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1. Project Management (Group A)

1.1. Title and Approval Page

Quality Assurance Project Plan for Environmental Information Submitted to State Policymakers In the Greenhouse Gas Inventory and Options Identification Phase of the CPRG Program

Grant Number: 02F36101
Period of Performance: 07/03/2023 – 06/30/2027

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QAPP Revision History

Revision No.	Description	Author	Date
0	Original Version	Angela Raso, NMED	February 2, 2024
1	Revised Version	Mark Edwards, NMED	February 10, 2025
2	Revised Version	Mark Edwards, NMED	August 5, 2025
3	Revised Version	Mark Edwards, NMED	August 19, 2025

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1.4. Abbreviations

AQB	Air Quality Bureau
CAA	Clean Air Act
CCAP	Comprehensive Climate Action Plan
CCB	Climate Change Bureau
CFR	Code of Federal Regulations
CNEE	Center for the New Energy Economy
CPRG	Climate Pollution Reduction Grant
E3	Energy + Environmental Economics
EPA	U.S. Environmental Protection Agency
EPD	Environmental Protection Division
ERG	Eastern Research Group
GHG	Greenhouse Gas
GHGRP	Greenhouse Gas Reporting Program (40 CFR Part 98)
ICR	Information Collection Request
OAR	EPA Office of Air and Radiation
NM	New Mexico
NMED	New Mexico Environment Department
NMEMNRD	New Mexico Energy Minerals and Natural Resources Department
PCAP	Priority Climate Action Plan

PM	Project Manager
PO	EPA Project Officer for Grant
POP	Period of Performance
POR	EPA Project Officer's Representative
PWP	Project Work Plan
QA	Quality Assurance
QAM	Quality Assurance Manager
QAMD	Quality Assurance Manager Delegate
QAPP	Quality Assurance Project Plan
QC	Quality Control
SIT	State Inventory Tool (provided by the EPA)
TL	Task Leader
WESTAR	Western States Air Resources Council

1.5. Distribution List

This section presents the primary staff who will be working on the project. This section presents specific staff members who will be identifying existing[1] data resources for evaluation and potential use under the project. This section also includes all other staff who will be serving in project-specific roles for implementing the Quality Assurance Project Plan. The listing in Table 1-1 includes staff responsible for implementing independent internal quality management steps and staff serving in external oversight roles.

This QAPP and, as applicable, all major deliverables relying on existing data will be distributed to the staff presented in Table 1-1. Additionally, this QAPP will be provided to any unlisted staff who are assigned to perform work under this project. A secured copy of this QAPP will be maintained in the project files under the file path *//ENV-CCTF Staff Team/GHG Emissions/QAPP*.

Table 1-1 QAPP Distribution List

Name	Organization	Role	Contact Information
Mitchell Mariama	US EPA	EPA Project Officer (PO)	Mitchell.Mariama@epa.gov
Brenton Gildner	US EPA	EPA Division Quality Assurance Officer	Gildner.Brenton@epa.gov
Claudia Borchert	NMED	Climate Change Bureau Chief	Claudia.Borchert@env.nm.gov (505) 699-8489

[1] The term "existing data" is defined by the EPA's *Environmental Information Quality Policy* (CIO 2105.3) as "… data that have been collected, derived, stored, or reported in the past or by other parties (for a different purpose and/or using different methods and quality criteria). Sometimes referred to as data from other sources." The term "secondary data" may also be used to describe "existing data" in historical EPA quality-related documents.

Name	Organization	Role	Contact Information
Rachel Finkelstein	NMEMNRD	Climate Policy Bureau Chief	Rachel.Finkelstein@emnrd.nm.gov
Bonney Hughes	NMED	Planning and Operations Section Manager, Climate Change Bureau	Bonney.Hughes@env.nm.gov (505)479-2207
Angela Raso	NMED	Permitting Section Manager, Quality Assurance Manager Climate Change Bureau	Angela.Raso@env.nm.gov (505)819-9825
Mark Edwards	NMED	Environmental Scientist, Quality Assurance Manager Delegate Climate Change Bureau	Mark.Edwards@env.nm.gov (505)699-3825

1.6. Project/Task Organization

The personnel involved in carrying out the objectives of this project and their roles and responsibilities are described below and summarized in Table 1-2 and Figure 1-1.

This project/task is being conducted by the New Mexico Environment Department's (NMED's) Climate Change Bureau (CCB). CCB is organized within the Environmental Protection Division (EPD) of NMED. Certain portions of the project will be carried out by contractors at the direction of NMED CCB.

Michelle Miano, NMED EPD Director, and Claudia Borchert, CCB Chief, will provide senior-level oversight and decision making as needed. Claudia Borchert is responsible for NMED's technical and financial performance as well as maintaining communications with the EPA to ensure mutual understanding of grant requirements, EPA expectations, and conformity with EPA quality procedures; managing oversight and conduct of project activities including allocation of resources to specific tasks; ensuring that quality procedures are incorporated into all aspects of the project; developing, conducting, and/or overseeing QA plans as necessary; ensuring that any corrective actions are implemented; operating project activities within the documented and approved Quality Assurance Project Plan; and ensuring that all products delivered to the EPA are of specified type, quantity, and quality.

Existing GHG emissions inventories were conducted under contract by E3 and ERG with oversight by NMED. These inventories are described in 1.7 (Problem Definition / Background) and 1.8 (Project / Task Description). The emissions inventories were completed by E3 under contract with CNEE on behalf of NMED. At CNEE Patrick Cummins was the subject matter expert in charge of review. At NMED Claudia Borchert, in her former role as NMED climate change coordinator, and Roslyn Higgin and Sufi Mustafa from NMED's Air Quality Bureau modeling and emissions inventory section, oversaw the completion of the most recent Oil and Gas Emissions Inventory. CNEE's Patrick Cummins and staff from NMED and NMEMNRD that are no longer employed with the agencies were the subject matter experts in charge of the 2018 economy wide emission inventory.

Crowbar Creek Consulting, E3, and ERG conducted updated work on New Mexico's emissions inventories at the direction of NMED, including an updated economy-wide 2021 inventory, a 2005

baseline projection, and 2030 and 2050 future year projections for climate planning. This work was completed prior to completing Revision No. 1 of this QAPP, and the QAPP has been updated accordingly.

Angela Raso, CCB Permitting Section Manager, oversaw reviewing and validating the work done by Crowbar Creek Consulting, E3, ERG, and future contractors who may perform work at the direction of NMED in support of the economy-wide 2021 inventory. She is responsible for overseeing the program quality system, monitoring, and facilitating QA activities on tasks, and generally helping the contractors and NMED staff understand and comply with EPA QA requirements. She is responsible for assisting the contractors and NMED staff in planning, documenting, and implementing the QA requirements for this project. Working with the NMED staff, she will ensure that process- and project-specific QA documents are developed; that required or recommended protocols are followed; that data are reduced, validated, and reported according to specific criteria; and that QC assessments are performed.

Angela Raso is employed by NMED CCB, which has contracted outside entities to conduct the analysis. Her work will be overseen by Claudia Borchert.

Mark Edwards, CCB Environmental Scientist, will oversee Adelante's QA evaluation of the 2021 NM economy-wide GHG emissions inventory. He is responsible for overseeing the contractor's work products, ensuring that the QA review meets the requirements of this QAPP, and assisting the contractor implement the QA requirements outlined in this QAPP for inventory review.

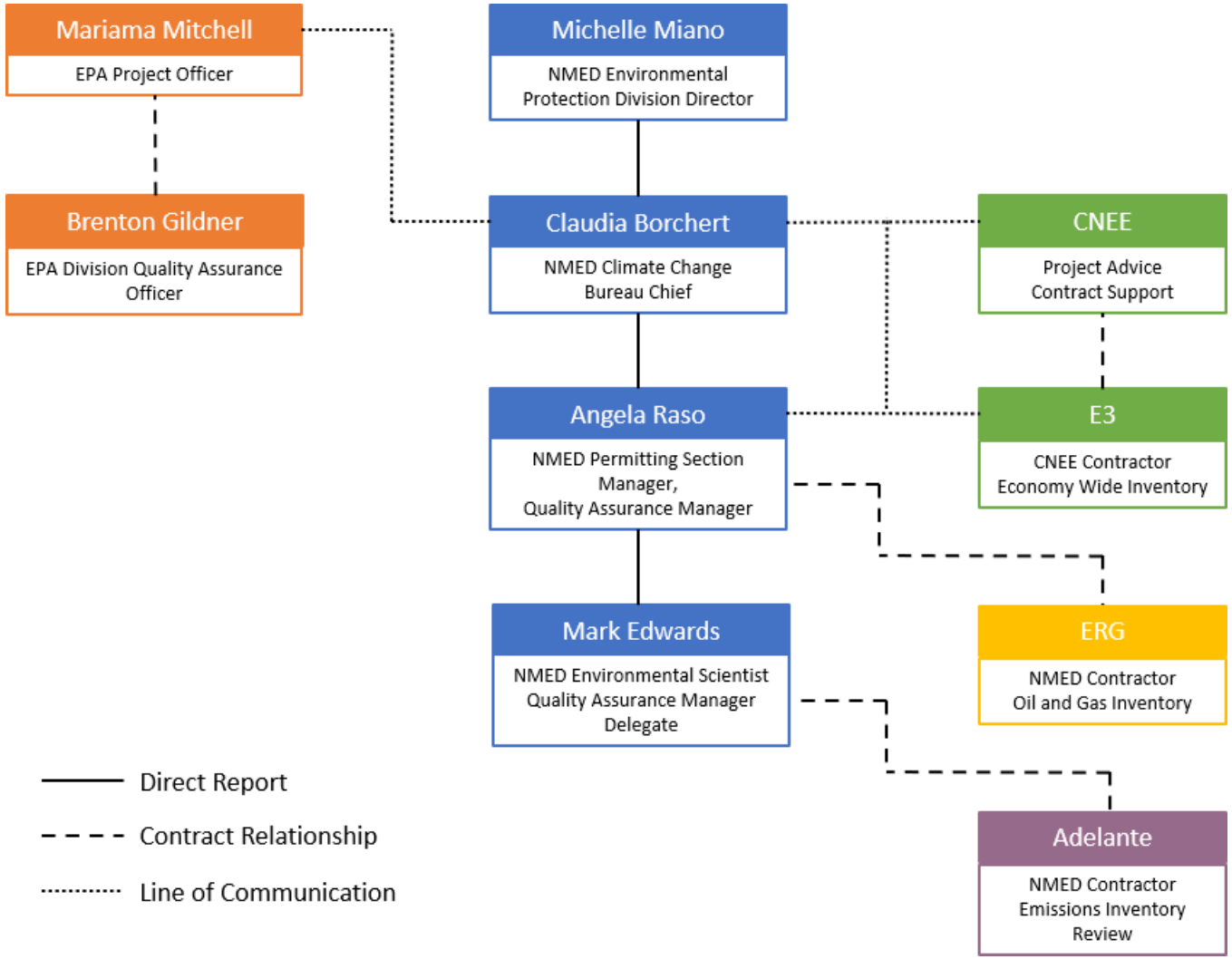
Additionally, QC functions will be carried out by other technical staff and monitored by Claudia Borchert and Angela Raso. They will oversee this plan and implement quality improvements. Other technical staff will include people with expertise in industrial processes and air pollution engineering, technical reviewers, database specialists, quality auditors, and technical editors. Angela Raso and Claudia Borchert will ensure that technical staff do not review work in a QA capacity for which they were a primary or contributing author. **Table 1-2** presents the responsibilities of staff and organizations in the project / task.

