Climate Pollution Reduction Grants Program:

Puerto Rico

Quality Assurance Project Plan

Department of Natural and Environmental Resources

Air Quality Area

February, 2024

GRANT Number 96225223

1. Project Management (Group A)

1.1. Title and Approval Page

Quality Assurance Project Plan for
Puerto Rico Climate Pollution Reduction Plan

Grant Number: _____

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February 27, 2024

APPROVALS:

_____ Date:

PR DNER Program Manager: Amarilys Rosario-Ortiz Date: Month, Day, 2024

_____

USEPA Region 2 Grants Project Officer: Juan Gutierrez Date: Month, Day, 2024

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USEPA Region 2 Quality Assurance Manager: Date: Month, Day, 2024

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QAPP Revision History

Revision No.	Description	Author	Date
0	Original Version	DNER	February, 2024
1		DNER	March, 2024

1.2. Table of Contents

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Abbreviations

CAA	Clean Air Act
CFR	Code of Federal Regulations
CCAP	Comprehensive Climate Action Plan
CPRG	Climate Pollution Reduction Grant
DNER	Department of Natural and Environmental Resources
DNER-AQA	Department of Natural and Environmental Resources-Air Quality Area
EPA	U.S. Environmental Protection Agency
GHG	Greenhouse Gas
GHGRP	Greenhouse Gas Reporting Program (40 CFR Part 98)
ICR	Information Collection Request
LGGIT	Local GHG Inventory Tool
NEI	EPA's National Emissions Inventory
OAR	EPA Office of Air and Radiation
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

QCC	Quality Control Coordinator
SIT	State GHG Inventory Tool (provided by the EPA)
TL	Task Leader

1.3. Distribution List

This section presents the primary staff who will be working on the project. These staff will be identifying existing[1] data resources for evaluation and potential use under the project or serving in project-specific roles for implementing the Quality Assurance Project Plan (QAPP). 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 in DNER's SharePoint under the <> directory.

Table 1.1 QAPP Distribution List

Name	**Organization**	**Role**
Juan Gutierrez	US EPA, Region 2	EPA Project Officer (PO) or PO Representative (POR)
EPA QAM/QAMD	US EPA, Region 2	EPA Quality Assurance Manager or Delegate
Amarilys Rosario Ortiz	DNER	Grantee Project Manager, AQA Manager
DNER QA Manager	DNER	Grantee Quality Assurance Manager
Technical Consultant	TBD	Grantee Quality Control Coordinator, TBD
Technical Consultant	TBD	Grantee Task 1 Leader, TBD
Technical Consultant	TBD	Grantee Task 2 Leader, TBD
Technical Consultant	TBD	Grantee Task 3 Leader, TBD
Technical Consultant	TBD	Grantee Task 4 Leader, TBD
Technical Consultant	TBD	Grantee Task 5 Leader, TBD
Technical Consultant	TBD	Grantee Technical Staff 1, TBD
Technical Consultant	TBD	Grantee Technical Staff 2, TBD
Technical Consultant	TBD	Grantee Technical Staff 3, TBD

[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.

1.4. Project/Task Organization

The primary personnel responsible for implementation of this project are the DNER Project Manager (PM), Quality Assurance Manager (QAM), and Task Leaders (TLs)[2]. Their duties are outlined briefly in this section. The project QAM is independent of the unit generating the data.

AQA Manager is the DNER PM and will provide senior-level oversight as needed. The PM is responsible for DNER'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.

The DNER PM will assign a TL for each technical task with instructions to complete a baseline emissions inventory for the sector(s) under the task, to develop options for potential emissions reductions with estimated reductions per option, and to develop uncertainty estimates for each reduction estimate. **Table 1.1** presents the TLs for each technical task. Each TL is responsible for the day-to-day technical activities under their assigned task, including planning, reporting, and controlling of technical and financial resources allocated to the task by the PM. Accordingly, each TL is primarily responsible for implementing the Quality Program and this QAPP on task-level assignments.

