OMB No. 2506-0177
(exp. 7/31/2028)

U.S. DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
WASHINGTON, DC 20410-1000

This Worksheet was designed to be used by those "Partners" (including Public Housing Authorities, consultants, contractors, and nonprofits) who assist Responsible Entities and HUD in preparing environmental reviews, but legally cannot take full responsibilities for these reviews themselves. Responsible Entities and HUD should use the RE/HUD version of the Worksheet.

Air Quality (CEST and EA) – PARTNER

HUD Exchange Air Quality Page

1. **Does your project include new construction or conversion of land use facilitating the development of public, commercial, or industrial facilities OR five or more dwelling units?**

   ☒ Yes → *Continue to Question 2.*

   ☐ No → *If the RE/HUD agrees with this recommendation, the review is in compliance with this section. Provide any documents used to make your determination.*

2. **Is your project's air quality management district or county in non-attainment or maintenance status for any criteria pollutants?**
   Follow the link below to determine compliance status of project county or air quality management district:
   EPA Green Book: detailed information about area National Ambient Air Quality Standards (NAAQS) designations

   ☒ No, project's county or air quality management district is in attainment status for all criteria pollutants
   → *If the RE/HUD agrees with this recommendation, the review is in compliance with this section. Continue to the Worksheet Summary below. Provide any documents used to make your determination.*

   ☐ Yes, project's management district or county is in non-attainment or maintenance status for one or more criteria pollutants. → *Continue to Question 3.*

3. **Determine the estimated emissions levels of your project for each of those criteria pollutants that are in non-attainment or maintenance status on your project area. Will your project exceed any of the *de minimis or threshold* emissions levels of non-attainment and maintenance level pollutants or exceed the screening levels established by the state or air quality management district?**

   ☐ No, the project will not exceed *de minimis* or threshold emissions levels or screening levels
   → *If the RE/HUD agrees with this recommendation, the review is in compliance with this section. Explain how you determined that the project would not exceed de minimis or threshold emissions.*

☐ Yes, the project exceeds *de minimis* emissions levels or screening levels.

→ *Continue to Question 4. Explain how you determined that the project would not exceed de minimis or threshold emissions in the Worksheet Summary.*

4. **For the project to be brought into compliance with this section, all adverse impacts must be mitigated. Explain in detail the exact measures that must be implemented to mitigate for the impact or effect, including the timeline for implementation.**
   Click here to enter text.

Worksheet Summary

Provide a full description of your determination and a synopsis of the information that it was based on, such as:

- Map panel numbers and dates
- Names of all consulted parties and relevant consultation dates
- Names of plans or reports and relevant page numbers
- Any additional requirements specific to your program or region

Include all documentation supporting your findings in your submission to HUD.

https://www3.epa.gov/airquality/urbanair/sipstatus/reports/pr_areabypoll.html

https://www3.epa.gov/airquality/greenbook/adden.html

https://www.arcgis.com/apps/mapviewer/index.html?layers=2a487fb6c56e492e8e2e66608d9b93d6

The USEPA Green Book identifies non-attainment areas within the Municipalities of Arecibo, Bayamón, Cataño, Guaynabo, Salinas, San Juan and Toa Baja. However, although the project is mainly in the Bayamón municipality according to EPA information and/or maps the project is outside of the APA depicted non-attainment or maintenance area. See Attached Figure – EPA Non-attainment area.

Nonetheless, due to the project is for linear transportation, Federal Highway Administration (FHWA) environmental requirements and standards were followed. To this effect in September 2021 and updated on March 31, 2026, an Atmospheric Emissions Study was done. The results show that the project complies with no significant impact. Copy of said Study is included herein as an Appendix.

Based on above and the following information the Project is in compliance with this section.

MOBILE SOURCE AIR TOXICS

Mobile Source Air Toxics are a subset of pollutants emitted from motor vehicles that are known or suspected to cause adverse human health effects. The USEPA Agency has identified several MSAT compounds including benzene, formaldehyde, acrolein, 1,3-butadiene, and diesel particulate matter.

In accordance with guidance developed by the Federal Highway Administration, MSAT emissions are evaluated qualitatively for projects of this scale because reliable tools are not available to predict project-specific MSAT health impacts. Furthermore, there are no established NAAQS or regulatory thresholds for MSAT.

Federal fuel and vehicle emission regulations implemented under the Clean Air Act have substantially reduced emissions from motor vehicles, and these reductions are expected to continue as cleaner vehicles replace older vehicles in the fleet.

Although the proposed project may result in localized changes in traffic volumes, long-term trends in decreasing vehicle emission rates are expected to reduce MSAT emissions over time. Therefore, potential MSAT impacts associated with the project are expected to be minimal.

CONSTRUCTION & OPERATIONAL EMISSION

Construction activities associated with the proposed highway would generate temporary emissions from the operation of heavy equipment, construction vehicles, and earthmoving activities. Pollutants generated during construction may include particulate matter (PM_{10} and $PM_{2.5}$), nitrogen oxides (NOx), carbon monoxide (CO), and volatile organic compounds (VOC).

These emissions would be temporary and localized and would occur only during the construction phase. Implementation of standard construction best management practices would minimize air emissions. These practices include periodic watering of exposed soil, covering haul trucks transporting loose materials, maintaining construction equipment in proper operating condition, and limiting unnecessary vehicle idling.

Because construction emissions would be short-term and intermittent, they are not expected to cause violations of the National Ambient Air Quality Standards or result in long-term degradation of regional air quality.

Once operational, the proposed roadway would generate emissions associated with vehicular traffic. Mobile sources are the primary contributors to transportation-related air pollutants.

Traffic projections, including Average Annual Daily Traffic (AADT), roadway design characteristics, and projected vehicle operations were reviewed to evaluate potential operational air emissions. While the project may result in localized changes in traffic volumes, the project would not be expected to cause pollutant concentrations that exceed NAAQS.

Carbon monoxide (CO) concentrations are typically evaluated for transportation projects that create significant congestion or involve high-volume intersections located in non-attainment or maintenance areas. Because the project area is located within an attainment area for carbon monoxide and the proposed project is not expected to generate substantial traffic congestion. In addition, the incorporation of electronic toll collection systems would reduce vehicle idling and minimize the potential for elevated CO concentrations near toll facilities.

GREENHOUSE GAS EMISSIONS

The PRHTA concurs with the recognition that climate change and extreme weather events pose a significant challenge to the safety, reliability, effectiveness, and sustainability of the national transportation system.

EPA has developed several alternatives to reduce the emissions of GHG from the transportation sector. These are part of the Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. The following table shows a summary of these opportunities[1].

Examples of Reduction Opportunities in the Transportation Sector		
Type	**How Emissions are Reduced**	**Examples**
Fuel Switching	Using fuels that emit less CO_2 than fuels currently being used. Alternative sources can include biofuels; hydrogen; electricity from renewable sources, such as wind and solar; or fossil fuels that are less CO_2-intensive than the fuels that they replace.	• Using public buses that are fueled by compressed natural gas rather than gasoline or diesel. • Using electric or hybrid automobiles, provided that the energy is generated from lower-carbon or non-fossil fuels. • Using renewable fuels such as low-carbon biofuels.
Improving Fuel Efficiency with Advanced Design, Materials, and Technologies	Using advanced technologies, design, and materials to develop more fuel-efficient vehicles.	• Developing advanced vehicle technologies such as hybrid vehicles and electric vehicles that can store energy from breaking and use it for power later. • Reducing the weight of materials used to build vehicles. • Reducing the aerodynamic resistance of vehicles through better shape design.
Improving Operating Practices	Adopting practices that minimize fuel use.	• Reducing the average taxi time for aircraft. • Driving sensibly (avoiding rapid acceleration and braking, observing the speed limit). • Reducing engine-idling. • Improved voyage planning for ships, such as through improved weather routing, to increase fuel efficiency.
Reducing Travel Demand	Employing urban planning to reduce the number of miles that people drive each day. Reducing the need for driving through travel efficiency measures such as commuter, biking, and pedestrian programs.	• Building public transportation, sidewalks, and bike paths to increase lower-emission transportation choices. • Zoning for mixed use areas, so that residences, schools, stores, and businesses are close together, reducing the need for driving.

[1] The main aim of this report is to assess options for mitigating climate change. Several aspects link climate change with development issues. This report explores these links in detail, and illustrates where climate change and sustainable development are mutually reinforcing.

According to the EPA[2], the most effective way to reduce CO2 emissions is to reduce fossil fuel consumption. One of the strategies suggested by the EPA for the reduction of CO2 emissions through energy conservation is the reduction of the distance traveled by vehicles to reduce petroleum consumption. In addition, it is commonly known that, as traffic congestion increases, fuel consumption and thus CO2 emissions also increase[3]. Traveling at a steady speed will give much lower fuel consumption and emissions when compared with a stop-and-go driving pattern.

It is therefore expected that the construction of an alternative route that allows a more efficient traffic flow will have beneficial impacts by reducing CO2 emissions from vehicles in the project area. **Thus, by reducing both the travel time and the "stop and go" effect caused by both signalized and non-signalized intersections, fuel consumption is reduced, thus reducing the amount of greenhouse gas emissions**.

Therefore, transportation greenhouse gases (GHGs) reductions can be achieved by implementing strategies such as:

- Vehicle efficiency,
- Low-carbon fuels,
- **Reductions in Vehicle Miles Traveled (VMT)**,
- Vehicle/systems operations, and
- Construction/maintenance and agency operations.

In addition, although greenhouse gases (GHGs), including carbon dioxide, methane, and nitrous oxide, are emitted primarily through the combustion of fossil fuels in vehicles and construction equipment, HUD environmental review regulations at **24 CFR Part 58** do not identify GHG emissions as a specific compliance factor, and no federal thresholds currently require quantitative analysis for HUD-funded projects. Nonetheless, the construction of the proposed highway would result in temporary GHG emissions from construction equipment and material transport. Operational emissions would result from vehicular traffic using the roadway. However, the project is consistent with long-standing regional transportation plans and is not expected to substantially increase regional vehicle miles travel. The incremental contribution of the project to global greenhouse gas emissions would therefore be minimal and would not result in significant climate-related impacts.

Based on the above the project would not significantly contribute to climate change, to the contrary as goal includes reducing VMT and travel time and consequently a reduction in CO2 gas emissions.

RADON

Radon is a radioactive gas that forms when radium and certain other radioactive metals break down in rocks, soil, and water. It is found in nearly all soils and moves through the soil to the air and into structures through cracks and other areas of permeability. Building materials and groundwater may also be a source of indoor radon. Once inside, radon concentrations can build to high levels, regardless of the age, condition, or design of the building.