Future-year NM economy-wide emissions inventories will be performed following the methods outlined in this QAPP. Additional contractors or staff may support the development of such inventories or perform QA review of those inventories as described here.

Table 1-2 Project Personnel Roles and Responsibilities

Individual / Organization	Role	Responsibility
Michelle Miano	Environmental Protection Division Director	Provide senior level oversight, final decision making
Claudia Borchert	Climate Change Bureau Chief	Provide senior level oversight, final responsibility for technical and financial performance
Angela Raso	Permitting Section Manager	Oversee QA requirements and develop QAPP as QA manager
E3	Contractor	Compile statewide emissions inventory for base, current, and future years. Statewide inventory includes Transportation, Electricity Generation, and Commercial and Residential Building Sectors. Conduct measure specific emission reduction estimates.
ERG	Contractor	Oil and gas industry specific base, current, and future year emissions inventories
CNEE	Project Advice / Contract support	Oversee the Contract with E3, serve in an advisory role
Crowbar Creek Consulting	Contractor	Work in support of GHG emissions inventories in advisory capacity
Adelante	Contractor	Review and validate emissions inventories conducted by contractors
Mark Edwards	Environmental Scientist	Oversee contractor review and validation of emissions inventories as QA manager delegate

Figure 1 Project Organization Chart



1.7. Problem Definition / Background

Under this project, NMED and contractors will validate existing statewide and industry specific emissions inventory data, update the inventory from 2018 to 2021, develop a 2005 baseline inventory, and perform 2030 and 2050 future year projections of emissions for the major sources of greenhouse gas (GHG) emissions within New Mexico. This work was completed after submission of Revision No. 0 of this QAPP and prior to the submission of the current revision of this QAPP (Revision No. 1). NMED and NMEMNRD will use that inventory data to develop a climate action plan. This QAPP focuses on the handling of environmental information under sector-specific tasks by technical staff charged with completing the following subtasks in a future planning project implemented in accordance with this QAPP:

1. Develop a comprehensive GHG inventory for the largest sources within each sector,
2. Develop options for reducing emissions within each sector,
3. Develop estimates or ranges of estimates for the reductions achievable under each option,
4. Develop uncertainty analyses for the emissions reduction estimate(s) or ranges under each option, and
5. Present the inventory, options listing, and associated analyses in a technical report for consideration by state policymakers with the authority to approve the deliverables under the CPRG planning grants.

Prior to the submission of Revision No. 0 of this QAPP, New Mexico had two existing GHG inventories: a 2020 report on 2005 and 2018 economy-wide emissions[2] prepared by E3; and a 2022 report on 2020 emissions from the oil and gas sector[3] prepared by ERG. The existing GHG inventories were prepared using the best available information, including state specific information when available. See **Table 1-3** for a summary of calculation methods used in New Mexico GHG inventories.

Table 1-3 Emissions calculation methodology in current GHG emissions inventories

Sector	Calculation method
Electricity generation	Based on emissions data for in-state electricity generation. Data sources include EPA and EIA
Transportation	2005 emissions were based on default EPA SIT outputs. 2018 emissions were calculated based on energy consumption from EIA SEDS multiplied by fuel specific emissions factors from EPA SIT.
Residential	
Commercial	

[2] https://cnee.colostate.edu/wp-content/uploads/2021/01/New-Mexico-GHG-Inventory-and-Forecast-Report_2020-10-27_final.pdf
[3] https://service.web.env.nm.gov/urls/ktmiJzVo

Table 1-3 Emissions calculation methodology in current GHG emissions inventories

Sector	Calculation method
Industrial (non-oil and gas sector)	Non-oil and gas non-combustion emissions were based on default EPA SIT outputs. 2005 non-oil and gas combustion emissions were based on direct SIT output net fossil fuel industry fuel consumption. 2018 non-oil and gas combustion emissions were based on EIA SEDS energy consumption with EPA SIT emission factors.
Agriculture	Based on default SIT outputs.
Coal mining	
Waste	
Natural and working lands	
Oil and Gas sector	2005 and 2018 fugitive emissions were based on WESTAR 2014-2016 baseline emissions scaled by oil production and natural gas transmission and distribution emissions from SIT. 2005 and 2018 combustion emissions were based on WESTAR 2014-2016 baseline emissions scaled by oil production and downstream fossil fuel industry combustion emissions identified from SEDS. 2020 oil and gas sector emissions were sector segment specific but were generally based on the NMED minor source emissions inventory, EPA's GHGRP, EPA's GHGI, and EPA's NEI.

After the submission of Revision No. 0 of this QAPP and before the submission of the current revision of this QAPP (Revision No. 1), NMED and NMEMNRD, along with Crowbar Creek Consulting advisory support, oversaw the work of contractors E3 and ERG who updated the economy-wide and oil and gas inventories to a common year (2021)[4], cast them back to a baseline of 2005 by completing a 2005 oil and gas industry inventory[5], and projected 2030 and 2050 future year emissions in the same manner as the existing inventories described in Table 1-3 unless noted. Validation of New Mexico GHG inventories may utilize the EPA's State Inventory Tool (SIT),[6] state-level GHG inventories prepared by the EPA,[7] data reported to the EPA's GHGRP[8], and comparison of multiple methodologies of state inventories. Significant differences will be evaluated and discussed in the inventory report with the underlying data

[4] https://service.web.env.nm.gov/urls/UbsMeZjN
[5] https://service.web.env.nm.gov/urls/GJmTKUNR
[6] https://www.epa.gov/statelocalenergy/state-inventory-and-projection-tool
[7] https://www.epa.gov/ghgemissions/state-ghg-emissions-and-removals
[8] https://www.epa.gov/ghgreporting/data-sets

and methodology used for the independent state estimates. Validation of the state specific inventory will focus on the following sectors and gases:

Sectors	***Greenhouse Gases (across all sectors)***
1. Oil and gas industry 2. Transportation 3. Electricity generation 4. Commercial and residential buildings	carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), fluorinated gases (F-gases) including hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), sulfur hexafluoride (SF_6), and nitrogen trifluoride (NF_3)

Future-year NM GHG emissions inventories will be developed by NMED and/or contractors at NMED's direction following the QA protocols outlined in this QAPP.

1.7.1. Rationale for Selection of Sectors

For each sector included in the statewide inventory Table 1-4 briefly describes why the sector was included in the evaluation of the existing inventory and the relative significance of the sector in terms of the magnitude of emissions from existing inventories, the associated geographic distribution of the sources, and recent trends in readily available activity data for the source category.

Table 1-4 Rationale for Sector Selection

Sectors selected for validation	Rationale for including in GHG inventory validation
Oil and gas	New Mexico is the second largest oil and gas producing state in the United States. The oil and gas industry is the largest source of both GHG and air emissions in the state. The existing state specific GHG emissions inventory for the oil and gas sector shows that the industry emitted nearly 33 MMT CO_2e in 2020. Oil and gas operations in New Mexico are concentrated in the San Juan Basin in the north-west corner of the state, and the Permian Basin in the southeast. Oil and gas production in New Mexico has increased in recent years and is projected to continue increasing in the future. The state has taken world leading measures to reduce the carbon intensity of oil and gas operations, however it is essential to continue tracking GHG emissions from the oil and gas sector.