Task-level management system. For each of the major deliverables under each task, the assigned TL will review all QA-related plans and reports and is responsible for transmitting them to the QA Manager (or delegate) for review and approval. Each TL is responsible for ensuring that quality procedures are implemented at the task level and for maintaining the official, approved, task-level QAPP content. Each TL will discuss any concerns about quality or any proposed revisions to task-level QAPP content with the QA Manager (or delegate) to identify, resolve, or preclude problems or to amend task-level plans, if necessary. In addition, each TL will work with the DNER PM and the QA Manager to identify and implement quality improvements. The DNER PM is responsible for ensuring the consistency of similar or related QA measures across tasks, and the TLs are responsible for overseeing task-level work performed by technical staff and providing assurance that all required QA/QC procedures are being implemented.

Project-level management system. Tasks are expected to proceed concurrently, in parallel. The PM will maintain close communications with each TL and ensure any difficulties encountered or proposed changes at the task level are reviewed for implications on other similar or related tasks. The PM is also responsible for communicating progress or difficulties encountered (across all tasks) to the EPA PO or POR, who provides the EPA's primary oversight function for this project at EPA OAR/EPA Region 2 and is responsible for review and approval of this QAPP and any future revisions. The PM (with support from TLs and assigned DNER technical staff) will be responsible for consulting with the EPA PO or POR, on planning, scheduling, and implementing the QA/QC for all project deliverables and obtaining required EPA approvals.

The QA Manager is responsible for overseeing the quality system, monitoring and facilitating QA activities on tasks, and generally helping the DNER PM and TLs understand and comply with EPA QA requirements. They will not be involved in data collection or analyses for the CPRG, which will primarily be the task of the technical consultant. At the request of the DNER PM, QAM is responsible for conducting

[2]Note, throughout this document "DNER" refers to both DNER staff and the technical consultant that DNER contracts with to perform quantitative analyses related to the CRPG program.

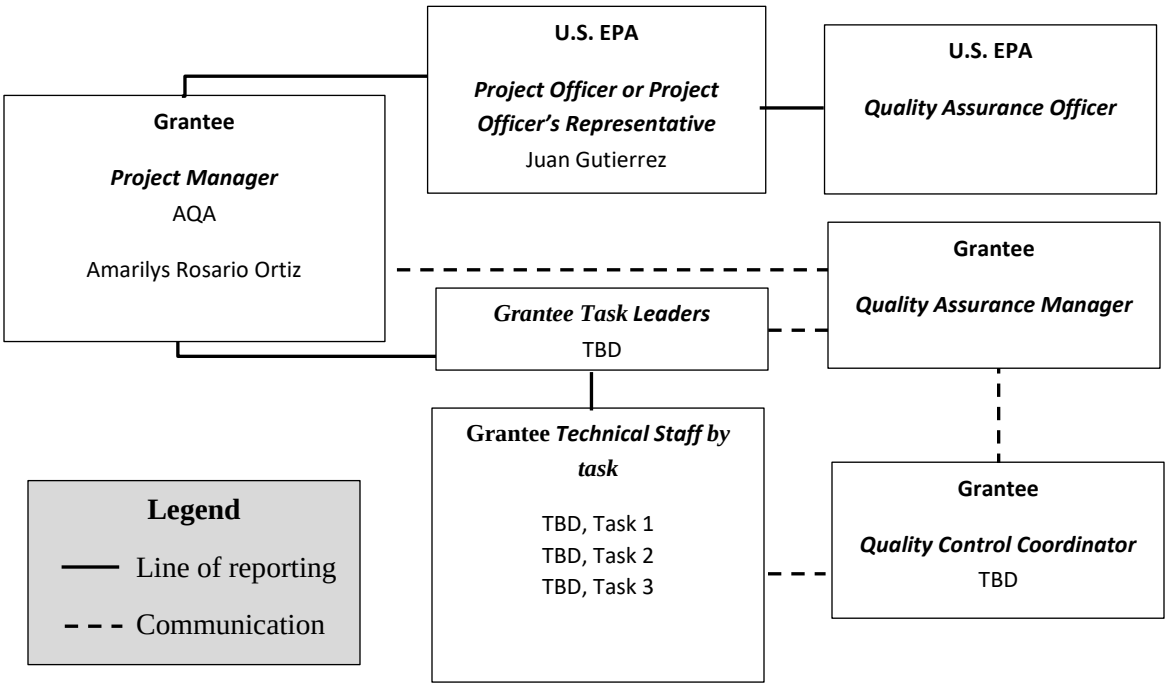
periodic independent audits of this project's QA program and will produce written documentation of the audit results and recommendations.

