions Inventories*[4] prepared for CENRAP by Environ;
- *VOC Emissions from Oil and Condensate Storage Tanks*[5] prepared for the Texas Environmental Research Consortium;
- *Emissions from Oil and Gas Production Facilities*[6] prepared for TCEQ by ERG;
- AP-42, Chapter 5.2, *Transportation and Marketing of Petroleum Liquids*[7]*;* and
- AP-42, Chapter 1, *External Combustion Sources*[8]*.*

AACOG will update ERG's 2010 methods with more recent data and methods to include:

- Updated production and well data from the Railroad Commission of Texas (RRC)[9];
- Estimates for the number, activity level, and emissions factors as established by the ERG's Upstream Oil and Gas Heaters and Boilers report[10];
- Impacts of pneumatic controller emissions as estimated by the Oklahoma Independent Petroleum Association (OIPA)[11],
- Emissions factors that account for the New Source Performance Standards (NSPS) and applicable TCEQ rules as assessed by the Capital Area Council of Governments (CAPCOG)[12] and the East Texas Council of Governments (ETCOG)[13]; and
- Other data and methods found to reflect more recent, local and relevant information.

3.2.2 Growth Factors

Emissions will be projected to 2018 using exploratory data analysis (EDA) and based on the historical production trends of each county, a method borrowed from CAPCOG's November 2013 study*, Selected Oil and Gas Production Equipment Emissions and Activity Estimates for CAPCOG and Milam Counties*.

4 QUALITY METRICS

This section describes the quality control method requirements for the data used and the procedures for determining the quality of the data. Note that 10% of the data used in this study will be audited. After each section is completed, the QA/QC director will check data inputs into the formulas and documentation on methodologies. The QA/QC director will recalculate formulas to ensure results can be replicated and are accurate. The QA/QC director will work

[4] Bar-Ilan A., Rajashi P., Grant J., Shah, T., & Pollack, A. (November 2008). Recommendations for Improvements to the CENRAP States' Oil and Gas Emissions Inventories, prepared for CENRAP. Novato, CA: Environ.
[5] Hendler, A., Nunn, J., Lundeen, J. (October 31, 2006, revised April 2, 2009). VOC Emissions from Oil and Condensate Storage Tanks, prepared for the Texas Environmental Research Consortium.
[6] Eastern Research Group, Inc. (August 31, 2007). Emissions from Oil and Gas Production Facilities, prepared for TCEQ. Morrisville, NC.
[7] Environmental Protection Agency (EPA). (July 2008, updated December 4, 2008). Chapter 5.2, Transportation and Marketing of Petroleum Liquids, AP-42 (5th ed.).
[8] Environmental Protection Agency (EPA). (January 1995). Chapter 1, External Combustion Sources, AP-42 (5th ed.).
[9] Railroad Commission of Texas. (2015). Wells, Arcview Shape (SHP).
[10] Lange, B. Pring, M., & Treimel, S. (Aug. 30, 2013). Upstream Oil and Gas Heaters and Boilers. Morrisville, NC: Eastern Research Group, Inc., prepared for TCEQ.
[11] Oklahoma Independent Petroleum Association (OIPA). (November 2014). Pneumatic Controller Emissions from a Sample of 172 Production Facilties.
[12] Capital Council of Governments (CAPCOG). (November 2013). Selected Oil and Gas Production Equipment Emissions and Activity Estimates for CAPCOG and Milam Counties.
[13] Alvarez, Y., Shah, T., Bar-Ilan, A. Lindhjem, C., Kemball-Cook, S., & Yarwood, G. (June 2013). Gas Compressor Engine Study for Northeast Texas, prepared for ETCOG. Novato, CA: Environ Corp.

closely with the project manager to update the calculations, emission estimates, and documentations. The results of the audit process will be provided in the draft and final emission inventory submitted to TCEQ.

4.1 Data

The data for upstream oil and gas conventional well emissions must be reasonably consistent with other studies. The data must also be reasonably complete in order to adequately represent the study area's emissions.

4.2 Quality Control

Quality control (QC) "is a system of routine technical activities implemented by inventory development personnel to measure and control the quality of the inventory as it is being developed. The QC system is designed to:

1. Provide routine and consistent checks and documentation points in the inventory development process to verify data integrity, correctness, and completeness;
2. Identify and reduce errors and omissions;
3. Maximize consistency within the inventory preparation and documentation process; and
4. Facilitate internal and external inventory review processes.