Sectors selected for validation	Rationale for including in GHG inventory validation
Transportation	Transportation activities were the largest source (29 percent) of total U.S. greenhouse gas emissions in 2021. From 1990 to 2021, transportation CO_2 emissions from fossil fuel combustion increased by 19 percent. New Mexico's existing 2018 economy wide GHG emissions inventory shows that transportation is the second highest GHG source in the state, with 15.8 MMT of CO_2e emissions in 2018. The state has already begun taking measures to reduce emissions from the transportation sector, but more work will likely be needed to meet state GHG emission reduction goals.
Electricity generation	The electric power sector accounted for 25 percent of total U.S. greenhouse gas emissions in 2021. In 2018 electricity generation was the 3rd highest source of GHG emissions, with 12.1 MMT of CO_2e emissions. The magnitude of GHG emission reductions due to electrification in other sectors are dependent on the emissions from electricity production.
Commercial and residential buildings	In 2021, the commercial and residential sectors accounted for 7 and 6 percent of total U.S. greenhouse gas emissions, respectively. Emissions from the commercial and residential sectors have increased since 1990. Total residential and commercial greenhouse gas emissions, including direct and indirect emissions, in 2021 have increased by 2% since 1990. In 2021, an increase in heating degree days (0.5 percent) increased energy demand for heating in the residential and commercial sectors, however, a 1.8 percent decrease in cooling degree days compared to 2020 reduced demand for air conditioning in the residential and commercial sectors.

1.7.2. Decisions to be Made

Existing EPA datasets and the SIT cover categories of GHG emissions by sector and by activity or segment (e.g., electric utility combustion of natural gas). The SIT provides many default values to facilitate developing statewide estimates that are consistent with the National Inventory of GHG Emissions.[9] Task Leaders will be charged with four primary decisions under each task of this project:

1. Determine (for each major activity estimate) if existing EPA data or the SIT default estimate for the sector/activity should be used for the statewide, baseline estimate, or should the state's estimate be derived from existing information available to the state (including other EPA datasets, state inventories, or GHGRP publications)?

[9] https://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks-1990-2021

2. Determine the best options for reducing emissions of air pollution and achieving the following objectives[10] under the Inflation Reduction Act:
   a. Reduce climate pollution, create good jobs, and lower energy costs for families.
   b. Accelerate work addressing environmental injustice and empowering community driven solutions in overburdened neighborhoods.
   c. Deliver cleaner air by reducing harmful air pollution in places where people live, work, play, and go to school.
3. Develop an estimate (or range) of reductions that could be achieved under each option.
4. Estimate the uncertainty of the emissions reduction estimate under each option.

1.7.3. Actions to be Taken, Action Limits, and Expected Outcomes

Existing state-level estimates, existing reports prepared by the EPA, or the SIT tool will be utilized with federal default values for each sector/activity relevant to GHG-emitting activities within the state. Actions will be limited to the GHG-emitting activities defined in the SIT or in the existing EPA estimates used by the state. Subsequently, the state may elect to prepare separate, independent estimates for the state's major sector/activities based on the state's existing data resources. If the state elects to incorporate these independent estimates in the inventory, the independent estimate will be compared to the SIT estimate or the EPA's state-level estimate by subject matter experts with the requisite knowledge of the source category, and the rationale for utilizing the state's independent estimate will be documented in the state's GHG inventory report along with the underlying data and calculation methodology. NMED expects that sectors that include major stationary sources under CAA Title V with longstanding requirements for submission of activity data and emissions estimates may be better represented in the GHG inventory based on existing data. For minor sources of GHGs, NMED expects that the SIT default estimates for the state will provide the better estimates. NMED expects that the oil and gas industry will be best represented by the state's 2020 oil and gas sector inventory, which was compiled using data reported to NMED by both major (Title V) sources and minor sources with an air quality registration or permit, state level well information, and EPA emission factors.

When identifying the best options for reducing air pollution, each Task Leader will consider the activities affecting the largest numbers of families, business establishments, recreation areas, and schools.[11] Options may include measures for achieving potential reductions in nonattainment areas and impacting residential, commercial, and school districts near the largest sources of air pollution.

1.7.4. Reason for Project

The 2021 GHG inventory and options analyses developed under this project will be utilized by NMED and NMEMNRD for planning purposes to support New Mexico's development of the following three deliverables under the CPRG Program:

[10] CPRG Program Guidance, page 4. Available at https://www.epa.gov/inflation-reduction-act/climate-pollution-reduction-grants#CPRGProgramGuidance.
[11] Ibid.

- New Mexico's **Priority Climate Action Plan** (PCAP), which is due on March 1, 2024. This plan will include near-term, implementation-ready, priority GHG reduction measures and is a prerequisite for any implementation grant.
- New Mexico's **Comprehensive Climate Action Plan** (CCAP), which is due in 2025 (later for tribes and territories). This plan will review all sectors that are significant GHG sources or sinks and include both near- and long-term GHG emission reduction goals and strategies.
- New Mexico's **Status Report** on progress towards goal, which is due in 2027 (not applicable to tribes or territories). This progress report will include updated analyses, plans, and next steps for key metrics.

This QAPP describes in detail the necessary QA and QC requirements and technical activities that will be implemented to ensure the baseline GHG inventory and the sector-specific emissions reduction options are reliable for the PCAP and CCAP. As necessary, revisions to the QA and QC requirements defined in this QAPP will be updated in the 2027 Status Report.

1.7.5. Relevant Clean Air Act Mandates and Authorizations

The inventory and options analyses produced under this project will support a grant application authorized under 42 U.S.C.A. § 7437 for *Greenhouse Gas Air Pollution Plans and Implementation Grants*. The inventory and options analyses will be used to evaluate opportunities for reducing GHG emissions from all major-emitting sources including both mobile source categories and stationary source categories. This project will include the fundamental research necessary to evaluate and plan new programs (and amendments to existing Clean Air Act [CAA] programs) for reducing emissions from fossil fuel combustion activities. Many sectors and activities that will be included in the GHG inventory (and subsequent emissions reductions options analyses) include major sources of criteria and toxic pollutants. Accordingly, the purpose of this project (to evaluate and plan for reductions in GHG emissions, including reductions from usage or production of fossil fuels) is also consistent with the following statutory mandates and authorizations under Clean Air Act Title I:

- ***§ 7403. Research, investigation, training, and other activities***
  (a) Research and development program for prevention and control of air pollution
  The Administrator shall establish a national research and development program for the prevention and control of air pollution ….
    (1) conduct, and promote the coordination and acceleration of, research, investigations … and studies related to the causes … extent, prevention, and control of air pollution;
    (2) encourage, cooperate with, and render technical services and provide financial assistance to air pollution control agencies and other appropriate public or private agencies, institutions, and organizations, and individuals in the conduct of such activities ….
  (b) Authorized activities of Administrator in establishing research and development program
  In carrying out the provisions of [paragraph (a)] the Administrator is authorized to–
    (1) collect and make available, through publications and other appropriate means, the results of and other information, including appropriate recommendations by him in connection therewith, pertaining to such research and other activities;….
    (2) make grants to air pollution control agencies … for purposes … in subsection (a)(1) ….

- ***§ 7404. Research related to fuels and vehicles***
  (a) Research programs; grants; ….
  The Administrator shall give special emphasis to research and development into new and improved methods, having industry-wide application, for the prevention and control of air pollution and control of air pollution resulting from the combustion of fuels… he shall–
  (1) conduct and accelerate research programs directed toward development of improved, cost-effective techniques for–
  (A) control of combustion byproducts of fuels, ….
  (B) improving efficiency of fuels combustion so as to decrease atmospheric emissions ….

- ***§ 7405. Grants for support of air pollution planning and control programs***
  (a) Amounts; limitations; assurances of plan development capability.
  (1)(A) The Administrator may make grants to air pollution control agencies … in an amount up to three-fifths of the cost of implementing programs for the prevention and control of air pollution …. For the purpose of this section, "implementing" means any activity related to the planning, developing, establishing, carrying-out, improving, or maintaining of such programs….
  (A) With respect to any air quality control region or portion thereof for which there is an applicable implementation plan under section 7410 … grants under subparagraph (A) may be made only to air pollution control agencies which have substantial responsibilities for carrying out such applicable implementation plan.

1.7.6. Information Provided by the EPA under § 7403(b)(1)

Under authority of CAA § 7403(b)(1) the EPA has provided the following resources to states to ensure reliable air emissions inventories are produced to support plans for reducing emissions:

- Agency-wide Quality Program Documents
- Quality Assurance-specific Directives
  - CIO 2105.3 – *Environmental Information Quality Policy*, April 10, 2023
  - CIO 2105-P-01.3 – *Environmental Information Quality Procedure*, March 7, 2023
  - CIO 2105-S-02.0 – EPA's Environmental Information QA Project Plan (QAPP) Standard
  - EPA Regional Sites for Quality Management Plans and Guidance:
    - Region 1
    - Region 2
    - Region 3
    - Region 4
    - Region 5
    - Region 6
    - Region 7
    - Region 8
    - Region 9
    - Region 10
- QA Guidance
  - EPA QA/G-4 – *Guidance on Systematic Planning Using Data Quality Objectives Process*
  - EPA QA/G-5 – *Guidance for Quality Assurance Project Plans*

NMED and its contractor(s) will utilize these resources, as applicable, to ensure evaluation of existing data and utilization of those data are consistent with the EPA's relevant directives and guidance.

1.8. Project / Task Description

An example schedule of deliverables for the technical tasks (Tasks 1-5) for GHG inventory QAPPs is presented in **Tables 2.1** through **2.5.** The work to be performed under this project by E3 and ERG on behalf of NMED and NMEMNRD involves preparing a statewide GHG emissions inventory for New Mexico. The organization of the work is based on the use of New Mexico's existing GHG inventory and the EPA's SIT[12] under the following tasks:

Task 1: State inventory of oil and gas industry GHG emissions

Task 2: State inventory of transportation sector GHG emissions

Task 3: State inventory of electric generation GHG emissions

Task 4: State inventory of commercial and residential buildings GHG emissions

Task 5: State inventory GHG emissions from other sectors

For each sector-specific task, Table 1-5 Technical Task Descriptions for Task 1- Table ***1-9*** provide planned activities and a schedule of deliverables.