For each task under this project, the QAM is supported by the QC Coordinator, who will assist in the implementation of the quality system. The QAM will work closely with the PM and QC Coordinator to improve any deficiencies noted during audits.

The QC Coordinator, which will be a role assigned within the technical consultant, is responsible for assisting the PM and TLs in planning, documenting, and implementing the QA requirements for this project. Working with the PM, and in consultation with the QAM, they 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. The QC Coordinator will communicate with the PM and the QAM, as needed, on quality issues.

In addition, QC functions will be carried out by other technical staff and will be carefully monitored by the PM, who will work with the QA Manager to oversee this plan and implement quality improvements. For work done under this project, technical staff may include persons with expertise in the local residential, commercial, and industrial activities. Technical staff may also include persons with expertise in air pollution engineering, technical reviewers, database specialists, quality auditors, and technical editors. The PM will ensure that technical staff do not review work in a QA capacity for which they were a primary or contributing author. **Exhibit 1** presents the organizational chart for the project.

Exhibit 1. Project Organization[3]



[3] Under the EPA's QAPP standard (CIO 2105-S-02.0, Section 3) the organization chart must also identify any contractor relationships relevant to environmental information operations.

1.5. Problem Definition / Background

Under this project, DNER will identify, evaluate, and utilize existing data resources[4] to develop a regional inventory of the major sources of greenhouse gas (GHG) emissions within the Puerto Rico and 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 GHG inventory for the Priority Climate Action Plan (PCAP) using the EPA tool Greenhouse Gas Inventory Data Explorer,
2. Expand on GHG inventory for Comprehensive Climate Action Plan (CCAP) by using EPA's State Inventory Tool (SIT) for major or minor sectors,
3. Quantify measures using EPA tools

The GHG inventory may utilize the EPA's SIT,[5] state-level GHG inventories prepared by the EPA,[6] and data reported to the EPA's Greenhouse Gas Reporting Program (GHGRP)[7] together with any independent, sector-specific estimates prepared by the state. Any state estimates will be compared to corresponding federal estimates for validation. Significant differences will be evaluated and discussed in the inventory report with the underlying data and methodology used for the independent state estimates. The statewide inventory will include the following sectors and gases:

Sectors	***Greenhouse Gases (across all sectors)***
1. Transportation 2. Electricity generation and/or use 3. Natural and working lands 4. Industry 5. Agriculture 6. Commercial and residential buildings 7. Waste and materials management 8. Wastewater	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)

1.5.1. Rationale for Selection of Sectors

For each sector included in the statewide inventory, **Table 1.2** briefly describes why the sector is included in the inventory and the relative significance of the sector in terms of the magnitude of air emissions from existing inventories, the associated geographic distribution of the sources, and recent trends in readily available activity data for the source category.

[4] EPA, *Environmental Information Quality Policy*, CIO 2105.3, 03/07/2023 (p. 8) provides common examples of environmental information used to support the EPA's mission at https://www.epa.gov/system/files/documents/2023-04/environmental_information_quality_policy.pdf.
[5] https://www.epa.gov/statelocalenergy/state-inventory-and-projection-tool
[6] https://www.epa.gov/ghgemissions/state-ghg-emissions-and-removals
[7] https://www.epa.gov/ghgreporting/data-sets

Table 1.2 Rationale for Sector Selection

Sectors Included in Inventory	**Rationale for Including in GHG Inventory**
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. Transportation activities occur across all states.
Electric power generation	The electric power sector accounted for 25 percent of total U.S. greenhouse gas emissions in 2021. Power generation and/or consumption occurs across all states.
Industry	The industrial sector accounted for 24 percent of U.S. greenhouse gas emissions in 2021. Since 1990, industrial sector emissions have declined by 11 percent. In 2021, total energy use in the industrial sector increased by 2 percent due to an increase in total industrial production and manufacturing output. EPA's GHGRP data provide additional insights into underlying trends in the industrial sector.
Natural and working lands[8]	Natural and working lands include fluxes of carbon from activities such as converting forests to agricultural use and practices that remove CO_2 from the atmosphere and store it in long-term carbon sinks like forests. In 2021, the net CO_2 removed from the atmosphere by natural and working lands was 12% of total U.S. greenhouse gas emissions. Between 1990 and 2021, total carbon sequestration in this sector decreased by 14%, primarily due to a decrease in the rate of net carbon accumulation in forests, as well as an increase in CO_2 emissions from urbanization.
Agriculture	Agriculture accounted for about 10 percent of U.S. greenhouse gas emissions in 2021, and agricultural soil management was the largest source of N_2O emissions. Enteric fermentation was the largest source of CH_4 emissions.
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.
Waste and materials management	This sector includes landfills, composting, and anaerobic digestion. Landfills were the third largest source of anthropogenic methane emissions in 2021, and landfills accounted for 1.9 percent of total U.S. greenhouse gas emissions.
Wastewater	Wastewater treatment, both domestic and industrial, was the third largest anthropogenic source of N_2O emissions in 2021, accounting for 5.2 percent of national N_2O emissions and 0.3 percent of total U.S. greenhouse gas emissions. Emissions from wastewater treatment increased by 6.1 MMT CO_2e (41.6 percent) since 1990 as a result of growing U.S. population and protein consumption.