---

[2] Ibid

[3] University of California Transportation Center, UCTC-FR-2010-11, Real-World Carbon Dioxide Impacts of Traffic Congestion, Barth and Boriboonsomsin, May 2011.

The most common pathway for human exposure to radon is inhalation indoors. Radon is the number one cause of lung cancer in non-smokers and the second leading cause of lung cancer overall. The risk of adverse health effects from radon in indoor air depends largely on two main variables: the level of radon exposure and the length of time exposed. Many radon-induced lung cancers can be prevented by testing and reducing radon levels in existing buildings and by using radon resistant construction techniques for all new construction.

The goal for mitigating radon in buildings is to reduce radon concentrations in indoor air as low as reasonably achievable and practicable considering the efficacy of current industry standard radon reduction systems and environmental conditions (e.g., geology and climate). The most effective strategy to protect the health and safety of occupants is to prevent radon from entering the building by using radon resistant construction techniques; another effective strategy is to reduce the level of radon inside existing buildings by installing and operating a radon reduction system. An effective radon reduction system achieves two main goals: it reduces the concentration of radon gas in the home by venting it safely outside the structure and removes the radon gas from under the foundation before it can come into the home.

HUD's environmental regulations at 24 CFR 58.5(i)(2)(i) and (ii)4 state that,

> [i]t is HUD's policy that all properties that are being proposed for use in HUD programs be free of hazardous materials, contamination, toxic chemicals and gases, and radioactive substances, where a hazard could affect the health and safety of occupants or conflict with the intended utilization of the property.
>
> The environmental review of multifamily housing . . . , must include the evaluation of . . . other evidence of contamination on or near the site, to ensure that occupants of proposed sites are not adversely affected by any of the hazards listed in paragraph (i)(2)(i) of this section.
>
> As radon is a radioactive substance, HUD or the responsible entity (RE) must consider it as part of the site contamination analysis for projects that:
>
> - Require an environmental review at the level of Categorically Excluded Subject to 50.4 or 58.5 ("CEST"), Environmental Assessment, or Environmental Impact Statement; and
> - **Involve structures that are occupied or are intended to be occupied at least four (4) hours a day.**

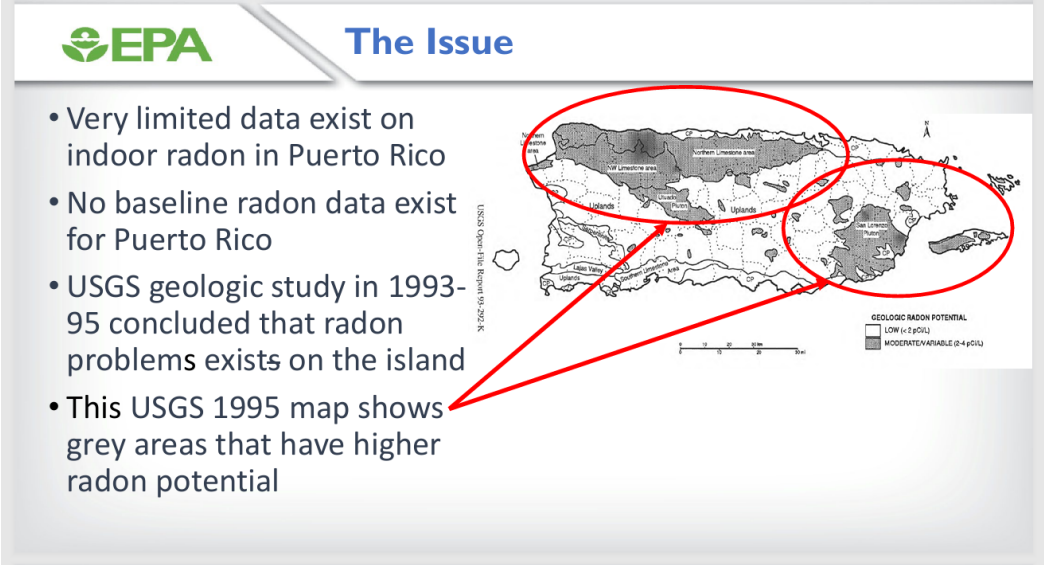
Exemptions from having to consider radon in the contamination analysis:

- **Buildings with no enclosed areas having ground contact**.
  - Buildings containing crawlspaces, utility tunnels, or parking garages would not be exempt, however buildings built on piers would be exempt, provided that there is open air between the lowest floor of the building and the ground.

- **Buildings that are not residential and will not be occupied for more than 4 hours per day.**
- Buildings with existing radon mitigation systems - document radon levels are below 4 pCi/L8 with test results dated within two years of submitting the application for HUD assistance and document the system includes an ongoing maintenance plan that includes periodic testing to ensure the system continues to meet the current EPA recommended levels. If the project does not require an application, document test results dated within two years of the date the environmental review is certified. Refer to program office guidance to ensure compliance with program requirements.

- Buildings tested within five years of the submission of application for HUD assistance: test results document indoor radon levels are below the current EPA's recommended action levels of 4.0 pCi/L. For buildings with test data older than five years, any new environmental review must include a consideration of radon using one of the methods in Section A below.

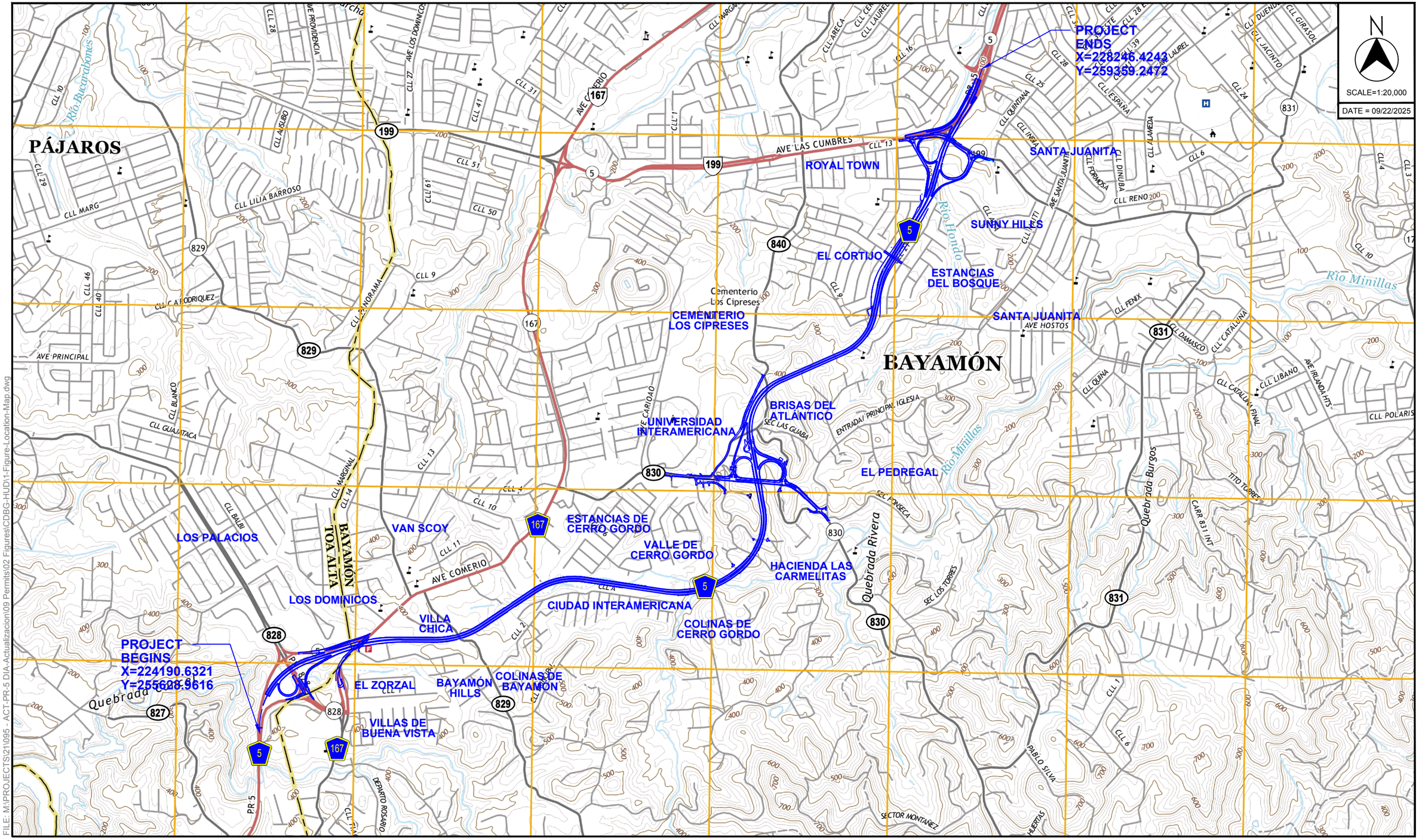
For Puerto Rico USEPA has informed that:



https://aarst.org/wp-content/uploads/2024/03/10_45_SR_TUE_Povetko_Evaluation-of-Pilot-Radon-Dectector-1.pdf

Based on the above the project complies with HUD Radon requirements because:

- is outside radon potential area; and
- does not include construction of buildings.