Table 1-5 Technical Task Descriptions for Task 1

Tasks and Deliverables	**Schedule**
Task 1. State inventory of oil and gas industry GHG emissions	
1. The state has several New Mexico specific GHG emission estimates for the oil and gas sector: a. NMED conducted a GHG inventory of air quality permitted major and minor oil and gas sources in 2010 [NMED 2010]. b. The Western States Air Resources Council (WESTAR) oil and gas working group estimated annual emissions by gas for a variety of western states, including New Mexico[13]. This included: i. baseline estimates for 2014-2016 [WESTAR 2014] ii. future year projections for 2023 [WESTAR 2023] c. E3 back- and foreword-cast oil and gas sector GHG emissions to: i. 2005 [E3 2005] by: • scaling to New Mexico crude oil production,	Within 60 days of QAPP approval by EPA or by federally authorized delegate.

[12] https://www.epa.gov/statelocalenergy/state-inventory-and-projection-tool.

[13] Grant et al., Revised and Final Report: 2028 Future Year Oil and Gas Emissions Inventory for WESTAR-WRAP States – Scenario #1: Continuation of Historical Trends"

Tasks and Deliverables	Schedule
Task 1. State inventory of oil and gas industry GHG emissions	
• adding emissions from non-overlapping fossil fuel industry fuel consumption calculated using SIT and fuel consumption data from EIA SEDS • and adding fugitive methane emissions from natural gas transmission and distribution from SIT ii. 2018 [E3 2018] by: • scaling to NM crude oil production accounting for declining emissions intensity forecast from WRAP. • adding emissions from non-overlapping fossil fuel industry fuel consumption calculated using SIT and fuel consumption data from EIA SEDS • and adding fugitive methane emissions from natural gas transmission and distribution from SIT d. ERG estimated 2020 oil and gas sector GHG emissions [ERG 2020] using segment specific analysis. Emissions estimates were based on: • State isolated emissions submitted to NMED for the major and minor source emissions inventory in 2020. These emissions were calculated for NM operations using 40 CFR 98 subpart W and subpart C. • Exploration and Production emissions were scaled from reported emissions using well counts or production. • Emissions from inactive oil and gas wells was estimated using NMEMNRD data and emission factors from Townsend-Small et al. 2016[14] and Townsend-Small et al. 2021[15]. e. ERG produced 2005 estimates of oil and gas sector GHG emissions [ERG 2005] by scaling each segment appropriately. f. ERG produced 2030 estimates of GHG emissions [ERG 2030] based on EIA oil and gas production projections, accounting for existing state and federal rules. g. ERG produced an estimate of the 2030 emission reductions that are attributable to state rules [2030 state reductions].	

[14] Townsend-Small A, Ferrara T W, Lyon D R, Fries A E, and Lamb B K. Emissions of coal bed and natural gas methane from abandoned oil and gas wells in the United States. Geophys. Res. Lett., 43, 2283-90. 2016.
[15] Amy Townsend-Small and Jacob Hoschouer. Direct measurements from shut-in and other abandoned wells in the Permian Basin of Texas indicate some wells are a major source of methane emissions and produced water. Environmental Research Letters, 16, 5, 2021.

Tasks and Deliverables	Schedule
Task 1. State inventory of oil and gas industry GHG emissions	
h. E3 scaled the 2020 specific inventory to 2021 to produce an economy wide inventory using oil and gas production [E3 2021 O&G]. 2. NMED or its contractor(s) will conduct an analysis of the inventories listed in (1) relative to statewide oil and gas production. Any outlier inventories will be analyzed to determine the source of differences. 3. Emission reductions for potential measures will be evaluated based on the methods used to calculate emissions in the ERG2020 and ERG2030 inventories.	

Table 1-6 Technical Task Descriptions for Task 2

Tasks and Deliverables	Schedule
Task 2. State inventory of transportation sector GHG emissions	
1. 2005 transportation sector GHG emissions were calculated for New Mexico by E3 using EPA's State Inventory and Projection Tool (SIT). 2. At the time of calculation, the 2018 SIT was not available. 2018 transportation sector GHG emissions were calculated for New Mexico by E3 using fuel specific emission factors from SIT and fuel consumption from EIA SEDS. 3. E3 produced 2021 transportation sector GHG emission estimates following similar methodology to the 2018 estimates. 4. E3 produced 2030 and 2050 transportation sector GHG emission projections. 5. NMED or its contractor(s) will compare the state specific transportation sector emissions inventory estimates for 2005, 2018, and 2021 to the EPA's state-level GHG data from https://www.epa.gov/system/files/other-files/2023-02/State-Level-GHG-data.zip. a. If GHG estimates differ by more than 5% NMED or its contractor(s) will qualitatively evaluate the causes of the differences, and determine which estimate is more reliable. b. The percent difference will be calculated as follows: $Percent\ Difference = \frac{\text{State Estimate-EPA GHG data}}{\frac{\text{State Estimate+EPA GHG data}}{2}} * 100\%$ 6. Emissions reductions for potential measures will be evaluated using the most appropriate method. Potential methods for evaluating emission reductions include: a. Argonne National Laboratory's AFLEET tool[16]. b. Adjusting the inputs to the SIT and calculating the change in emissions	Within 60 days of QAPP approval by EPA or by federally authorized delegate.

[16] Available at https://afleet.es.anl.gov/home/

Tasks and Deliverables	Schedule
Task 2. State inventory of transportation sector GHG emissions	
c. Adjusting fuel consumption and calculating emissions using the same emission factors used in (1) – (4) above.	

Table 1-7 Technical Task Descriptions for Task 3

Tasks and Deliverables	Schedule
Task 3. State inventory of electric generation GHG emissions	
1. E3 calculated 2005, 2018, and 2021 electricity generation GHG emissions using EPA and EIA data. 2. E3 will produce 2030 and 2050 electricity generation GHG emissions estimates. 3. NMED or its contractor(s) will compare the state specific electricity generation GHG emissions for 2005, 2018, and 2021 to the EPA's State-level data from https://www.epa.gov/system/files/other-files/2023-02/State-Level-GHG-data.zip and EPA's GHG reporting program data for electric generating units. a. If GHG estimates differ by more than 5% NMED or its contractor(s) will qualitatively evaluate the causes of the differences, and determine which estimate is more reliable. b. The percent difference will be calculated as follows: $Percent\ Difference = \frac{\text{State Estimate-EPA GHG data}}{\frac{\text{State Estimate+EPA GHG data}}{2}} * 100\%$ 4. Emissions reductions for potential measures will be evaluated using the most appropriate method. Potential methods for evaluating emission reductions include: a. Adjusting energy consumption data b. Adjusting emission factor based on electricity mixtures	Within 60 days of QAPP approval by EPA or by federally authorized delegate.

Table 1-8 Technical Task Descriptions for Task 4

Tasks and Deliverables	
Task 4. State inventory of commercial and residential buildings GHG emissions	
1. 2005 commercial and residential building GHG emissions were calculated for New Mexico by E3 using EPA's State Inventory and Projection Tool (SIT). 2. At the time of calculation, the 2018 SIT was not available. 2018 commercial and residential building GHG emissions were calculated for New Mexico by E3 using fuel specific emission factors from SIT and fuel consumption from EIA SEDS. 3. E3 produced 2021 commercial and residential building GHG emission estimates following similar methodology to the 2018 estimates.	Within 60 days of QAPP approval by EPA or by federally

Tasks and Deliverables	
Task 4. State inventory of commercial and residential buildings GHG emissions	
4. E3 produced 2030 and 2050 commercial and residential building GHG emission projections. 5. NMED or its contractor(s) will compare the state specific commercial and residential building emissions inventory estimates for 2005, 2018, and 2021 to the EPA's state-level GHG data from https://www.epa.gov/system/files/other-files/2023-02/State-Level-GHG-data.zip. a. If GHG estimates differ by more than 5% NMED or its contractor(s) will qualitatively evaluate the causes of the differences, and determine which estimate is more reliable. b. The percent difference will be calculated as follows: $Percent\ Difference = \frac{\text{State Estimate-EPA GHG data}}{\frac{\text{State Estimate+EPA GHG data}}{2}} * 100\%$ 6. Emissions reductions for potential measures will be evaluated using the most appropriate method. Potential methods for evaluating emission reductions include: a. Adjusting the inputs to the SIT and calculating the change in emissions b. Adjusting fuel consumption and calculating emissions using the same emission factors used in (1) – (4) above.	authorized delegate.

Table 1-9 Technical Task Descriptions for Task 5

Tasks and Deliverables	Schedule
Task 5. State inventory of GHG emissions from other sectors	
1. E3 calculated GHG emissions for 2005 and 2018 for the following sectors using SIT: a. Non-oil and gas sector industry i. 2018 combustion emissions were based on EIA SEDS energy consumption with EPA SIT emission factors. b. Agriculture c. Coal mining d. Waste e. Natural and working lands. 2. E3 developed 2021, 2030, and 2050 GHG emission calculations using similar methodology. 3. Emission reductions for potential measures will be evaluated using existing federal and EPA tools. All estimated emission reductions will be evaluated for consistency with the state inventory.	Within 60 days of QAPP approval by EPA or by federally authorized delegate.