[8] Under international GHG inventory protocols this category is called "Land use, land-use change, and forestry."

1.5.2. 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)?
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.

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

Existing state-level estimates 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. DNER 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, DNER expects that the SIT default estimates for the state will provide the better estimates.

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. DNER expects that

[9] https://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks-1990-2021
[10] CPRG Program Guidance, page 4. Available at https://www.epa.gov/inflation-reduction-act/climate-pollution-reduction-grants#CPRGProgramGuidance.
[11] Ibid.

each task will produce up to three options for sector-specific emissions reduction projects for further consideration by management and policymakers.

1.5.4. Reason for Project

The baseline GHG inventory and options analyses developed under this project will be utilized by DNER for planning purposes to support Puerto Rico's development of the following three deliverables under the CPRG Program:

- Puerto Rico'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.
- Puerto Rico'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.
- Puerto Rico'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.

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1.5.5. 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…
  (C) 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.

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

Under authority of CAA § 7403(b)(1) the EPA has provided the following resources to 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*

DNER 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.

1.6. Project / Task Description

An example schedule of deliverables for the technical tasks (Tasks 1-3) for GHG inventory QAPPs is presented in **Tables 2.1** through **2.3.** The work to be performed under this project by DNER involves preparing a statewide GHG emissions inventory for Puerto Rico. The organization of the work is based on the use of the EPA's SIT under the following sector-specific tasks:

Task 1: Develop a GHG inventory for the Priority Climate Action Plan (PCAP) using the EPA tool Greenhouse Gas Inventory Data Explorer.

Task 2: Expand GHG inventory for CCAP by using EPA's SIT for major or minor sectors.

Task 3: Quantify measures using EPA tools.

For each sector-specific task, **Tables 2.1–2.3** provide planned activities and a schedule of deliverables for use by states preparing GHG inventories. The EPA's SIT, other resources, and answers to frequently asked questions are also located on the State and Tribal Greenhouse Gas Data and Resources webpage.[12]

Table 2.1 Technical Task Descriptions for Task 1.

Tasks and Deliverables	Schedule
Task 1. Develop a GHG inventory for the PCAP	
GHG Inventory Tool Decision: 1. Use the EPA tool *Greenhouse Gas Inventory Data Explorer*, produce a total emissions profile for Puerto Rico from 1990 to 2020. The sectors that will be included are electric power industry, transportation, industry, agriculture, commercial, and residential. a. Download the data and graphs from the website and review accuracy.	Within 90 days of QAPP approval by EPA.

Table 2.2 Technical Task Descriptions for Task 2.

Tasks and Deliverables	Schedule
Task 2. Expand on GHG inventory for CCAP by using EPA's SIT for major or minor sectors	
1. Use the EPA's State Inventory and Projection Tool (SIT) at https://www.epa.gov/statelocalenergy/state-inventory-and-projection-tool. To develop estimates for the following sectors:	Within 90 days of CCAP deadline.

GHGRP Values	SIT Modules
Electric Power Sector	[co2ffc-module.xlsm]
Transportation	[co2ffc-module.xlsm] for CO_2 [Mobile Combustion module.xlsm] for C and N_2O from the transportation sector.

[12] https://www.epa.gov/ghgemissions/state-and-tribal-greenhouse-gas-data-and-resources.

Table 2.2 Technical Task Descriptions for Task 2.