SOURCE: U.S.G.S TOPOGRAPHIC MAPS 2018

PR-5 EXTENSION
FROM PR-167 TO PR-199
BAYAMÓN - TOA ALTA, PUERTO RICO

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PR-5 EXTENSION

FIGURE LOCATION MAP

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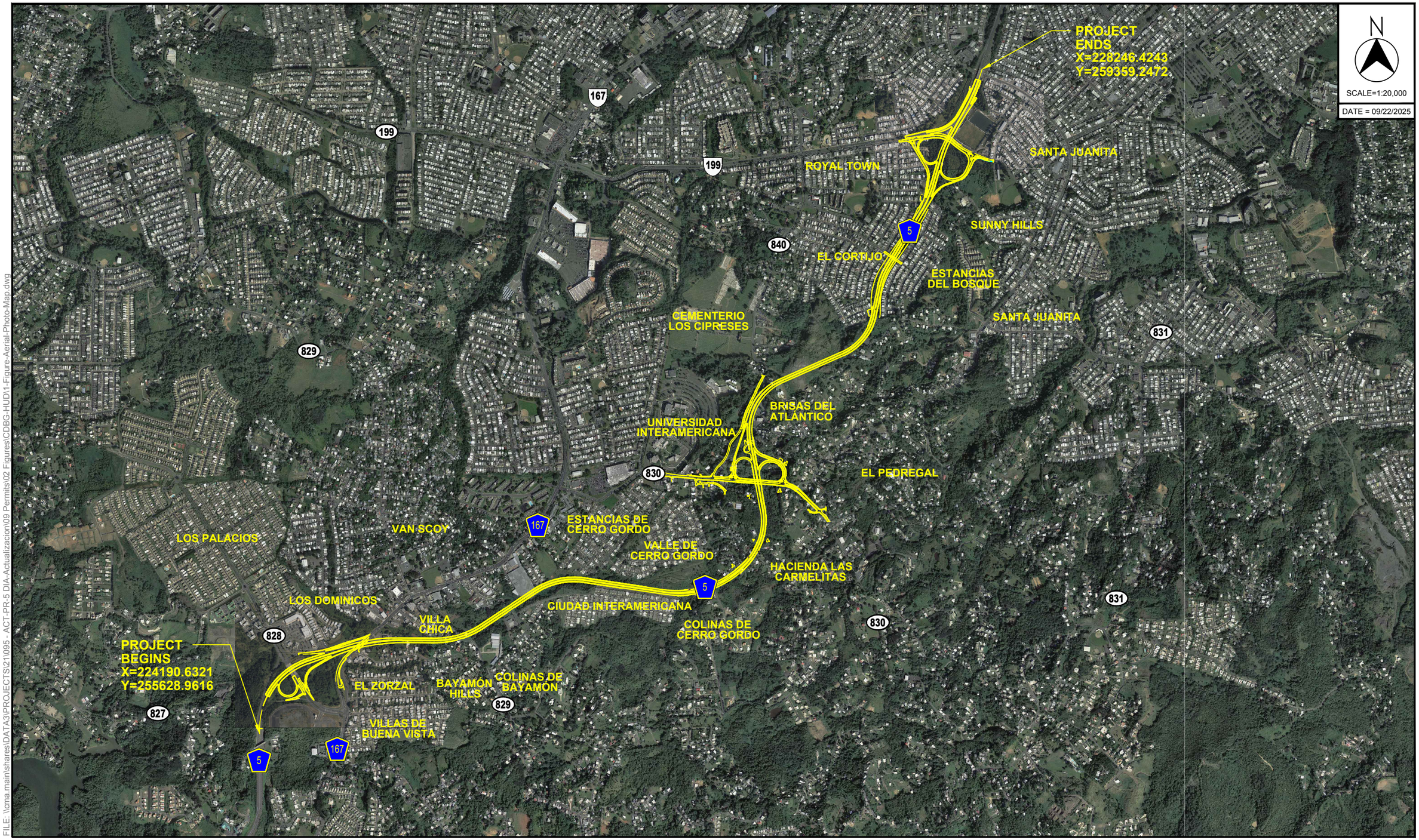

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SOURCE: AERIAL PHOTO GOOGLE MAPS 2010

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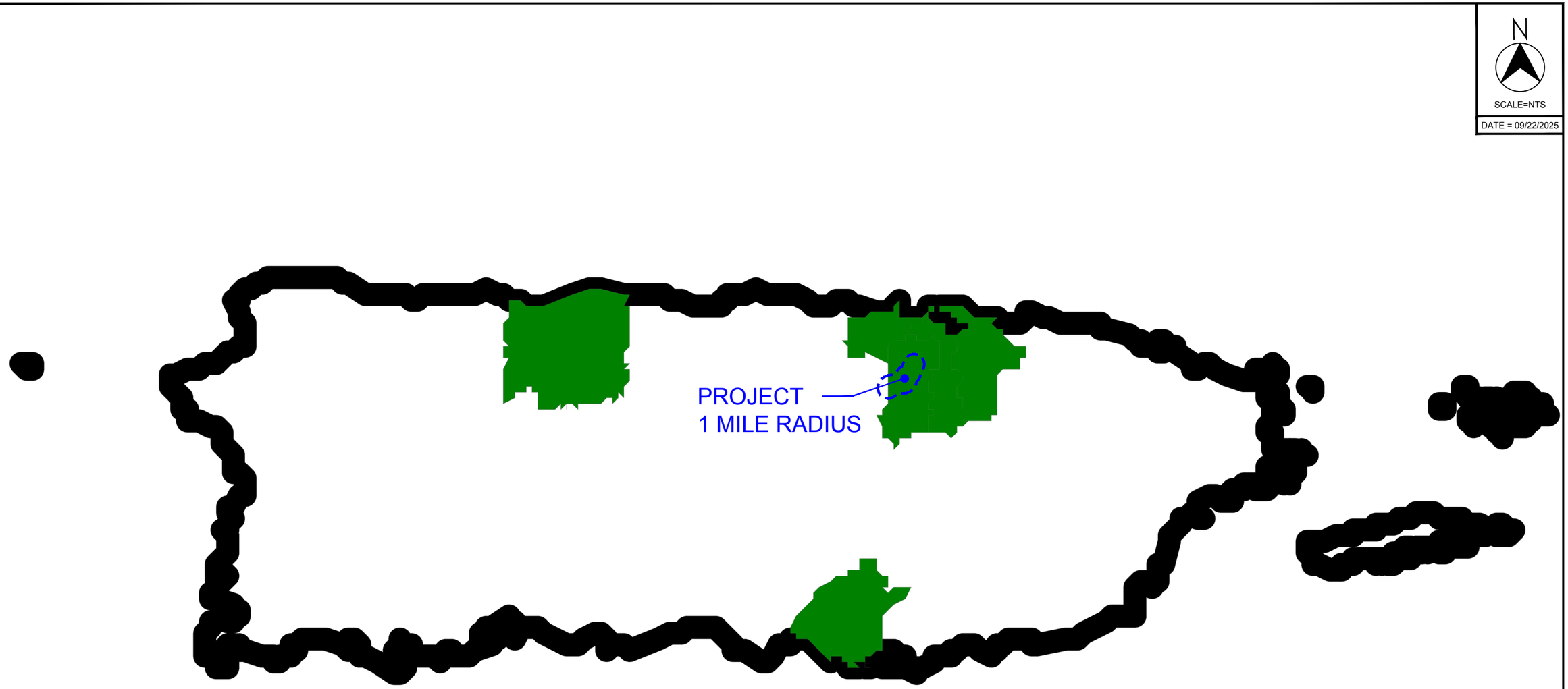
PR-5 EXTENSION

FIGURE AERIAL PHOTO MAP



Legend **

- County Designated Nonattainment for 6 NAAQS Pollutants
- County Designated Nonattainment for 5 NAAQS Pollutants
- County Designated Nonattainment for 4 NAAQS Pollutants
- County Designated Nonattainment for 3 NAAQS Pollutants
- County Designated Nonattainment for 2 NAAQS Pollutants
- County Designated Nonattainment for 1 NAAQS Pollutant

* The National Ambient Air Quality Standards (NAAQS) are health standards for Carbon Monoxide, Lead (1978 and 2008), Nitrogen Dioxide, 8-hour Ozone (2008), Particulate Matter (PM-10 and PM-2.5 (1997, 2006 and 2012), and Sulfur Dioxide.(1971 and 2010)

** Included in the counts are counties designated for NAAQS and revised NAAQS pollutants. Revoked 1-hour (1979) and 8-hour Ozone (1997) are excluded. Partial counties, those with part of the county designated nonattainment and part attainment, are shown as full counties on the map.

FILE: \\cma.main\shares\DATA3\PROJECTS\21\095 - ACT-PR-5 DIA-Actualizacion\09 Permits\02 Figures\CDBG-HUD\3-FIGURE AIR QUALITY MAP.dwg

SOURCE: CLEAN AIR ACT'S NATIONAL AMBIENT AIR QUALITY STANDARDS (NAAQS) DATED 03/31/2022

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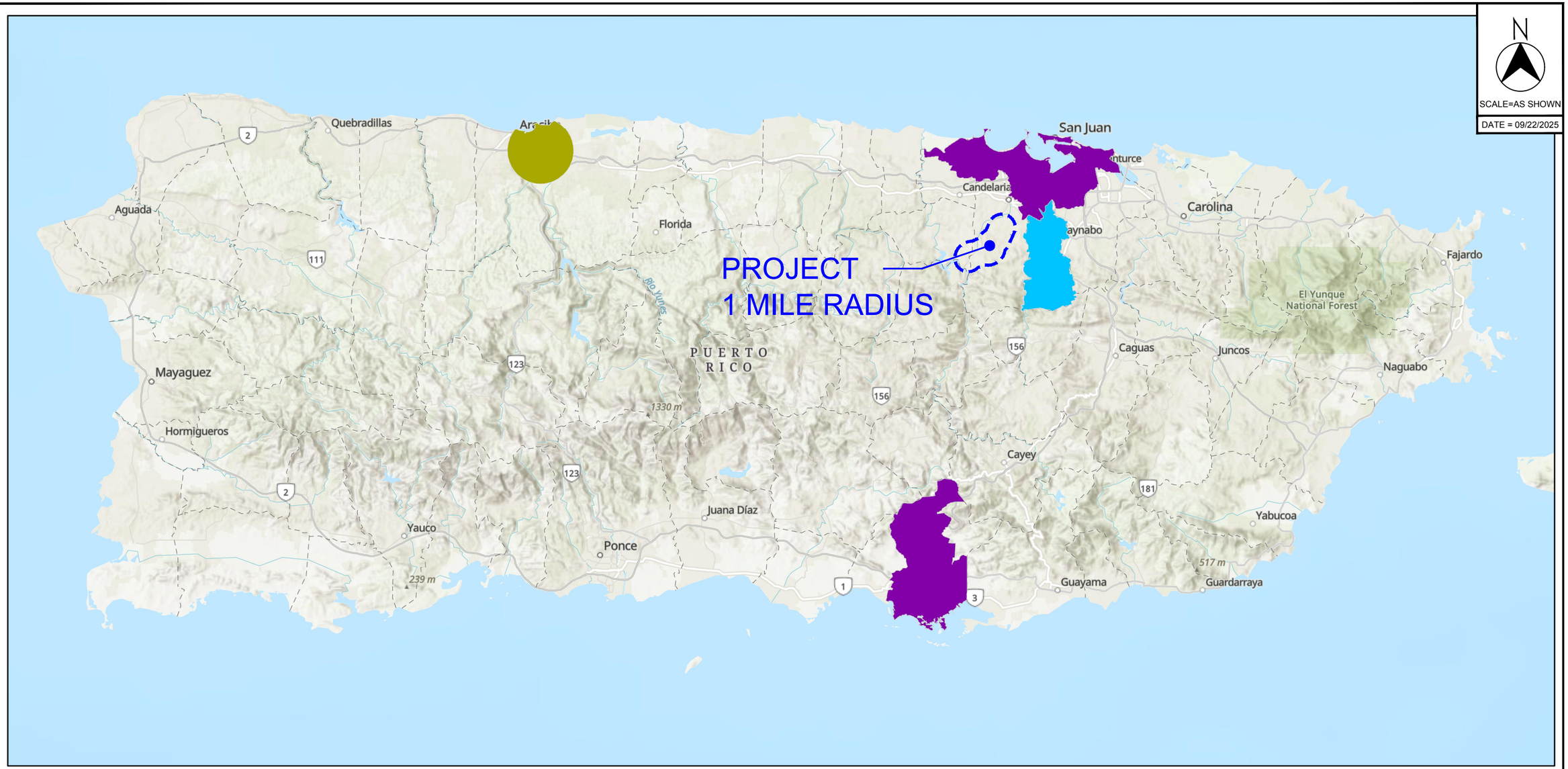
PR-5 EXTENSION