1.9. Quality Objectives / Criteria

The primary objectives for this project are to develop reliable inventories for each of the primary GHG-emitting sectors in New Mexico and to identify options for reducing emissions from those sectors. Accordingly, all quality objectives and criteria are aligned with these primary objectives. The quality system used for this project is the joint responsibility of the NMED PM, Task Leaders, and QC Coordinator. As discussed in Section 1.4, an organizationally independent QA Manager will maintain oversight of all required measures in this QAPP. QC functions will be carried out by technical staff and will be carefully monitored by the responsible Task Leaders, who will work with the QA Manager and QC Coordinator to identify and implement quality improvements. All activities performed under this project will conform to this QAPP.

1.9.1. Data Quality, Management, and Analyses

For this project, NMED or contractors at NMED's direction will use a variety of QC techniques and criteria to ensure the quality of data and analyses. Data of known and documented quality are essential components for the success of the project, as these data will be used to inform the decision-making process for New Mexico's PCAP and CCAP as discussed in Section 1.5.4 of this QAPP. The table in **Appendix A** lists by task the specific QC techniques and criteria that are part of this QAPP.

The data quality objectives and criteria for this project are accuracy, precision, bias, completeness, representativeness, and comparability. *Accuracy* is a measure of the overall agreement of a measurement to a known value. It includes a combination of random error (precision) and systematic error (bias). *Precision* is a measure of how reproducible a measurement is or how close a calculated estimate is to the actual value. *Bias* is a systematic error in the method of measurement or calculation. If the calculated value is consistently high or consistently low, the value is said to be biased. Our goal is to ensure that information and data generated and collected are as accurate, precise, and unbiased as possible within project constraints. It is not anticipated that this project will include primary data collection. Generally, existing data and tools provided by the EPA and other qualified sources will be used for project tasks. A subject matter specialist familiar with technical reporting standards (such as a permit writer or compliance engineer with knowledge of the state's facilities operating in the sector) will be used to QA all data utilized for developing the statewide GHG inventory. NMED or its contractor(s) will verify the accuracy of all data by checking for logical consistency among datasets. All existing environmental data shall meet the applicable criteria defined in CFR and associated guidance, such as the validation templates provided in the *EPA QA Handbook Volume II*.

Uncertainty can be evaluated using a few different approaches. The most useful uncertainty analysis is quantitative and is based on statistical characteristics of the data such as the variance and bias of estimates. In a sensitivity analysis, the effect of a single variable on the resulting emissions estimate generated by a model (or calculation) is evaluated by varying its value while holding all other variables constant. Sensitivity analyses will help focus on the data that have the greatest impact on the output data. Additional statistical tests may be utilized depending on the need for more or less rigorous tools and on the specific project activity being evaluated.

When available, data originally gathered using published methods whose applicability, sensitivity, accuracy, and precision have been fully assessed, such as EPA reference methods, will be preferred and considered to be of acceptable quality. Project decisions may be adversely impacted if, for example, existing data were used in a manner inconsistent with the originator's purpose. Metadata can be described as the amount and quality of information known about one or more facets of the data or a dataset. It can be used to summarize basic information about the data (e.g., how, why, and when the existing data were collected), which can make working with specific data or datasets easier and provides the user with more confidence. Metadata are valuable when evaluating existing data, as well as when planning for collection primary data that may be required in the future. However, the effort needed to locate and obtain original source materials can be costly. Accordingly, a graded approach to planning will be applied and ongoing discussions with the EPA will be held to determine what magnitude and rigor of QA effort are appropriate and affordable for the project.

For the data analysis completed under this project, analytical methods will be reviewed to ensure the approach is appropriate and calculations are accurate. Spreadsheets will be used to store data and complete necessary analyses. The design of spreadsheets will be configured for the intended use. All data and methodologies specific to each analysis will be defined and documented. Tables and fields will be clearly and unambiguously named. Spreadsheets will be checked to ensure algorithms call data correctly and units of measure are internally consistent. Hand-entered or electronically transferred data will be checked to ensure the data are accurately transcribed and transferred.

The draft inventory will be evaluated for GHG-emitting-sector and geographic completeness. NMED or its contractor(s) will utilize the framework of sectors in the EPA's SIT tool or the EPA's state-level GHG inventories to ensure that the inventory prepared under this project includes all major GHG-emitting sectors. To ensure the inventory is geographically complete, the draft inventory will also be made available for review on NMED's website. Interested stakeholders will be informed of the availability of the emissions inventory and related documents through a GovDelivery announcement.

Representativeness is a qualitative term that expresses the degree to which data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, a process condition, or an environmental condition. NMED or its contractor(s) will use the most complete and accurate information available to compile representative data for this project.

Data c*omparability* is a qualitative term that expresses the measure of confidence that one dataset can be compared to another and can be combined for the decision(s) to be made. NMED or its contractor(s) will compare datasets when available from different sources to check the quality of the data. This QA step will also ensure that any highly correlated datasets or indicators are identified. Supporting data, such as information on test methods used and complete test reports, are important to ensure the comparability of emissions data.

1.9.2. Document Preparation

All documents produced under this project will undergo internal QC review, as well as technical review and an editorial review, prior to submission to the EPA PO. QC will be performed by an engineer,

scientist, or economist, as appropriate, with sufficient knowledge. The technical reviewer will review the document for accuracy and integrity of the technical methodologies, analyses, and conclusions.

An editorial review of all final documents will be performed. Editors will verify clarity, spelling, and grammatical correctness, and ensure documents are free of typographical errors. Editors will verify that references are cited correctly. This will include a comparison against the original documents.

The *QC Documentation Form* (**Appendix B**) will be used to track the approval process. The form must be completed and signed for all document deliverables. The signatures required include those of the Task Leader and technical and editorial reviewers. Completion of this form certifies that technical review, editorial review, and all required QC procedures have been completed to the satisfaction of the TL and QC Coordinator. Copies of these signed forms will be maintained in the project files.

1.10. Special Training / Certifications

All NMED staff and contractors assigned to work on this project shall have appropriate technical and QA training to properly perform their assignments. NMED staff serving in QAM or QCC roles under this project will complete a training course on QA/QC activities similar to the course available at https://www.epa.gov/quality/training-courses-quality-assurance-and-quality-control-activities. The PM and all TLs under this project will have appropriate training and education to complete and understand air emissions inventory.

If training is required for new staff or for particular segments of the GHG inventory, Angela Raso and Claudia Borchert will identify available training resources for the inventory segment and incorporate the required training into the project schedule.

1.11. Documents and Records

NMED or its contractor(s) will document in electronic form (and/or hard copy) QC activities for this project. The PM is responsible for ensuring that copies of all completed QC forms, along with other QA records (including this QAPP), will be maintained in the project files. Project files will be retained by NMED for a minimum of 5 years after completion of validation activities. The types of documentation that will be prepared for this project include:

- Planning documentation (e.g., QAPP)
- Implementation documentation (i.e., Review/Approval Forms and QA records)
- Assessment documentation (i.e., QA audit reports).

Detailed documentation of QC activities for a specific task or subtask will be maintained using the *QC Documentation Form* shown in **Appendix B**. This form will document the completion of the QC techniques planned for use on this project as listed in the table in **Appendix A**. One or more completed versions of these forms, as necessary, will be maintained in the project files. The types of documents for which QC will be conducted and documented may include raw data, data from other sources such as

data bases or literature, field logs, sample preparation and analysis logs, instrument printouts, model input and output files, and results of calibration and QC checks.

Technical reviews will be used along with other technical assessments (i.e., QC checks) and QA audits to corroborate the scientific defensibility of any data analyses. A technical review (i.e., internal senior review) is a documented critical review of a specific technical work product. It is conducted by subject matter experts who are collectively equivalent (or senior) in technical expertise to those who performed the work. Given the nature of the deliverables under this project, a technical review is an in-depth assessment of the assumptions, calculations, extrapolations, alternative interpretations, and conclusions in technical work products. Technical review of proposed methods and associated data will be documented in the *QC Documentation Form* shown in **Appendix B**. The form will include the reviewer's charge, comments, and corrective actions taken.

Additionally, NMED has developed and instituted document control mechanisms for the review, revision, and distribution of QAPPs. Each QAPP has a signed approval form, title page, table of contents, and a document control format that conforms to EPA's Environmental Information QAPP Standard; see header at top of the page. The distribution list for this QAPP was presented in **Table 1-1**. During the course of the project, any revision to the QAPP will be circulated to everyone on the distribution list, as well as to any additional staff supporting this project. Any revision to the QAPP will be documented by issuing a revised QAPP , approved by the same signatories to this QAPP, and circulated to everyone on the distribution list by the NMED PM.

At this time, the project will not collect or handle personally identifiable information (PII) subject to the Privacy Act of 1974. However, if during the course of this project technical staff determine that PII is required to support project objectives, NMED revise this QAPP to discuss the requirements of the Privacy Act of 1974.

2. Existing Data Acquisition and Management Protocols (Group B)

2.1. Sampling Process Design

2.1.1. Need and Intended Use of Data Used

As indicated in Table 1-5 - Table ***1-9***, a wide range of data for a diverse set of GHG-emitting activities is necessary to prepare a statewide inventory. Existing data resources may include sector-specific or facility-specific GHG emissions estimates, emissions factors, or activity data for use with emissions factors. The experimental design for this inventory project relies on the EPA's State Inventory Tool (SIT) together with independent estimates prepared by NMED and contractors on behalf of NMED. The SIT allows for expedited estimates for many sectors with default entries included in the tool. Existing data resources from previously completed inventories will be utilized to develop GHG emissions estimates that are comparable to the SIT estimates. Subsequently, the SIT estimates for each sector will be compared to any independent state estimate utilized for the statewide inventory.