QC activities include technical reviews, accuracy checks, and the use of approved standardized procedures for emission calculations. These activities should be included in inventory development planning, data collection and analysis, emission calculations, and reporting."[14]

Equations, data sources, and methodology will be checked throughout the development of the emission inventory. "Simple QA procedures, such as checking calculations and data input, can and should be implemented early and often in the process. More comprehensive procedures should target:

- Critical points in the process;
- Critical components of the inventory; and
- Areas or activities where problems are anticipated"[15]

Special emphasis will be put on critical components, such as production data, for quality checks. Upstream oil and gas conventional wells emission inventory process will be compared to previous data sets from other oil and gas production emission inventories.

When errors and omissions are identified, they will be corrected and all documentation will be updated with the corrections. All emission inventory calculation methodologies will be documented and described in detail so external officials and other interested parties can replicate the results. For every emission inventory source, documentation will be consistent and contained data sources, methodology, formulas, and results.

Pertinent information used for developing the oil and gas production emissions inventory will be analyzed to ensure that the information is reasonable (i.e., avoiding extremely low or high values that are indicative of errors). Data that are found to be questionable will be examined in greater detail to determine what errors might be present and what adjustments might be needed. If data are revised, the sources, procedures, and calculations used will be thoroughly documented. The Project Manager will review and approve all data adjustments.

[14] Eastern Research Group, Inc, Jan. 1997. "Introduction: The Value of QA/QC'. Quality Assurance Committee Emission Inventory Improvement Program, U.S. Environmental Protection Agency. p. 1.2-1. Available online: http://www.epa.gov/ttn/chief/eiip/techreport/volume06/vi01.pdf. Accessed 06/04/2012.
[15] *Ibid*., p. 1.2-2.

AACOG will use a senior peer reviewer not directly involved in conducting the project to review all methods and results of the work. The senior peer reviewer will be involved in the initial planning stages of this project to ensure the planned approaches are technically sound, and will also provide quality checks and review on all final products prior to submittal to TCEQ to ensure the project procedures were properly implemented. When the emission inventory is completed, documentation and spreadsheets will be sent to TCEQ and other interested parties for review.

5 DATA ANALYSIS, INTERPRETATION AND MANAGEMENT

5.1 Data Reporting Requirements

Primary data on emissions that is assembled for this study will be reported electronically and documented in the project final report. Any data that is assembled for this study will also be delivered electronically and documented in the final report. Data that are documented elsewhere, such as data on emission factors or data used to calculate emissions, will be documented in the final report by reference to the original data source. Records will be maintained that include sufficient information to reconstruct each emission inventory calculation.

5.2 Data Management Procedures

Hard copy data received during the course of the project will be cataloged into the file index and made available for copying or checkout. Electronic data files will be stored in a specific project directory on AACOG's fileserver network drives. Original data files will be kept in a separate folder and will not be altered or changed. Project staff will make copies of any data files needed and perform their work with the copy. All project staff will have access to these files and all files on the network drive undergo automatic backup each night such that any information can be easily retrieved as necessary. After the final product is completed and approved by TCEQ, all project data will be archived on CD-ROM for storage.

5.3 Project Deliverables

The project final delivery will include a technical report documenting the oil and gas emissions inventory improvement project and the information necessary to update TCEQ modeling files. All relevant AQ/QC findings will be included in the final report. The report will describe the steps taken and any background that is relevant to the project. The report shall provide the report in Microsoft Office Word and Adobe Acrobat Reader (*.pdf) formats. The final report will include the following components:

1. An executive summary and abstract.
2. An introduction that discusses background and objectives. Include relationships to other studies if applicable.
3. A discussion of the pertinent accomplishments, shortfalls, and limitations of the work completed.
4. Recommendations, if any, for what should be considered next as a new study.

The final report will provide a comprehensive overview of activities undertaken and data collected and analyzed during the study. The final report will highlight major activities and key findings, provide pertinent analysis, describe encountered problems and associated corrective actions, and detail relevant statistics including data, parameter, or model completeness, accuracy and precision.