FIGURE AIR QUALITY MAP



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SOURCE: U.S. EPA Office of Air and Radiation (OAR) - Office of Air Quality Planning and Standards (OAQPS)

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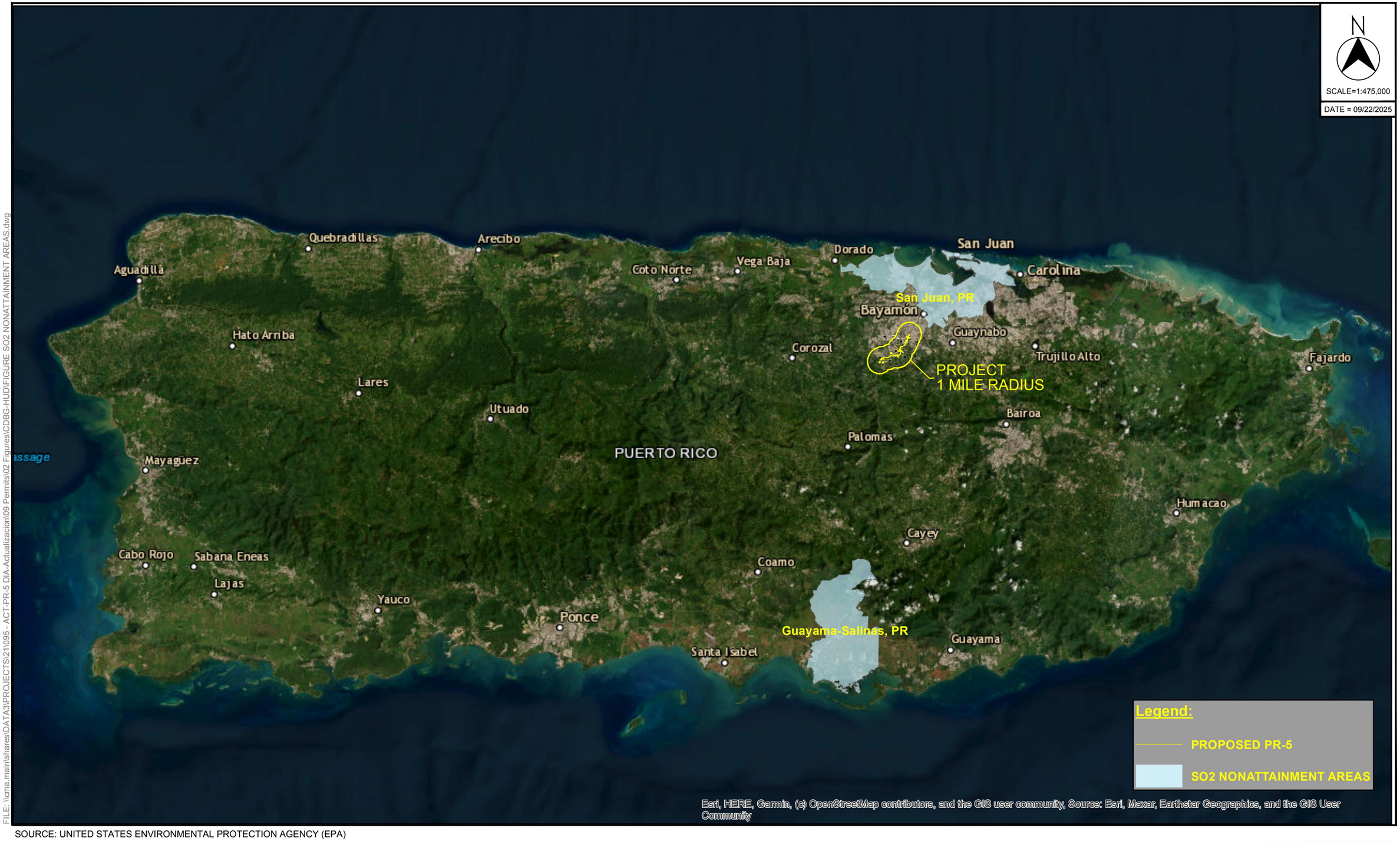
PR-5 EXTENSION

FIGURE AIR QUALITY MAP



FILE: \\cma.main\shares\DATA3\PROJECTS\21\095 - ACT-PR-5 DIA-Actualizacion\09 Permits\02 Figures\CDBG-HUD\FIGURE SO2 NONATTAINMENT AREAS.dwg

SOURCE: UNITED STATES ENVIRONMENTAL PROTECTION AGENCY (EPA)

PR-5 EXTENSION
FROM PR-167 TO PR-199
BAYAMÓN - TOA ALTA, PUERTO RICO
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PR-5 EXTENSION

FIGURE SO2 NONATTAINMENT AREAS

PUERTO RICO HIGHWAY AND TRANSPORTATION AUTHORITY

PRHTA

GOVERNMENT OF PUERTO RICO

Air Emissions Study Update

Extension of State Road PR-5
Bayamón, Puerto Rico

Prepared for:

Puerto Rico Highways and Transportation Authority

Original Study Prepared on September 15, 2021

March 31, 2026
CMA 21095

CMA ARCHITECTS & ENGINEERS LLC

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1.0 Introduction

The Puerto Rico Highways and Transportation Authority (PRHTA) propose the extension of State Road PR-5 between the existing PR-5 and PR-199 intersection and PR-167. **Figure 1** shows an aerial photo depicting the project area.

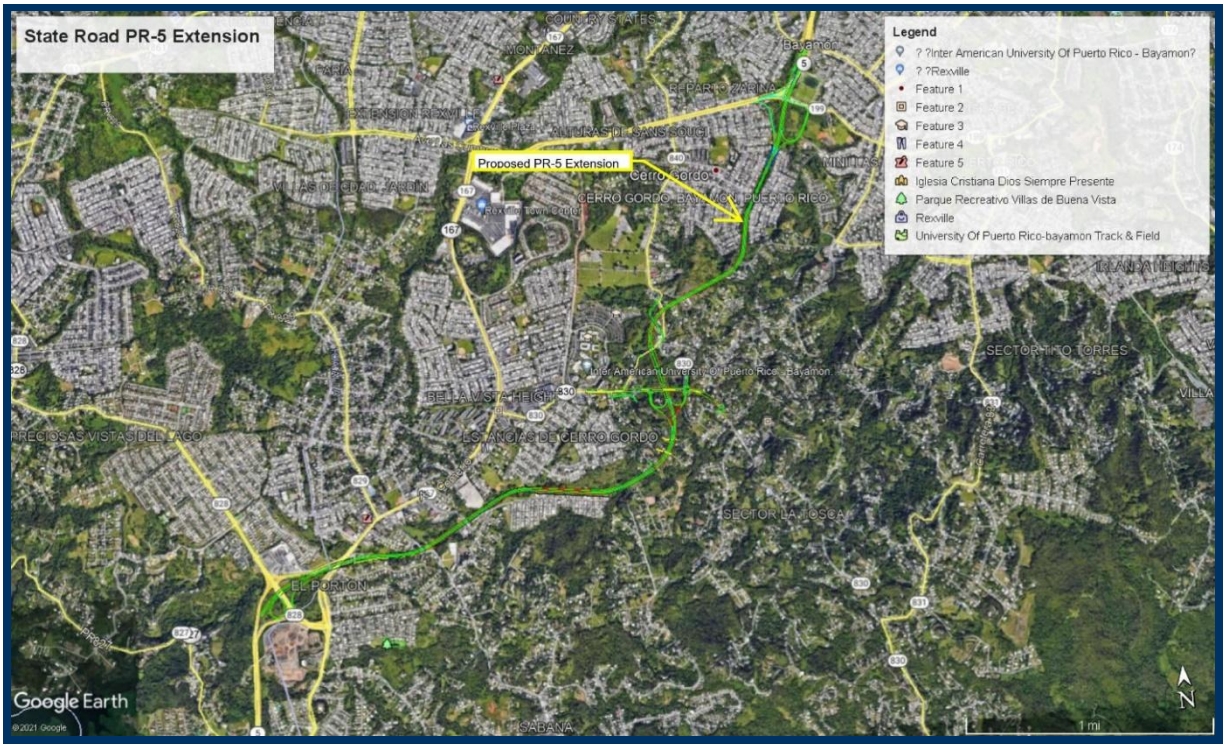

Figure 1 – Aerial Photo

PRHTA has retained CMA Architects & Engineers LLC to conduct an Air Emissions Study along the project corridor.

To estimate vehicle air emissions along the PR-5, we use the latest version of the Motor Vehicle Emissions Simulator (MOVES). EPA's MOVES is an emission modeling system that estimates emissions for mobile sources at the national, county, and project level for criteria air pollutants, greenhouse gases, and air toxics. Using this mathematical model, the emissions of carbon monoxide, sulfur dioxide, nitrogen oxides, and particulate matter (PM 2.5) were estimated.