2.1.2. Identification of Data Sources and Acquisition

In addition to the data integrated into the EPA's SIT tool, the data sources identified in Table 1-5 - Table ***1-9*** will be utilized under each task to develop estimates for the major-emitting sectors in New Mexico.

2.2. Quality Control

All environmental information operations conducted for this project will involve existing, non-direct measurement data. All data received will be reviewed by a senior technical staff member to assess data quality and completeness before their use. In addition to reviewing and assessing the data collected, all data entered into spreadsheets and all calculations completed for analyses will be reviewed by a senior technical reviewer. The reviewer will evaluate the approach to ensure the methods are appropriate and have been applied correctly to the analysis. The technical reviewer will also confirm all data were entered correctly and that calculations are complete and accurate. Any data entry and calculation errors will be identified and corrected. Data tables prepared for the draft and final reports will be checked against the spreadsheets used to store the data and complete the analysis.

Where calculations are required to assess the data/datasets, calculations will be performed using computer spreadsheets to reduce typographical or translation errors–mathematical/statistical calculations are performed using spreadsheets or software programs with predefined formulas and functions. All underlying spreadsheets will be retained and reviewed. NMED or its contractor(s) will ensure that any manipulations performed on the data/dataset were done correctly.

As appropriate, NMED or its contractor(s) will conduct statistical checks to look for data outliers or unusual data. These statistical checks may include: sorting a datasheet for one or more data variables; Graphing data using boxplots, histograms, and scatterplots; Z-scores; hypothesis tests to find outliers; or an interquartile range (IQR) to calculate boundaries for what constitutes minor and major outliers. The methods used will be driven by the scale and type of data. NMED or its contractor(s) will determine

outlier detection methods to be used based on the initial review of the data. Identified outliers will be highlighted to the EPA PO or delegate with options for treatment.

2.3. Non-direct Measurements

All environmental information operations conducted on this project will involve existing, non-direct measurement data. All existing data received will be reviewed by a senior technical staff member to assess data quality and completeness before their use.

Consistent with the EPA's QA requirements, this QAPP describes the procedures that will be used to ensure the selection of appropriate data and information to support the goals and objectives of this project. Specific elements addressed by this QAPP include:

- Identifying the sources of existing data,
- Presenting the hierarchy for data selection,
- Describing the review process and data quality criteria,
- Discussing quality checks and procedures should errors be identified, and
- Explaining how data will be managed, analyzed, and interpreted.

Data presented in the GHG inventory will be traced to its source (e.g., database input and output). Key resources include data collected by the EPA (e.g., GHGRP data), data from EPA-approved data sources (e.g., EIA Form 923 data), and data collected by NMED and reported to EPA (e.g. air quality emissions inventories). These sources may include primary literature (i.e., peer-reviewed journal articles and reports) or databases. We may also use approved existing sources (e.g., handbooks, databases). Whenever possible the most site or state specific data deemed reliable will be used. Original sources for all information and data contained in the document will be included in a list of references with appropriate citations. When peer-reviewed literature or EPA-approved data sources cannot be used, we will document any significant limitations to the data sources used.

We will document information regarding each dataset and our rationale/selection criteria for selecting the data sources used in the inventory. The contractors will be responsible for evaluating and selecting the data for project tasks. NMED or its contractor(s) will oversee and approve data sources and rationale.

Table 2-1 presents an example hierarchy for data quality when identifying and reviewing available sources of data and information. When evaluating data resources, efforts will be made to identify and select data sources that most closely conform to the highest ranked criteria. Data quality metrics and documentation may not be provided by each source, and as necessary, we may consult with subject matter experts from permitted facilities or trade associations operating in New Mexico to qualify data for use to meet project objectives.

Any available data quality information will be reviewed by NMED, contractors, and project advisors to ensure that the data represent full-scale designs and commercial processes, and that they are applicable to economic and regulatory conditions in the United States. NMED and contractors will document data sources used and any significant limitations of utilized data or information to ensure that the data are appropriate for their intended use. An internal technical reviewer will review the approach for selecting and compiling data; the review will include examination of the data sources and the intended use of the

data. The specific QC techniques used will depend on the technical activity or analysis to which they are applied. The contractor is responsible for verifying the usability of data and related information.

Table 2-1 Existing Data Quality and Hierarchy

Quality Rank	Source Type
Highest	Federal, state, and local government agencies
Second	Consultant reports for state and local government agencies
Third	NGO studies; peer-reviewed journal articles; trade journal articles; conference proceedings
Fourth	Conference proceedings and other trade literature: non-peer-reviewed
Fifth	Individual estimates (e.g., via personal communication with vendors)

NMED will work with EPA to ensure that all data used for the project are appropriate for their intended use. The main criteria that will be used in the selection of the data are the quality of the data (based on peer review, credible source, and/or QA documentation), availability, suitability for the intended purpose.

NMED or its contractor(s) will use the Secondary Data Quality Ranking Hierarchy when identifying and reviewing available sources of information. The source types in **Table 2-1** appear in the order in which they are likely to meet data quality criteria. For example, federal government data are more likely to be from a credible source, thoroughly reviewed, suitable, available, and representative, and any exceptions to these data criteria are likely to be noted in the government data, providing transparency. Data from individuals are expected to be less reliable, not peer reviewed, and may not be suitable or representative.

If it is determined that data meeting the fourth (i.e., conference proceedings and other trade literature: non peer-reviewed) or fifth (i.e., individual estimates such as personal communications with vendors) level are from the best or only available data source, NMED or its contractor(s) will include in the inventory a description of these data with associated limitations for review by the EPA PO or delegate.

These measures of data quality will be used to judge whether the data are acceptable for their intended use. In cases where available data do not or may not meet data quality acceptance criteria, NMED or its contractor(s) will include in the inventory a discussion for review by the EPA PO or delegate explaining how emissions estimates that relied on such data compare to SIT estimates.

We will also consider, for example, the age (i.e., date of dataset) and the representativeness of the data and will include in the inventory report for review by the EPA of any quality concerns regarding data that are outdated or that have other quality issues, like data gaps or inconsistency with other sources. Any data source utilized that is older than 10 years will specifically be flagged in the inventory report.

Representativeness will be evaluated by determining that the emissions or activity data are descriptive of conditions in the United States, data are current, and data are descriptive of similar processes within New Mexico. Any incomplete datasets will be identified, and deficiencies will be evaluated to determine whether data are missing or confusing and if they meet the secondary-use quality objectives.

Key screening criteria will be used to screen the sources identified. The contractors will provide oversight to the screening process to ensure sources collected are the most relevant and meet quality requirements. Available data and information from the selected sources will be compiled and relevant summary information will be extracted from the information sources to develop the required output for each of the project tasks.

2.3.1. Criteria for Accepting Existing Data for Intended Use

The criteria for determining whether the data are acceptable for use in developing the statewide inventory will be based on a comparison of the associated emissions estimate to the emissions estimate produced using the EPA's SIT. While some differences between the state's calculations and SIT calculations are expected, differences of more than 5% must be accompanied by an explanation subject to approval by the EPA prior to using the state's estimate in lieu of the SIT estimate. The exception to this is the oil and gas sector, where EPA's GHG inventory by state, SIT, and GHGRP data are inadequate to estimate New Mexico Emissions. Evaluation of New Mexico's GHG emissions from the oil and gas sector is described in Table 1-5.

2.3.2. Criteria for Options Identification in Planning Phase

The criteria for reviewing all activities under each task and identifying the best options for emissions reductions will be based on the following criteria[17] in the EPA's CPRG program guidance:

1. Quantity of reductions in emissions of climate pollution under the option.
2. Number of jobs likely to be created by the option.
3. Environmental justice benefits of the project including the number of people living in overburdened neighborhoods that will benefit from the option.
4. Quantity of reductions in criteria and toxic air pollutants that can be achieved by option.
5. Number of people living, working, recreating, and going to school in the area(s) benefiting from the option.

2.4. Data Management

Data management procedures include file storage and file transfer. All project and data files will be transferred from contractors to NMED and stored on NMED project servers. Files will be organized and maintained in folders by project, task, and function, including a system of file labeling to ensure version control. Any files containing confidential business information will be stored on secure computers. The Angela Raso will make sure that staff are trained and adhere to the project file organization and version control labeling to ensure that files are placed in consistent locations. All files will be backed up each

[17] CPRG Program Guidance, page 4. Available at https://www.epa.gov/inflation-reduction-act/climate-pollution-reduction-grants#CPRGProgramGuidance.

night to avoid loss of data. Data are stored in various formats that correspond to the software being used. As necessary, data will be transferred using various techniques, including email, File Transfer Protocol, or shared drives. Typically, records will be archived once the project is completed. Record retention times will be based on contractual and statutory requirements or will follow NMED practices for storing materials of up to 5 years after the end of the period of performance (POP). Multiple project staff are granted access rights to the archived file system for each project. Records may be retrieved from archived file system by the TL, PM, or other project staff with access during the records retention period. As soon as allowed by applicable regulations or the grant agreement, records will be destroyed according to NMED policies and procedures. For any sensitive information that is gathered under the project, NMED's policy is consistent with EPA–recommended methods of destruction, which include degaussing, reformatting, or secure deletion of electronic records; physical destruction of electronic media; recycling; shredding; incineration; and pulping. Should the grant specify some other manner of disposition (e.g., transfer to the client), NMED will comply with that directive. As noted above, NMED has developed a file naming convention/nomenclature for electronic file tracking and record keeping. Foremost, all files must be given a short but descriptive name. For those records and files gathered or provided to NMED, the filename may include the identification of "original" in its filename.