Tasks and Deliverables	Schedule
Task 2. Expand on GHG inventory for CCAP by using EPA's SIT for major or minor sectors	
<table><tr><td>Industrial</td><td>[ip-module.xlsm] [wastewater-module.xlsm] (municipal) [natural-gas-and-oil-module.xlsm, flaring]</td></tr><tr><td>Agriculture</td><td>[ag-module.xlsm]</td></tr><tr><td>Commercial</td><td>[co2ffc-module.xlsm] for CO_2 [stationaiy-combustion-module.xlsm] for CH_4 and N_2O</td></tr><tr><td>Residential</td><td>[co2ffc-module.xlsm] for CO_2 [stationaiy-combustion-module.xlsm] for CH_4 and N_2O</td></tr></table> 2. Review the user's manual available using the "Consult User's Guide" button on the [Control] sheet. This tool produces GHG estimates through 2020 for the state selected on row 3 of the [Control] sheet.	

Table 2.3 Technical Task Descriptions for Task 3.

Tasks and Deliverables	Schedule
Task 3. Quantify Measures	
1. Use EPA tested tools from their webpage "Quantifying Energy Savings and Greenhouse Gas (GHG) Reductions" https://www.epa.gov/inflation-reduction-act/quantifying-energy-savings-and-greenhouse-gas-ghg-reductions. A variety of tools can be used such as EPA's AVERT and MOVES to quantify the chosen reduction measures. a. If download is needed for the tool, download and review user's manual. b. If need, compare to other projections for a range of projected emissions.	Within 120 days of CCAP deadline and CCAP deadline.

1.7. Quality Objectives / Criteria

The primary objectives for this project are to develop reliable inventories for each of the GHG-emitting sectors in Puerto Rico and to identify options for reducing emissions from those sectors. Accordingly, all quality objectives and criteria are aligned with these objectives. The quality system used for this project is the joint responsibility of the DNER 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 to identify and implement quality improvements. All activities performed under this project will conform to this QAPP.

1.7.1. Data Quality, Management, and Analyses

For this project, DNER 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 the Puerto Rico's PCAP and CCAP as discussed in Section 1.5.4. The table in **Appendix A** is an example checklist of 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. DNER 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. 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. DNER will utilize the framework of sectors in the EPA's SIT tool or the EPA's state-level GHG emitting sectors. To ensure the inventory is geographically complete, the draft inventory will also be submitted for review by staff who are familiar with all activities subject to local or federal standards to ensure that all major-emitting activities in all regions of the state are included in the inventory.

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. DNER will use the most complete and accurate information available to compile representative data for this project.

Data comparability 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. DNER will compare datasets when available from different sources to check for 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 reference methods used and complete test reports, are important to ensure the comparability of emissions data.

1.7.2. 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 TL 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 QAM or QCC. Copies of these signed forms will be maintained in the project files.

1.8. Special Training / Certifications

All DNER staff assigned to work on this project shall have appropriate technical and QA training to properly perform their assignments. DNER staff serving in the QAM role under this project will have completed 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 completed an online training course on air emissions inventories on the Air Knowledge website at https://airknowledge.gov/EMIS-SI.html.

If training is required for new staff or for particular segments of the GHG inventory, the PM in coordination with the associated TL will identify available training resources for the inventory segment and incorporate the required training into the project schedule.

1.9. Documents and Records

DNER will document in electronic form QC activities for this project. The TL 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 DNER for at least ten years after the completion of the CCAP. 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 QC records)
- Assessment documentation (i.e., audit reports and independent calculations).

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 and activities 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, DNER 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 an EPA-approved document control format (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 in a QAPP addendum, approved by the same signatories to this QAPP, and circulated to everyone on the distribution list by the DNER PM.

At this time, DNER does not believe the project will 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, DNER will meet all requirements of the Privacy Act of 1974. Appendix indicates the status of our determination regarding applicability of the Privacy Act of 1974 under this project.

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 **Tables 2.1 – 2.5**, 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 SIT together with independent estimates prepared by DNER.