Carbon monoxide, or CO, is a colorless, odorless gas that is formed when carbon fuel is not burned completely. The figure below shows the contribution of various sources to the emissions of CO:

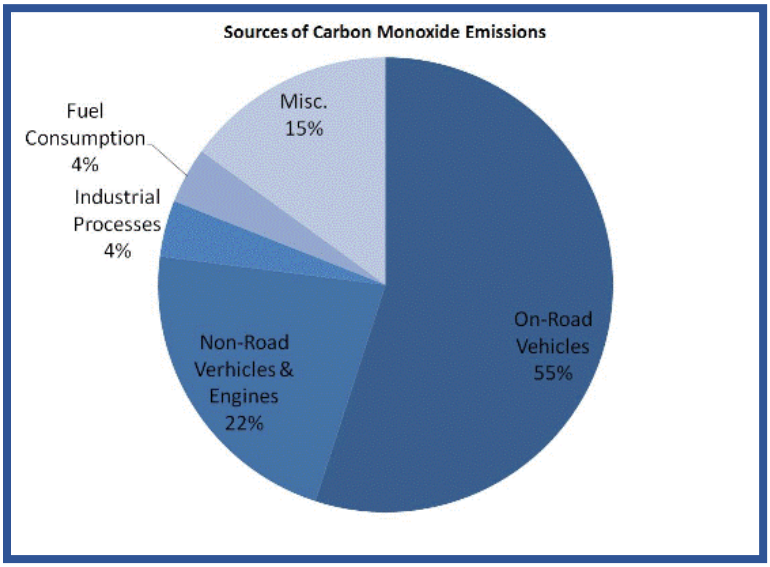

Figure 2 – Sources of Carbon Monoxide

Carbon Monoxide is a component of motor vehicle exhaust, which contributes about 55 percent of all CO emissions nationwide. Other non-road engines and vehicles (such as construction equipment and boats) contribute about 22 percent of all CO emissions nationwide. Higher levels of CO generally occur in areas with heavy traffic congestion. In cities, 85 to 95 percent of all CO emissions may come from motor vehicle exhaust.

Sulfur dioxide (SO_2) emissions from vehicles result from burning sulfur-containing fuels, primarily diesel and, to a lesser extent, gasoline. While industrial sources and shipping are larger contributors, road vehicles, especially heavy-duty trucks and buses, contribute to regional haze, respiratory issues, and acid rain. Regulations reducing sulfur in fuel have significantly lowered these emissions. The following are several Key Aspects of Vehicle SO_2 Emissions:

- **Sources:** The main culprits are diesel-powered vehicles (trucks, buses, trains) and ships using high-sulfur bunker fuel.
- **Environmental & Health Impact:** SO_2 contributes to fine particulate matter (PM2.5) formation, causes acid rain, damages ecosystems, and triggers respiratory issues like asthma.

- **Reduction Strategies:** The primary method for reducing vehicle SO_2 is adopting ultra-low sulfur diesel[1] (ULSD) fuel standards.
- **Trends:** In the U.S., despite millions of vehicles, stringent fuel standards have led to significant reductions in total SO_2 from road transportation over the past few decades.
- **Regulation:** SO_2 is a "criteria pollutant" monitored under regulations like the U.S. Clean Air Act.

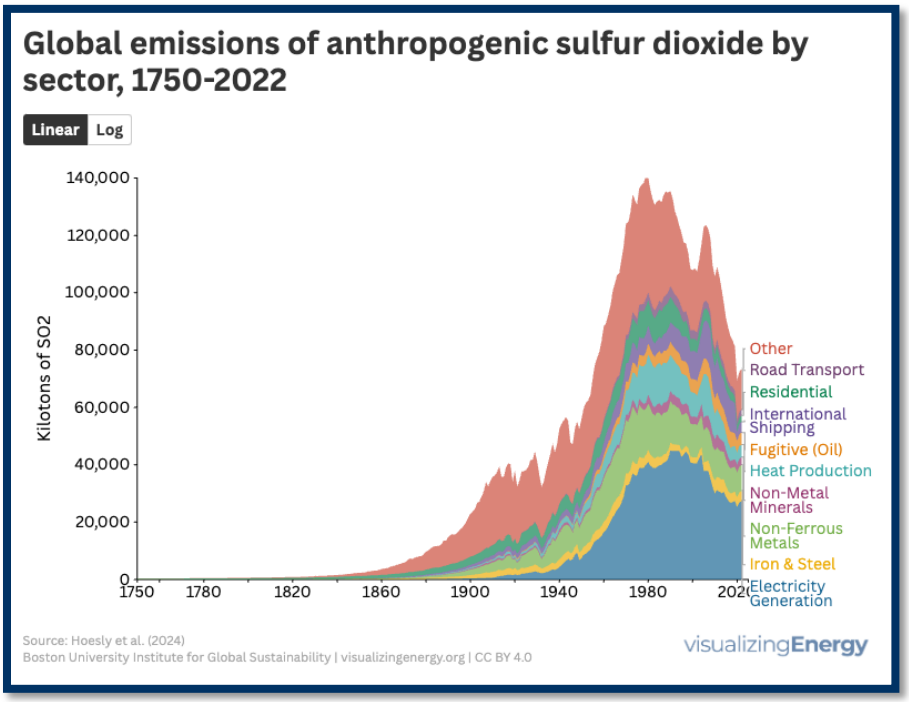

Figure 3 – Global Emissions of Anthropogenic SO_2 per Sector[2]

$PM_{2.5}$ emissions from vehicles originate from tailpipe combustion, brake and tire wear, and resuspended road dust, with diesel vehicles generally emitting significantly more particulate matter (16.589 mg/km) than gasoline vehicles (1.266 mg/km). These emissions are major urban air pollution sources, contributing to premature deaths and increased health risks. The following are several Key Aspects of Vehicle $PM_{2.5}$ Emissions:

[1] Ultra-low sulfur diesel (ULSD) is a cleaner-burning fuel with a maximum sulfur content of 15 ppm, established as the standard for highway vehicles since 2006-2010 to reduce emissions. It enables advanced emission control systems, such as Diesel Particulate Filters (DPF), but can sometimes cause issues with seal lubrication or fuel system deposits.

[2] https://visualizingenergy.org/global-anthropogenic-sulfur-dioxide-emissions-1750-2022/

- **Emission Sources:** Primarily, $PM_{2.5}$ is emitted directly from diesel and gasoline exhaust. Non-exhaust sources, such as brake and tire wear, contribute significantly, particularly in heavier electric vehicles.
- **Vehicle Type & Speed:** Diesel engines are higher emitters than gasoline engines. $PM_{2.5}$ emissions are also higher at higher speeds and during peak, congested traffic.
- **Environmental Impact:** Road transportation contributes to poor air quality and is a major source of urban smog.
- **Health Effects:** Exposure to vehicular $PM_{2.5}$ is linked to serious health conditions, including increased hospitalizations for respiratory and cardiovascular issues.

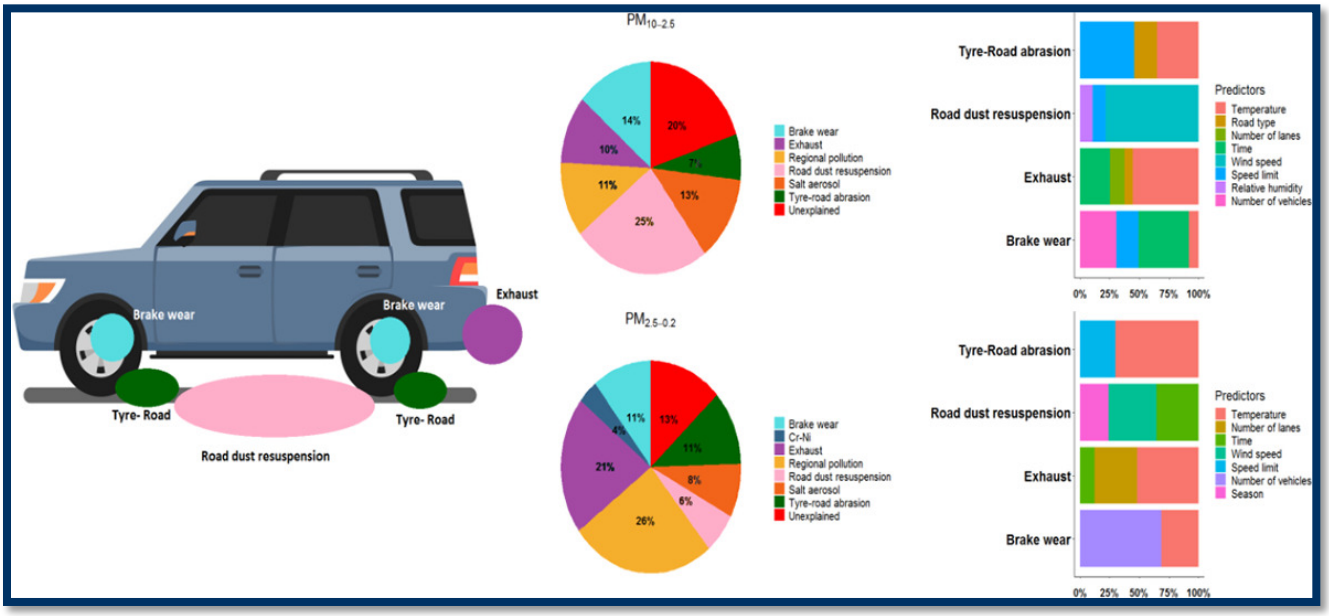

Figure 4 – Sources of Particulate Matter[3]

NO_x (nitrogen oxides) emissions from cars, primarily nitrogen dioxide (NO_2) and nitric oxide (NO), are major air pollutants formed during high-temperature combustion in engines. They contribute significantly to poor air quality in urban areas, causing respiratory issues and smog. While modern vehicles use catalytic converters to reduce these emissions, older, poorly maintained, or high-load diesel vehicles often produce higher levels of NO_x.

The transportation sector is one of the largest contributors to anthropogenic U.S. greenhouse gas (GHG) emissions. According to the Inventory of U.S. Greenhouse Gas Emissions and Sinks 1990–2022 (the national inventory that the U.S. prepares annually under the United

[3] https://www.sciencedirect.com/science/article/abs/pii/S0048969722024615

Nations Framework Convention on Climate Change), transportation accounted for the largest portion (28%) of total U.S. GHG emissions in 2022. Cars, trucks, commercial aircraft, and railroads, among other sources, all contribute to transportation end-use sector emissions.