Similarly, files that have undergone a review by an independent, qualified person will include, at the end of the filename, the initials of the reviewer or the suffix "rev" (in lieu of initials) if more than one reviewer reviewed the file, along with the date reviewed and version number, as a way to track which staff person(s) reviewed the file and when. Filenames of draft versions will follow an incremental, decimal numbering system. More specifically, each successive draft of a document is numbered sequentially from version 0.1, 0.2, 0.3… until a final version is complete. Final versions will be indicated by whole numbers (e.g., version 1.0). Final versions of documents that undergo revisions will be labeled version X.1 for the first set of revisions. While the document is under review, subsequent draft versions will increase incrementally (e.g., 1.2, 1.3, 1.4) until a revised final version is complete (e.g., version 2.0).

In the event data retrieval is requested and to prevent loss of data, all draft and final file versions will be retained electronically—that is, superseded versions will not be deleted.

Note that changes made to deliverables will be made using the software's *track changes* feature, which allows a user to track and view all changes that are made to the document version. All deliverable reviews will be documented in a QC Documentation Form (see **Appendix B**) for the project. This form will be maintained in the project files.

For this project, it is not anticipated that any special hardware or software will be used. General software available through Microsoft Suite including Excel, PowerPoint, Access, and Word will be sufficient to perform the work (described in **Tables 2.1–2.5)** for this project.

3. Assessment and Oversight (Group C)

NMED is committed to preparing a comprehensive and reliable inventory of GHG emissions from New Mexico. Under this project our senior management team has dedicated the necessary resources to ensure we deliver an inventory that can be relied upon for future policy decisions. Accordingly, under this project, we will concurrently implement existing quality management systems that NMED has previously utilized for submissions to the EPA under Title I of the Act where task-level deliverables will be subjected to required, regular reviews (e.g., quarterly) to ensure that technical, financial, and schedule requirements of this project are consistent with the EPA PO's and QAM's expectations. This section discusses Elements C.1 (assessments and response actions) and C.2 (reporting) applicable to this project.

3.1. Assessments and Response Actions

The QA program includes periodic review of data files and draft deliverables. The essential steps in the QA program are as follows:

1. Identify and define the problem.
2. Assign responsibility for investigating the problem.
3. Investigate and determine the cause of the problem.
4. Assign and accept responsibility for implementing appropriate corrective actions.
5. Establish the effectiveness of and implement the corrective action.
6. Verify that the corrective action has eliminated the problem.

The contractors will provide day-to-day oversight of the quality system. Periodic project file reviews will be carried out by NMED staff to verify that required records, documentation, and technical review information are maintained in the files. NMED staff will ensure that problems found during the review are brought to the attention of the contractor and are corrected immediately. All nonconforming data will be noted, and corrective measures to bring nonconforming data into conformance will be recorded.

NMED staff are responsible for determining whether the quality system established for the project is appropriate and functioning in a manner that ensures the integrity of all work products. All technical staff have roles and will participate in the corrective action process. Corrective actions for errors found during QC checks will be determined by the project management team. The originator of the work will make the corrections and will note on the QC form that the errors were corrected. A reviewer not involved in the creation of the work will review the corrections to ensure the errors were corrected. Any problems noted during audits will be reviewed and corrected by the QA Manager and discussed with the TL as needed. Depending on the severity of the deficiency, the TL may consult the QA Manager and stop work until the cited deficiency is resolved. Deficiencies identified and their resolution will be documented in monthly project reports, as applicable. The QA Manager and TL will comply and respond to all internal and EPA audits on the project, as needed. The QA Manager will produce a report outlining any corrective actions taken.

3.2. Reports to Management

The periodic progress reports (to the EPA PO) required in the grant agreement will be reviewed by NMED to ensure the project is meeting milestones and that the resources committed to the project are sufficient to meet project objectives. These periodic progress reports will describe the status of the project, accomplishments during the reporting period, activities planned for the next period, and any special problems or events including any QA/QC issues. Reports to the EPA will be drafted by project staff familiar with project activities during the reporting period.

Any QC issues impacting the quality of a deliverable, the project budget, or schedule will be identified and promptly discussed with NMED staff and management as appropriate. All significant findings will be included in monthly reports with the methods used to resolve the specific QC issue or the recommendations for resolution for consideration by the EPA's PO or designee.

Based on the technical work completed during the reporting period, progress reports will be reviewed internally by an independent, qualified technical person (equivalent or senior to the TL), prior to submitting to the PM. The PM will conduct a final review of the report before transmitting the progress report to the EPA PO and the PM's manager will be cc'd on all progress reports.

4. Data Validation and Usability (Group D)

4.1. Data Review, Verification, Validation

All work conducted under this project will be subject to technical and editorial review. When existing data for the same GHG-emitting activity are available from multiple sources, the background information documents will be reviewed for all sources to determine the dataset that is the most representative of operations in the state. Additionally, the inventory report will include the vintage of the existing data resource and preference will be given to the most recent dataset that is representative of similar GHG-emitting activities in the state. Reviews will be conducted by an independent, qualified person—or a person not directly involved in the production of the deliverable. The term "validation" refers to whether the data meets the QAPP-defined user requirements while the term "verification" refers to whether conclusions can be correctly drawn from the data. The quality of data used and generated for the project will be reviewed and verified at multiple levels by the project team. This review will be conducted by a senior technical reviewer with specific, applicable expertise. All original and modified data files will be reviewed for input, handling, and calculation errors. Additionally, all units of measure will be checked for consistency. Any potential issues identified through this review process will be evaluated and, if necessary, data will be corrected, and analysis will be revised as necessary, using corrected data. These corrections will be documented in project records. These measures of data quality will be used to judge whether the data are acceptable for their intended use. In cases where available data does not or may not meet data quality acceptance criteria, the TL will document these findings in the inventory along with corrective actions or use of alternative data sources.

4.2. Verification and Validation Methods

As a standard operating procedure, all data (retrieved and generated) will be verified and validated through a review of data files by an independent, qualified technical staff member (i.e., someone other than the document originator), and ultimately, the NMED TL. A checklist of QC activities for deliverables under this project is provided as **Appendix A**. Forms for documenting QC activities and review of deliverables are included in **Appendix B**. Documentation of calculations will be included in spreadsheet work products and in supporting memoranda, as appropriate.

The TL is responsible for day-to-day technical activities of tasks, including planning, data gathering, documentation, reporting, and controlling technical and financial resources. The TL is the primary person responsible for quality of work on tasks under this project and will approve all-related plans and reports. These reports will be transmitted by the TL to the QAM for final review and approval.

Reviews of analyses by the technical staff, and ultimately the TL, will include a thorough evaluation of content and calculated values. All original and modified data files will be reviewed for input, handling, and calculation errors. Additionally, all measurement units will be checked for consistency. Any potential issues identified through this review process will be evaluated, errors corrected, and analysis repeated using the corrected data. All corrections will be documented in project records.

Source data will be verified and validated through a review of data files by the technical staff, and ultimately the TL. Typical data verification reviews can include checks of the following:

- Data sources are clearly documented,
- Calculations are appropriately documented,
- All relevant assumptions are clearly documented,
- Conclusions are relevant and supported by results, and
- Text is well-written and easy to understand.

The documented review process will be stored with deliverables for the project. For the narrative describing the methodologies used for the inventory, all comments on drafts will be clearly and concisely summarized including a description of how substantive issues raised by commenters were resolved.

As discussed in Section 1.9, QC objectives include verification that data in database tables are stored and transferred correctly, algorithms call data correctly, units are internally consistent, and reports pull the required data. These data management issues will be addressed as part of the QC checks of data acquisition and document preparation.

For this project, it is not anticipated that any special data validation software will be required. However, where calculations are required to assess the data/datasets, calculations will be performed using computer spreadsheets (like Excel spreadsheets with predefined functions, or formulas) and calculators to reduce typographical or translation errors. General software available through the Microsoft Suite including Excel, PowerPoint, Access, and Word will be sufficient to perform the work as described in Section 1.6 for this project.

4.3. Reconciliation with User Requirements

All data (retrieved and generated) and deliverables in this project will be analyzed and reconciled with project data quality requirements. To ensure deliverables meet user requirements, the TL or senior technical lead will review all data and deliverables throughout the project to ensure that the data, methodologies, and tools used meet data quality objectives, are clearly conveyed, and represent sound and established science.

NMED will review each project with the EPA at the planning stage to ensure the approach is fundamentally sound and will meet the project objectives. The TL or senior technical lead will evaluate data continuously during the life term of the project to ensure they are of sufficient quality and quantity to meet the project goals. Prior to submission of draft and final products, the TL or senior technical lead will make a final assessment to determine whether the objectives have been fulfilled in a technically sound manner. Assumptions made in preparing project analyses will be clearly specified in the inventory.

As discussed in Section 1.9.1, uncertainty can be evaluated using a few different approaches. The most useful uncertainty analysis is quantitative and is based on statistical characteristics of the data such as

the variance and bias of estimates. In a sensitivity analysis, the effect of a single variable on the resulting emissions estimate generated by a model (or calculation) is evaluated by varying its value while holding all other variables constant. Sensitivity analyses will help focus on the data that have the greatest impact on the output data. Additional statistical tests may be utilized depending on the need for more or less rigorous tools and on the specific inventory activity being evaluated.

5. References

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EPA, EPA-454/B-17-001, *Quality Assurance Handbook for Air Pollution Measurement Systems, Ambient Air Quality Monitoring Program, Volume II*. Available at https://www3.epa.gov/ttnamti1/files/ambient/pm25/qa/Final%20Handbook%20Document%201_17.pdf. Accessed on 6/23/2023.