2.1.2. Identification of Data Sources and Acquisition

The following data sources will be evaluated for use under each task to develop estimates for the major-emitting sectors in DNER:

- Task 1: The EPA's *Greenhouse Gas Inventory Data Explorer* is expected to be the primary
- Task 2: The EPA's SIT tool is expected to be the primary source for this task.
- Task 3: This task is expected to us a variety of EPA quantification tools. DNER will select from the following subtasks for quantification of the measures or use other authorized EPA tools:
  - Subtask A: Vehicle registration data from the Puerto Rico Department of Transportation. State or federal averages on vehicle miles traveled and miles per gallon.
  - Subtask B: Activity data for electricity generators.
  - Subtask C: Forest resource data published by state or federal forestry officials.
  - Subtask D: Data published by the EPA under the Greenhouse Gas Reporting Program.
  - Subtask E: The EPA's SIT tool.
- Task 4: Data published by the EPA under the Greenhouse Gas Reporting Program
- Task 5: The EPA's SIT tool is expected to be the primary source for this task.

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. Calculations will be checked by repeating each calculation, independently, and comparing the results of the two calculations. 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, QC calculations will be performed using computer spreadsheets and calculators to reduce typographical or translation errors–mathematical/ statistical calculations are performed using spreadsheets or software programs with predefined formulas and functions. DNER will ensure that any manipulations performed on the data/dataset were done correctly. Such calculations could involve statistical checks to look for data outliers. One approach, for example, that may be used to identify outliers or unusual data points is sorting a datasheet for one or more data variables. This approach is a simple but effective way to highlight unusually high or low values. Graphing data using boxplots, histograms, and scatterplots is another method that may be used to identify gaps in the data (missing data), outliers, or unusual data points. Another approach that may be used is the use of Z-scores, which can quantify the unusualness of an observation when data follow a normal distribution. A Z-score for a particular value indicates the number of standard deviations above and below the mean that the value falls. For example, a Z-score of 2 indicates that an observation is two standard deviations above the average while a Z-score of -2 indicates the value is two standard deviations below the mean. A Z-score of zero represents a value that equals the mean. As appropriate, we will also use 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. DNER 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 for GHG Inventory and Options Identification

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., Department of Energy and other federal data sources). 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). 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 TL will be responsible for overseeing and confirming the selection of the data for the project tasks.

Table 3.1 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 the DNER to qualify data for use to meet project objectives.

Any available data quality information will be reviewed by DNER 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. DNER 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 DNER TL is responsible for verifying the usability of data and related information.

Table 3.1 Existing Data Quality Ranking 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)

DNER 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 vintage and quality of the data (based on peer review). The quality of the data will consider the credibility of the source, and the QA documentation provided by the data source. Senior technical staff will also evaluate the availability of alternative datasets, suitability of the selected data for the intended purpose, and agreement with LGGIT estimates.

DNER will use the Secondary Data Quality Ranking Hierarchy when identifying and reviewing available sources of data and information. The source types in **Table 3.1** appear in the order in which they are likely to meet the 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 compose the best or only available data source, the TL 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 if the data are acceptable for their intended use. In cases where available data do not or may not meet data quality acceptance criteria, the TL 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 the source 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 inconsistencies 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, that the data are current, and that the data are descriptive of similar processes within Puerto Rico. Any incomplete datasets will be identified, and deficiencies will be evaluated to determine if data are missing or confusing and if they meet secondary-use quality objectives.

Key screening criteria will be used to screen the sources identified. The DNER TL 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 50 percent 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.

2.3.2. Criteria for Options Identification

The criteria for reviewing all activities under each task and identifying the best options for emissions reductions will be based on the following criteria[13] 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.

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

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 stored on DNER project servers. Files will be organized and maintained by the TL 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 TL 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 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 DNER practices for storing materials of at least seven 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 DNER policies and procedures. For any sensitive information that is gathered under the project, DNER'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), DNER will comply with that directive. As noted above, DNER 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 DNER, 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, to track which staff person(s) reviewed the file and when. The 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 documented 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 the Microsoft Suite including Excel, PowerPoint, Access, and Word will be sufficient to perform the work (described in **Tables 2.1 – 2.3)** for this project.

3. Assessment and Oversight (Group C)

DNER is committed to preparing a comprehensive and reliable inventory of GHG emissions From Puerto Rico. 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 DNER 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 TL will provide day-to-day oversight of the quality system. Periodic project file reviews will be carried out by the QA Manager, at least once per year to verify that required records, documentation, and technical review information are maintained in the files. The QAM will ensure that problems found during the review are brought to the attention of the TL and are corrected immediately. All nonconforming data will be noted, and corrective measures to bring nonconforming data into conformance will be recorded.