Greenhouse gas emissions from transportation sources include carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), and various hydrofluorocarbons (HFCs). CO_2, CH_4, and N_2O are all emitted via the combustion of fuels, while HFC emissions are the result of leaks and end-of-life disposal from air conditioners used to cool people and/or freight.[4]

Radon in Puerto Rico is primarily a naturally occurring radioactive gas stemming from soil decay, rather than a byproduct of transportation emissions. While the EPA is mapping residential radon risks, significant, localized spikes (up to 434 pCi/L[5]) have been observed, sometimes coinciding with seismic events, posing potential risks to indoor air quality. **Figure 5** shows a diagram of the geologic radon potential areas in Puerto Rico. The project area, depicted in the figure, shows a low potential of less than 2 pCi/L.[6]

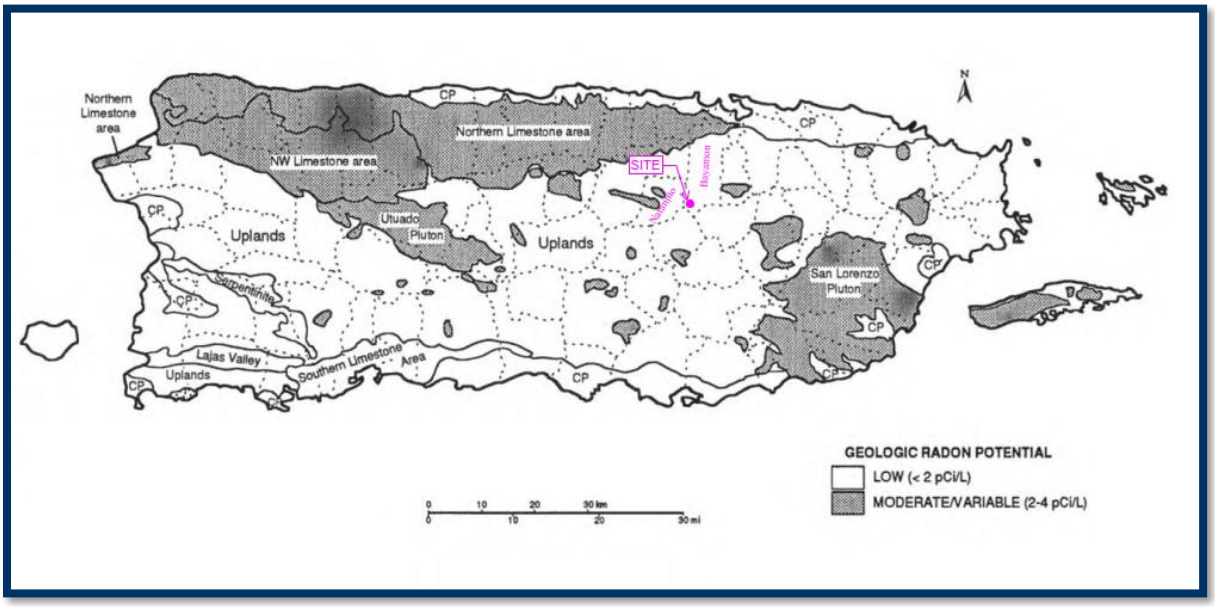

Figure 5 – Geologic Radon Potential

[4] Environmental Protection Agency, Fast Facts, U.A. Transportation Sector Greenhouse Gas Emissions 1990-2022, EPA-420-F24-022

[5] pCi/L (picocuries per liter) measures radon radioactivity, with the EPA recommending action to reduce levels of 4.0 pCi/L or higher.

[6] U.S. Geological Survey, Geologic Radon Potential of Guam and Puerto Rico, Open File Report 93-292-K, 1995

As shown in the previous figure, the project is located in the municipality of Bayamon, which is located in a low radon potential area.

The most common pathway for human exposure to radon is inhalation indoors. Radon is the number one cause of lung cancer in non-smokers and the second leading cause of lung cancer overall.2 The risk of adverse health effects from radon in indoor air depends largely on two main variables: the level of radon exposure and the length of time exposed. Many radon-induced lung cancers can be prevented by testing and reducing radon levels in existing buildings and by using radon-resistant construction techniques for all new construction.

2.0 Regulatory Background

2.1 National Ambient Air Quality Standards

The Clean Air Act, last amended in 1990, requires the EPA to set National Ambient Air Quality Standards (40 CFR part 50) for pollutants that are harmful to public health and the environment. The Clean Air Act established two types of national air quality standards. Primary standards set limits to protect public health, including the health of "sensitive" populations such as asthmatics, children, and the elderly. Secondary standards set limits to protect public welfare, including reducing visibility and preventing damage to animals, crops, vegetation, and buildings.

The EPA Office of Air Quality Planning and Standards (OAQPS) has set National Ambient Air Quality Standards for six principal pollutants, known as "criteria" pollutants. They are listed below. Units of measure for the standards are parts per million (ppm) by volume, parts per billion (ppb - 1 part in 1,000,000,000) by volume, milligrams per cubic meter of air (mg/m^3), and micrograms per cubic meter of air (µg/m^3). Table Number 1 shows these standards.

Table 1 – National Ambient Air Quality Standards[7]

Pollutant	Primary/Secondary	Averaging Time	Level
Carbon Monoxide	primary	8 hour	9 ppm
		1 hour	35 ppm
Lead	Primary and secondary	Rolling 3-month average	0.15 µg/m^3 [8]
Nitrogen Dioxide	primary	1 hour	100 ppb
	Primary and secondary	Annual	53 ppb [9]
Ozone	Primary and secondary	8 hour	0.075 ppm [10]

[7] As of October 2011.

[8] Final rule signed October 15, 2008. The 1978 lead standard (1.5 µg/m3 as a quarterly average) remains in effect until one year after an area is designated for the 2008 standard, except that in areas designated nonattainment for the 1978, the 1978 standard remains in effect until implementation plans to attain or maintain the 2008 standard are approved.

[9] The official level of the annual NO_2 standard is 0.053 ppm, equal to 53 ppb, which is shown here for the purpose of clearer comparison to the 1-hour standard.

[10] Final rule signed March 12, 2008. The 1997 ozone standard (0.08 ppm, annual fourth-highest daily maximum 8-hour concentration, averaged over 3 years) and related implementation rules remain in place. In 1997, EPA revoked the 1-hour ozone standard (0.12 ppm, not to be exceeded more than once per year) in all areas, although some areas have continued obligations under that standard ("anti-backsliding"). The 1-hour

Table 1 – National Ambient Air Quality Standards[7]				
Pollutant		**Primary/Secondary**	**Averaging Time**	**Level**
Particle Pollution	$PM_{2.5}$	Primary and secondary	24 hour	35 µg/m^3
	PM_{10}	Primary and secondary	24 hour	150 µg/m^3
Sulfur Dioxide		Primary	1 hour	75 ppb
		Secondary	3 hour	0.5 ppm [11]

The control strategy for this Plan, relating to motor vehicles, is principally based on the federal emissions control program, which aims to maintain contaminant concentrations in compliance with the national air quality standards, regardless of future increases in a vehicle's miles run.

The plan classifies Puerto Rico as Category III for CO, HC, and NO_x emissions. This one provides for the designation of areas covered by the following three classifications:

- **Category I -** Applies in areas in which any change in air quality is considered significant.
- **Category II -** Applies in areas in which the air quality deterioration is accompanied by an ordered growth and is considered insignificant.
- **Category III -** Applies to areas in which air quality deterioration, to reach the established rules, is considered insignificant.

The proposed project is located at the municipality of Bayamón. This area is in compliance with the air quality primary and secondary emissions standards for all the contaminants.

The PRAMN has sixteen (16) locations with forty-four (42)1 monitors around the island where the air quality for criteria pollutants (gaseous and particulate) is measured. The main goal of the PRAMN is to collect data to assess compliance with the NAAQS and to obtain information about air pollution. The information is available on maps, websites, and/or public notices. PRAMN is an important component for air quality management programs, provides the public with information on current conditions and progress in improving air quality, and is used by health researchers, business interests, environmental groups, and others. The data obtained from the air quality

ozone standard is attained when the expected number of days per calendar year with maximum hourly average concentrations above 0.12 ppm is less than or equal to 1.

[11] Final rule signed June 2, 2010. The 1971 annual and 24-hour SO_2 standards were revoked in that same rulemaking. However, these standards remain in effect until one year after an area is designated for the 2010 standard, except in areas designated nonattainment for the 1971 standards, where the 1971 standards remain in effect until implementation plans to attain or maintain the 2010 standard are approved

monitors for the criteria pollutants are compared with NAAQS to develop attainment and maintenance. The following figure shows the 2025 PRAMN location.

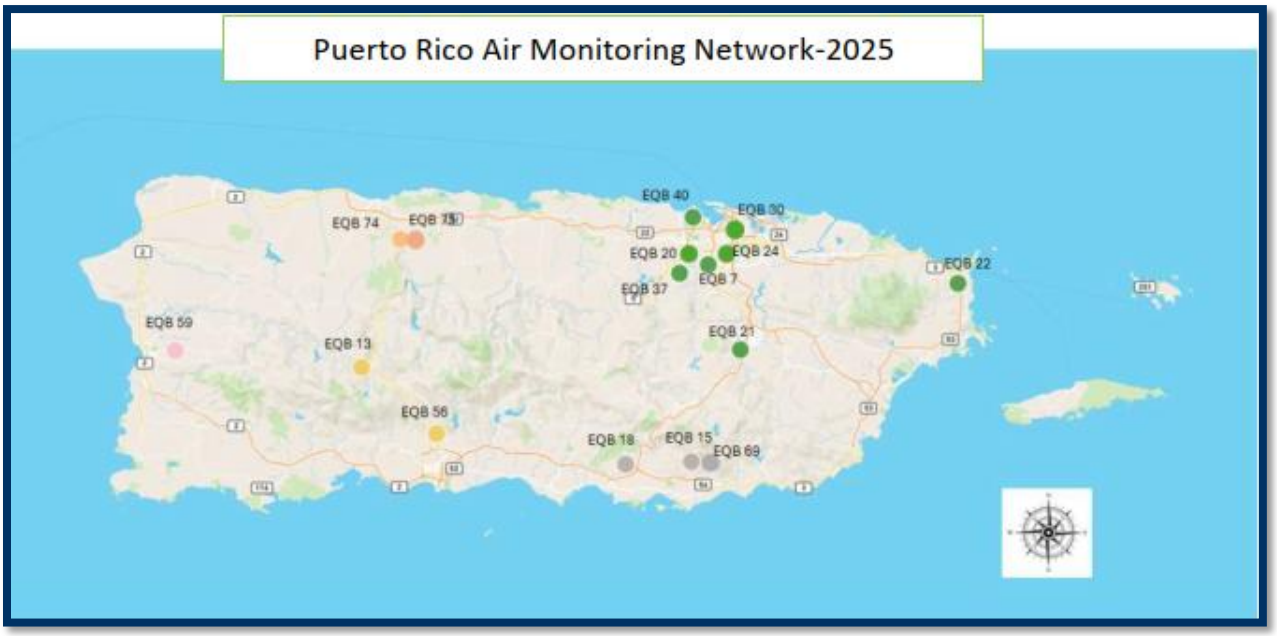

Figure 6 – Stations Operated by DNER

2.2 Mobile Sources Air Toxics

The Environmental Protection Agency (EPA) adopted controls on gasoline, passenger vehicles, and portable fuel containers (primarily gas cans) that will significantly reduce emissions of benzene and other hazardous air pollutants ("mobile source air toxics"). Benzene is a known human carcinogen, and mobile sources are responsible for the majority of benzene emissions. The other mobile source air toxics are known or suspected to cause cancer or other serious health effects. EPA limited the benzene content of gasoline to an annual refinery average of 0.62% by volume, beginning in 2011. These and other controls will significantly reduce emissions of benzene and other mobile source air toxics such as 1,3-butadiene, formaldehyde, acetaldehyde, acrolein, and naphthalene. There will be additional substantial benefits to public health and welfare because of significant reductions in emissions of particulate matter from passenger vehicles.