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EPA, Global warming potentials at https://www.ecfr.gov/current/title-40/chapter-I/subchapter-C/part-98/subpart-A?toc=1. Accessed on 7/26/2023.

USDA Forest Service, *Greenhouse gas emissions and removals from forest land, woodlands, and urban trees in the United States, 1990-2019* at https://www.fs.usda.gov/research/treesearch/62418. Accessed on 7/26/2023.

US DOT, *Highway Statistics Series* at https://www.fhwa.dot.gov/policyinformation/statistics/2021/vm1.cfm . Accessed on 7/26/2023.

Appendix A: Check Lists of Quality Control Activities for Deliverables

Tasks and Deliverables	Quality Control Procedures
Task 1. State inventory of oil and gas industry GHG emissions	
Statewide tabular inventory of GHG emissions from oil and gas sources with narrative report describing data sources, methodology, and documentation of QAPP implementation.	1. Comparison of multiple statewide inventories relative to statewide oil and gas production. 2. Review by a senior technical reviewer—analytical methods and results are explained clearly, technical terms are defined, conclusions are reasonable based on information presented, and level of technical detail is appropriate. 3. Editor review—writing is clear, free of grammatical and typographical errors.

Tasks and Deliverables	Quality Control Procedures
Task 2. State inventory of transportation sector GHG emissions	
Statewide tabular inventory of GHG emissions from mobile sources with narrative report describing data sources, methodology, and documentation of QAPP implementation.	1. Comparison of (a) statewide inventory *versus* (b) statewide inventory federal estimate developed by the EPA. 2. For any values used in state inventory that are significantly different from federal estimates, the table below will be utilized to assess precision and bias of the statewide inventory versus federal estimates:

Transportation Fuel	State Estimate	Federal Estimate	Statistics*
Aviation Gasoline			
Distillate Fuel			
Ethanol			
Jet Fuel, Kerosene			
Jet Fuel, Naphtha			
Hydrocarbon Gas Liquids			
Lubricants			
Motor Gasoline			
Natural Gas			
Residual Fuel			
Other			

* Precision and bias calculations will be in accordance with the EPA's Data Assessment Statistical Calculator (DASC) Tool available at https://www.epa.gov/sites/default/files/2020-10/dasc_11_3_17.xls with the state's estimate taken as the measured value and the SIT value taken as the audit value.

3. Review by a senior technical reviewer—analytical methods and results are explained clearly, technical terms are defined, conclusions are reasonable based on information presented, and level of technical detail is appropriate.

Tasks and Deliverables	Quality Control Procedures
Task 2: State inventory of transportation sector GHG emissions	
	4. Editor review—writing is clear, free of grammatical and typographical errors.

Tasks and Deliverables	Quality Control Procedures
Task 3: State inventory of electric generation GHG emissions	
Statewide tabular inventory of GHG emissions from electric power generation with narrative report describing data sources, methodology, and documentation of QAPP implementation.	1. Comparison of (a) statewide inventory *versus* (b) statewide federal estimate developed by the EPA. 2. For any values in the state inventory that are significantly different from federal estimates, the table below will be utilized to assess precision and bias of the state's estimate versus the federal estimate:

Electric Power Fuel	State Estimate	Federal Estimate	Statistics*
Coal			
Distillate Fuel			
Natural Gas			
Petroleum Coke			
Residual Fuel			
Wood			
Other			

* Precision and bias calculations will be in accordance with the EPA's Data Assessment Statistical Calculator (DASC) Tool available at https://www.epa.gov/sites/default/files/2020-10/dasc_11_3_17.xls with the state's estimate taken as the measured value and the SIT value taken as the audit value.

Ensure the GWPs used for the state estimate and the federal estimate are on the same basis. For example, the SIT tool uses AR5 GWP (e.g., methane GWP = 28).

3. Technical review of methods, calculations, and underlying datasets—data are appropriate for intended use, data are complete and representative and current, data sources documented, analytical methods are appropriate, and calculations are accurate.
4. Review by a senior technical reviewer—analytical methods and results are explained clearly, technical terms are defined, conclusions are reasonable based on information presented, and level of technical detail is appropriate)
5. Editor review—writing is clear, free of grammatical and typographical errors.

<table>
<tr><th>Tasks and Deliverables</th><th>Quality Control Procedures</th></tr>
<tr><td colspan="2">Task 4. State Inventory of commercial and residential buildings GHG emissions</td></tr>
<tr><td>Statewide tabular inventory of GHG emissions from the state's commercial and residential buildings with narrative report describing data sources, methodology, and documentation of QAPP implementation.</td><td>1. Comparison of (a) statewide inventory versus (b) statewide federal estimate developed by EPA.
2. For any values in state inventory that are significantly different from federal estimates, the table below will be utilized to assess precision and bias of the statewide inventory versus federal estimates:
<table><tr><th>Fuels and Feedstocks for commercial and residential buildings</th><th>State Estimate</th><th>Federal Estimate</th><th>Statistics*</th></tr><tr><td>Commercial building electricity consumption</td><td></td><td></td><td rowspan="8"></td></tr><tr><td>Residential building electricity consumption</td><td></td><td></td></tr><tr><td>Commercial building natural gas consumption</td><td></td><td></td></tr><tr><td>Residential building natural gas consumption</td><td></td><td></td></tr><tr><td>Commercial building consumption of other fuels</td><td></td><td></td></tr><tr><td>Residential building consumption of other fuels</td><td></td><td></td></tr><tr><td>Other</td><td></td><td></td></tr></table>* Precision and bias calculations will be in accordance with the EPA's Data Assessment Statistical Calculator (DASC) Tool available at https://www.epa.gov/sites/default/files/2020-10/dasc_11_3_17.xls with the state's estimate taken as the measured value and the SIT value taken as the audit value.
3. Technical review of methods, calculations, and underlying datasets—data are appropriate for intended use, data are complete and representative and current, data sources documented, analytical methods are appropriate, and calculations are accurate.
4. Review a senior technical reviewer—analytical methods and results are explained clearly, technical terms are defined, conclusions are reasonable based on information presented, and level of detail appropriate.
5. Editor review: writing is clear, free of grammatical and typographical errors.</td></tr>
</table>

Tasks and Deliverables	Quality Control Procedures
Task 5. State Inventory of GHG Emissions from Other Sectors	
Statewide tabular inventory of GHG emissions from the state's minor sectors with narrative report describing data sources, methodology, and documentation of QAPP implementation.	1. Comparison of (a) statewide inventory *versus* (b) statewide inventory federal estimate developed by the EPA. 2. For any values used in state inventory significantly different than federal estimates, the table below will be utilized to assess precision and bias of the statewide inventory for minor sectors versus SIT estimates:

Fuels and Feedstocks for Other Major Sectors	State Estimate	SIT Estimate	Statistics*
Asphalt and Road Oil			
Aviation Gasoline Blending Components			
Coal			
Coking Coal			
Crude Oil			
Distillate Fuel			
Feedstocks, Naphtha less than 401 F			
Feedstocks, Other Oils greater than 401 F			
Hydrocarbon Gas Liquids			
Kerosene			
Lubricants			
Misc. Petro Products			
Motor Gasoline			
Motor Gasoline Blending Components			
Natural Gas			
Pentanes Plus			
Petroleum Coke			
Residual Fuel			
Special Naphthas			
Still Gas			
Unfinished Oils			
Waxes			
Wood			
Other			

* Precision and bias calculations will be in accordance with the EPA's Data Assessment Statistical Calculator (DASC) Tool available at https://www.epa.gov/sites/default/files/2020-10/dasc_11_3_17.xls with the state's estimate taken as the measured value and the SIT value taken as the audit value.

3. Technical review of methods, calculations, and underlying datasets—data are appropriate for intended use, data are complete and representative and current, data sources documented, analytical methods are appropriate, and calculations are accurate.
4. Review by a senior technical reviewer—analytical methods and results are explained clearly, technical terms are defined, conclusions are reasonable based on information presented, and level of detail appropriate.
5. Editor review: writing is clear, free of grammatical and typographical errors.

Appendix B: Example QC Documentation Form

<Grantee Org.>

Documentation of QA Review and Approval of Electronic Deliverables

Approvals on this form verify that all technical and editorial reviews have been completed and the deliverable meets the criteria for scientific defensibility, technical, and editorial accuracy, and presentation clarity as outlined in the Quality Assurance (QA) Project Plan, QA Narrative, Quality Management Plan, and/or according to direction from the EPA PO.

Client:	EPA Region <X>
Grant Number:	<enter grant number>
EPA Project Officer:	<enter EPA PO>
Project Number:	<enter internal Project ID>
Project Name:	<enter internal project name>
Grantee Org. Project Manager	<enter grantee's project manager>

QA Form Details

Item Number	File Name (Copy the name of the File Reviewed)	Deliverable Description	Date Sent to Client	Deliverable (Draft)	Deliverable (Final)	Document Originator	QA Review Information (Review Type)	QA Review Information (Reviewer Name)	QA Review Information (Date Review was Performed)	QA Review Information (Brief Summary of Review Findings and Other Notes)	QA Review Information (Have all Findings Been Resolved)	QA Review Information (Originator Signature)	QA Review Information (Reviewer Signature)	QA Review Information (File Location) *Copy Long Folder Path Name*
01				☐	☐		*Technical*				☐ Yes			
							Technical				☐ Yes			
02				☐	☐		*Technical*				☐ Yes			
							Technical				☐ Yes			
03				☐	☐		*Technical*				☐ Yes			
							Technical				☐ Yes			
04				☐	☐		*Technical*				☐ Yes			
							Technical				☐ Yes			