The TLs and QA Manager are responsible for determining if 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 TL and, if necessary, with the QA Manager. The originator of the work will make the corrections and will note on the QC form that the errors were corrected. A reviewer or TL, 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 the PM and the PM's manager 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 the TL or other 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 the assigned TL and the PM or QCC 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 meet 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 the DNER TL or 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 do 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 DNER TL. An example of 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** . 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.

Source data will be verified and validated through a review of data files by the technical staff, and ultimately the TL. Reviews of analyses 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,
- 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 1.7, 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.

DNER 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 if 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 1.7.1, 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

EPA, *Chief Information Officer's Policy Directive on Environmental Information Quality Policy* available at EPA IT/IM Directive: Environmental Information Quality Policy, Directive # CIO 2105.3. Accessed on 7/26/2023.

EPA, *Chief Information Officer's Policy Directive on Information Technology / Information Management: Quality Assurance Project Plan (QAPP) Standard*, Directive # CIO 2105-S-02.0. Available at https://www.epa.gov/irmpoli8/quality-assurance-project-plan-qapp-standard. Accessed on 7/24/2023.

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.

EPA, GHGRP State and Tribal Fact Sheet. Available at https://www.epa.gov/ghgreporting/ghgrp-state-and-tribal-fact-sheet. Accessed on 6/23/2023.

-EPA, US GHG Inventory by State. Available at https://www.epa.gov/ghgemissions/state-ghg-emissions-and-removals. Accessed on 6/23/2023.

EPA, GHG Reporting Program. Available at https://ghgdata.epa.gov/ghgp/main.do. Accessed on 7/18/2023.

EPA, Data reported to EPA's Greenhouse Gas Reporting Program (GHGRP) at https://www.epa.gov/ghgreporting/data-sets

EPA, Fuel heating values and CO_2 emission factors at eCFR : 40 CFR Part 98 -- Mandatory Greenhouse Gas Reporting

EPA, National Inventory at https://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks-1990-2021

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, Federal Highway Administration Transportation Statistics at https://www.fhwa.dot.gov/policyinformation/statistics/2021/vm1.cfm. Accessed on 7/26/2023.

Appendix A. Example Check Lists of Quality Control Activities for Deliverables

Deliverables	Quality Control Procedures
Statewide inventory of GHG emissions with documentation of the following QC activities: (1) narrative report describing data sources and QC measures for data acquisition steps, (2) description of methodology and QC measures for validated proper implementation of methodology, and (3) documentation of QAPP implementation. (4) listing of emissions reductions options are present with documentation of rationale for each option.	1. 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. 2. Review by TL or 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.

Appendix B. Example QC Documentation Form

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 clarify 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 2
Grant Number: 96225223
EPA Project Officer: TBD
Project Name: Puerto Rico CPRG
Grantee Org. 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)	(Reviewer Name)	(Date Review was Performed)	(Brief Summary of Review Findings and Other Notes)	QA Review Information (Have all Findings Been Resolved?)	(Originator Signature)	(Reviewer Signature)	(File Location) *Copy Long Folder Path Name*
01				☐	☐		***Technical***				☐ Yes			
02				☐	☐		***Technical***				☐ Yes			
03				☐	☐		***Technical***				☐ Yes			
04				☐	☐		***Technical***				☐ Yes			
05				☐	☐		***Technical***				☐ Yes			
06				☐	☐		***Technical***				☐ Yes			

Appendix C. Compliance with Requirements Under the Privacy Act of 1974

Important Note about Personally Identifiable Information (PII)

The Privacy Act of 1974 (5 U.S.C. § 552a) mandates how federal agencies maintain records about individuals. Per OMB Circular A-130, Personally Identifiable Information (PII) is "information that can be used to distinguish or trace an individual's identity, either alone or when combined with other information that is linked or linkable to a specific individual."

EPA systems/applications that collect PII must comply with EPA's Privacy Policy and procedures to guard against unauthorized disclosure or misuse of PII in all forms. For more information click here. If PII are collected, then the QAPP will describe how the PII are managed and controlled.

Personally identifiable information (PII):

Please verify one of the following two options by checking the corresponding box:

1. This project **will not** collect Personally Identifiable Information (PII) ☒:
2. This project **will** collect Personally Identifiable Information (PII): ☐

This QAPP will comply with 5 U.S.C. § 552a and EPA's Privacy Policy.