2.3 Greenhouse Gases

Transportation is a primary source of greenhouse gas (GHG) emissions, accounting for roughly 28% of total U.S. GHG emissions in 2022, the largest share of any sector. These emissions, primarily carbon dioxide from burning gasoline and diesel, increased by 19% between 1990 and 2022. Light-duty vehicles, including passenger cars and trucks, are responsible for the majority of these emissions (57%), followed by medium- and heavy-duty trucks (23%).[12]

A typical passenger vehicle emits about 4.6 metric tons of carbon dioxide per year. This number can vary based on a vehicle's fuel type, fuel economy, and miles driven per year.

[12] Environmental Protection Agency Fast Facts on Transportation Greenhouse Gas Emissions, June 6, 2025

3.0 Methodology

3.1 Carbon Monoxide

To analyze the carbon monoxide concentrations at the site, a site visit was conducted. Using a CO meter, the current concentrations were measured. calculations in which estimated concentrations for one (1) hour and eight (8) hours were made for the proposed PR-5 for the design year, 2046. The current CO concentration was measured at the site.

Today's passenger cars are capable of emitting 90 percent less carbon monoxide over their lifetimes than their uncontrolled counterparts of the 1960's. As a result, ambient carbon monoxide levels have dropped, despite large increases in the number of vehicles on the road and the number of miles they travel. With continued increases in vehicle travel projected, however, carbon monoxide levels will begin to climb again unless even more effective emission controls are employed.[13]

The procedure used to estimate the carbon monoxide concentrations was using the CALINE4 ("California Line Source Prediction Model") computer model. This model disperses mathematically, in the surrounding road area, the carbon monoxide quantity emitted by the vehicles localized in the area. In this model, EPA emissions factors are used, the site geometry, and the local dispersion conditions that are established by the site meteorology.

To obtain the carbon monoxide emission factor for the design year (2046), the mathematical model MOVES3 was used. EPA's **MO**tor **V**ehicle **E**mission **S**imulator (MOVES) is a state-of-the-science emission modeling system that estimates emissions for mobile sources at the national, county, and project level for criteria pollutants, greenhouse gases, and air toxics.

The following table presents the necessary parameters for the carbon monoxide emissions estimation in the project area. Project data was obtained from the engineering preliminary drawings prepared by PRHTA, and the traffic data obtained at the site during a site visit.

[13] Environmental Protection Agency, Office of Mobile Sources, Automobiles and Carbon Monoxide, EPA 400-F-92-005, January 1993.

Table 2 - Necessary Parameters	
Parameter	**Units**
Road segment coordinates	Meters
Road width	Meters
Traffic Volume	Vehicles by hour
Carbon monoxide emission factor	Grams/mile
Emission source elevation	Meters
Receivers coordinate with respect to the road	Meters
Average wind velocity	Meters/second
Wind direction	-----
Atmospheric stability	-----
Mixing area elevation	Meters
Surface roughness	Centimeters
Average exposition time	Minutes
Settling Velocity	Centimeters/second
Deposition velocity	Centimeters/second
CO level in the environment	Parts per Million

3.1.1 Receivers

Six (6) sensitive areas were determined at the site. The receivers are comprised residential areas located adjacent to the project corridor. These receivers are:

- Receiver 1 – Amor Street, Buena Vista Ward
- Receiver 2 – Villa Rica St, Villa Rica
- Receiver 3- Ciudad Interamericana, Main Street
- Receiver 4 - Valles de Cerro Gordo, Diamante Street
- Receiver 5 – El Cortijo, Street 6
- Receiver 6 - El Cortijo Street 21

3.2 Other Pollutants

To obtain NAAQS and MSAT parameters emission factors for the design year (2046), the MOVES5.0.1 mathematical model, dated January 7, 2026, was used. The emissions of the following parameters will be estimated:

National Ambient Air Quality Standards (NAAQS)

- Carbon Monoxide
- Particulate Matter ($PM_{2.5}$)
- Nitrogen Oxides (NO_x)
- Sulfur Oxides (SO_2)

Mobile Sources Air Toxics (MSAT)

- Benzene
- 1,3-Butadiene
- Formaldehyde
- Acetaldehyde
- Acrolein

EPA's MOtor Vehicle Emission Simulator (MOVES) is a state-of-the-science emission modeling system that estimates emissions for mobile sources at the national, county, and project level for criteria pollutants, greenhouse gases, and air toxics. Design data, such as road width, maximum speed, and AADT, is used to estimate the air emissions.

4.0 Results

4.1 Carbon Monoxide

The computer models used in this study estimate the carbon monoxide emissions to be produced by the motor vehicles that will use the proposed road. To estimate the future emissions, we use a computer model with existing data to obtain an estimate of the environmental CO levels. The computer model was used to estimate the current CO levels. The current measured CO levels are 0.0 parts per million (ppm). Table 3 presents some data used to model the proposed project.

Table 3 - Data Used For Modeling

Data	Value
Road width	13.30 m
Traffic Volume	3,964 vph (2046)
Average wind velocity	0.5 m/s [14]
Mixing elevation	1,000 meters [15]
Average temperature	27°C [7]
Emission factor	1.86 g/mi [16] (2046)
Settling velocity	0 cm/s [6]
Deposition velocity	0 m/s [6]
Surface roughness	108 c1.86m [17]

Table 4 presents the CALINE 4 modeling results. **Appendix A** shows computer outputs from the Caline 4 and MOVES models.

[14] From the "Climatological Data Annual Summary", 2020.
[15] Mathematical modeling standard value.
[16] From MOVES results.
[17] From the Caline 4 User Manual

Table 4 - Future CO Concentrations in Parts per Million (Year 2046)				
Receiver	CO Levels			
	1 Hour Period	National Standard	8-Hour Period	National Standard
1	0.0	35.0	0.0	9.0
2	0.0	35.0	0.0	9.0
3	0.0	35.0	0.0	9.0
4	0.0	35.0	0.0	9.0
5	0.0	35.0	0.1	9.0
6	0.0	35.0	0.1	9.0

According to the results obtained by the mathematical modeling, the increase in motor vehicles flow will not cause an exceedance of the CO levels above the NAAQS.

The Department of Transportation and Public Works (DTPW) has implemented, as part of the process, a motor vehicle inspection to measure vehicles' CO emissions. As established, any vehicle that exceeds the established CO emissions limits will not be allowed to travel until the necessary vehicle improvements are made to reduce its emissions.

4.2 National Ambient Air Quality Standards

The computer model results show the grams of pollutants per traveled mile. State Road PR-5 will have a width of 20.6 meters. To estimate the pollutant concentration, we convert the g/cubic meters to parts per million (ppm) using a mixing height of 10 meters[18] and the following equation:

ppm = (1000 * (mg of pollutants / m^3 of air) * 22.45) / (Pollutant molecular weight)

The results of this equation are compared to the NAAQS values to determine compliance. The NAAQS limits for PM 2.5 are provided in µg/m^3. To calculate the PM 2.5 concentration in the air:

[18] Federal Highways Administration, Caline4 – A dispersion Model for Predicting Air Pollutants Concentrations Near Roadways, Final Report, November 1984, Revised June 1989.

$\mu g/m^3$ = (g of pollutant / m^3 of air) * 10^6

MOVES 5.0.1 emission factor was estimated for the current and design years for the 1-hour and 8-hour periods. The 1-hour period was obtained by averaging the emission factor over a 24-hour period, and the 8-hour factor was obtained by averaging the peak hours. The following tables show the results. **Appendix A** shows the MOVES modeling printout.

4.2.1 Sulfur Dioxide Emissions

Table 5 – Sulfur Dioxide Emissions

Year	Emission Factor [g/mi]	PR-5 Length [mi]	Sulfur Dioxide Emissions [g]	Sulfur Dioxide Molecular Weight [g/mol]	Volume of Air [m^3]	Sulfur Dioxide Concentration [ppb]	NAAQS Standard [ppb]
2046 1 hr	0.00129	3.125	0.00403	64.07	1,030,000	1.49E-03	75
2046 8 hr	0.00130	3.125	0.00406	64.07	1,030,000	1.50E-03	500

The results of mathematical modeling show that increased motor vehicle flow will not cause exceedances of SO_2 levels above the NAAQS.

Reducing sulfur dioxide (SO_2) emissions from vehicles is primarily achieved by using ultra-low sulfur diesel (ULSD) and cleaner gasoline, which reduces sulfur content to near-zero levels, preventing the fouling of emission control systems. Additional methods include driving less, proper vehicle maintenance, reducing idling, and transitioning to electric or highly fuel-efficient.

4.2.2 $PM_{2.5}$ Emissions

Table 6 – PM 2.5 Compounds

Year	Emission Factor [g/mi]	PR-545 Length [mi]	PM 2.5 Emissions [g]	Volume of Air [m^3]	PM 2.5 Concentration [$\mu g/m^3$]	NAAQS Standard [$\mu g/m^3$]
2046 24hr	2.51E-03	3.125	0.00785	1,030,000	0.00762	35

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The results of the mathematical modeling show that increased motor vehicle flow will not cause exceedances of the PM 2.5 NAAQS.

Historically, transportation systems accounted for 18% of particulate matter emissions (DTPW, 1998). These emissions are produced by loaded trucks without appropriate protection and due to a lack of road maintenance. To reduce these emissions, it is recommended to include cleaning for accumulated particulate matter. By cleaning this accumulated material, the likelihood that wind lifts the smaller particles is reduced, increasing particulate matter concentration in the area.

4.2.3 Nitrogen Oxides

Table 7 – Nitrogen Oxides Emissions

Year	Emission Factor [g/mi]	PR-545 Length [mi]	Nitrogen Oxides Emissions [g]	Nitrogen Oxides Molecular Weight [g/mol]	Volume of Air [m^3]	Nitrogen Oxides Concentration [ppm]	NAAQS Standard [ppm]
2046 1 hr	0.0896	3.125	0.280	46.01	1,030,000	0.0001	0.1
Annual	0.0904	3.125	0.283	46.01	1,030,000	0.0001	0.053

The results of the mathematical modeling show that increased motor vehicle flow will not cause NOx levels to exceed the NAAQS.

Reducing NO_x (nitrogen oxides) emissions from vehicles is primarily achieved through catalytic converters in gasoline engines, Selective Catalytic Reduction (SCR) using urea in diesel engines, and Exhaust Gas Recirculation (EGR) systems to lower combustion temperatures. Regular maintenance, such as replacing oxygen sensors and cleaning carbon buildup, also significantly reduces NO_x emissions.

4.3 Mobile Sources Air Toxics

The computer model results show the grams of pollutants per traveled mile. State Road PR-5 will have a width of 20.6 meters. To estimate the pollutant concentration, we convert the g/cubic meters to parts per million (ppm) using a mixing height of 10 meters[19] and the following equation:

ppm = (1000 * (mg of pollutants / m^3 of air) * 22.45) / (Pollutant molecular weight)

To obtain the lb/day for the analyzed pollutant, we use the following equation:

Emissions (lb/day) = Emission Rate (g/mi) * VMT[20] miles/day) * 1 lb/453.59237 g[21]

MOVES 5.0.1 emission factor was estimated for the design year for the 1-hour and 8-hour periods. The 1-hour period was obtained by averaging the emission factor over a 24-hour period, and the 8-hour factor was obtained by averaging the peak hours. The following tables show the results. **Appendix A** shows the MOVES modeling printout.

Table 8 – 2046 MSAT Emissions

Parameter	Emission Factor [g/mi]	Emissions [g]	Concentration [ppb]	Emissions [lb/day]
Benzene	0.0024	0.008	2.36	1.59
Acrolein	0.0000437	0.000136	0.056	0.03
Formaldehyde	0.0006	0.002	1.51	0.40
Butadiene	0.0000	0.000	0.00	0.00
Acetaldehyde	0.0006	0.002	1.04	0.40

[19] Federal Highways Administration, Caline4 – A dispersion Model for Predicting Air Pollutants Concentrations Near Roadways, Final Report, November 1984, Revised June 1989.
[20] VMT is the vehicle miles of travel calculated by multiplying daily traffic volume (AADT) and the length of the road.
[21] Florida Department of Transportation, Office of Environmental Management, Mobile Source Air Toxics, Quantitative Analysis Guidance and Emission Rates Look-up Tables, February 2018

4.4 Idling Emissions

Vehicle idling wastes roughly 6 billion gallons of fuel annually and produces about 30 million tons of in the U.S. alone. Idling for more than 10 seconds uses more fuel and creates more emissions than restarting, contributing significantly to smog, local air pollution, and respiratory issues. Idling releases toxins linked to asthma, lung diseases, and cardiovascular issues. Children are particularly vulnerable, as they breathe more air per pound of body weight.

Frequent idling occurs in school pickup lines, drive-through lines, tolls, and while waiting at loading docks. The proposed project is the extension of an existing expressway. The expressway will include at least one toll plaza. The proposed toll plaza for this project is an electronic system that eliminates any idling.

5.0 Conclusions and Recommendations

Based on the obtained computerized modeling results, it is not expected that the proposed project will significantly affect the area's carbon monoxide concentration. To maintain and/or reduce carbon monoxide concentrations in the area, it is recommended that people comply with motor vehicle laws and regulations.

The Environmental Protection Agency (EPA) has developed several alternatives to reduce the emissions of GHG from the transportation sector. These are part of the Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. The following table summarizes these opportunities.[22]

Table 9 – Examples of Reduction Opportunities in the Transportation Sector

Type	How Emissions are Reduced	Examples
Fuel Switching	Using fuels that emit less CO_2 than fuels currently being used. Alternative sources can include biofuels; hydrogen; electricity from renewable sources, such as wind and solar; or fossil fuels that are less CO_2-intensive than the fuels that they replace.	• Using public buses that are fueled by compressed natural gas rather than gasoline or diesel. • Using electric or hybrid automobiles, provided that the energy is generated from lower-carbon or non-fossil fuels. • Using renewable fuels such as low-carbon biofuels.
Improving Fuel Efficiency with Advanced Design, Materials, and Technologies	Using advanced technologies, design, and materials to develop more fuel-efficient vehicles.	• Developing advanced vehicle technologies such as hybrid vehicles and electric vehicles that can store energy from braking and use it for power later. • Reducing the weight of materials used to build vehicles. • Reducing the aerodynamic resistance of vehicles through better shape design.

[22] The main aim of this report is to assess options for mitigating climate change. Several aspects link climate change with development issues. This report explores these links in detail and illustrates where climate change and sustainable development are mutually reinforcing.

Table 9 – Examples of Reduction Opportunities in the Transportation Sector		
Type	**How Emissions are Reduced**	**Examples**
Improving Operating Practices	Adopting practices that minimize fuel use.	• Reducing the average taxi time for aircraft. • Driving sensibly (avoiding rapid acceleration and braking, observing the speed limit). • Reducing engine-idling. • Improved voyage planning for ships, such as through improved weather routing, to increase fuel efficiency.
Reducing Travel Demand	Employing urban planning to reduce the number of miles that people drive each day. Reducing the need for driving through travel efficiency measures such as commuter, biking, and pedestrian programs.	• Building public transportation, sidewalks, and bike paths to increase lower-emission transportation choices. • Zoning for mixed-use areas, so that residences, schools, stores, and businesses are close together, reducing the need for driving.

According to the EPA[2], the most effective way to reduce CO_2 emissions is to reduce fossil fuel consumption. One of the strategies suggested by the EPA for reducing CO2 emissions through energy conservation is reducing the distance vehicles travel to reduce petroleum consumption. In addition, it is commonly known that, as traffic congestion increases, fuel consumption and thus CO_2 emissions also increase[3]. Traveling at a steady speed will result in much lower fuel consumption and emissions than a stop-and-go driving pattern.

It is therefore expected that constructing an alternative route to improve traffic flow will have beneficial impacts by reducing CO_2 emissions from vehicles in the project area. Thus, by reducing both travel time and the "stop and go" effect at signalized and non-signalized intersections, fuel consumption is reduced, thereby reducing greenhouse gas emissions.

[2] Ibid

[3] University of California Transportation Center, UCTC-FR-2010-11, Real-World Carbon Dioxide Impacts of Traffic Congestion, Barth and Boriboonsomsin, May 2011.

Therefore, transportation greenhouse gas (GHG) reductions can be achieved by implementing strategies such as:

- Vehicle efficiency,
- Low-carbon fuels,
- Reductions in Vehicle Miles Traveled (VMT),
- Vehicle/systems operations, and
- Construction/maintenance and agency operations.

Based on the above, the project would not significantly contribute to climate change; to the contrary, the goal includes reducing VMT and travel time, thereby reducing CO_2 emissions.

This air emissions study was prepared with the information available to date. The available information included a project alignment design dated, traffic data provided by CMA, and the results of a Traffic Study dated September 2021, prepared by Steer. The study results and recommendations could be impacted if the project conditions change.

Respectfully submitted:



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APPENDIX A

MOVES3 AND CALINE 4 OUTPUTS

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AIR EMISSIONS CALCULATIONS

PUERTO RICO HIGHWAY AND TRANSPORTATION AUTHORITY

PRHTA

GOVERNMENT OF PUERTO RICO

Extension of State Road PR-5
Bayamón, Puerto Rico

March 31, 2026
CMA 21095

CMA ARCHITECTS & ENGINEERS LLC

Run	Header Item	Header Item Value
0	Report Description	Summary Report
0	Report Date/Time	2026-3-23 12:28:41
0	MOVES Output Database	PR_545
0	Emission Process	All
4	Run Date/Time	2026-03-23 12:20:44.0
4	Run Specification	C:\Users\Public\EPA\MOVES\MOVES5.0\PR5CO
4	Run Spec File Date/Time	2026-03-23 12:20:39.0
4	Run Spec Description	State Road PR-5 Extension Bayamon, Puerto Rico
4	Mass Units	g
4	Energy Units	J
4	Distance Units	mi
4	Time Units	hour

Run	Year	Hour	CO	Distance
4	2026	1	348564	93502
4	2026	2	216657	59469
4	2026	3	175874	47952
4	2026	4	167095	44246
4	2026	5	247479	66316
4	2026	6	636175	175340
4	2026	7	1560323	435709
4	2026	8	2603945	660291
4	2026	9	2555118	576703
4	2026	10	2269167	476759
4	2026	11	2405569	473431

4	2026	12	2728587	515434
4	2026	13	2974196	546539
4	2026	14	2987523	550196
4	2026	15	3192250	590238
4	2026	16	3602991	673191
4	2026	17	3818462	729769
4	2026	18	3763563	734126
4	2026	19	2645530	566797
4	2026	20	1835428	420879
4	2026	21	1399234	336058
4	2026	22	1213927	301720
4	2026	23	914084	236472
4	2026	24	641452	169773
4	2046	1	103556	78700
4	2046	2	64761	50055
4	2046	3	55740	40360
4	2046	4	55842	37242
4	2046	5	78200	55818
4	2046	6	192810	147582
4	2046	7	452864	366732
4	2046	8	746336	555760
4	2046	9	726404	485405
4	2046	10	631781	401284
4	2046	11	667031	398483
4	2046	12	738235	433836
4	2046	13	795117	460017
4	2046	14	801079	463095

4	2046	15	850712	496798
4	2046	16	955826	566619
4	2046	17	1011736	614240
4	2046	18	1003830	617907
4	2046	19	719071	477068
4	2046	20	504648	354250
4	2046	21	387814	282857
4	2046	22	340988	253955
4	2046	23	257436	199036
4	2046	24	184517	142896

Category	Field	Value	Description

State Road PR-5
Bayamon, Puerto Rico

MOVES 5.0.1 Algorithm Results Summary
Carbon Monoxide Emissions

Year	Emission Factor [g/mi]	PR-5 Length [mi]	Carbon Monoxide Emissions [g]	Carbon Monoxide Molecular Weight [g/mol]	Volume of Air [m3]	Estimated Carbon Monoxide Concentration [ppm]	NAAQS Standard [ppm]
2046 1 hr	1.48	3.125	4.633	28.01	1,030,000.0	0.004	35
2046 8 hr	1.52	3.125	4.754	28.01	1,030,000.0	0.004	9

Year 2046					
Hours	CO Emissions [g}	Distance [mi]	Emission Factor [g/mi]	Emission Factor 1 hr [g/mi]	Emission Factor 8 hrs. [g/mi]
1	103,556	78,700	1.32	1.48	1.52
2	64,761	50,055	1.29		
3	55,740	40,360	1.38		
4	55,842	37,242	1.50		
5	78,200	55,818	1.40		
6	192,810	147,582	1.31		
7	452,864	366,732	1.23		
8	746,336	555,760	1.34		
9	726,404	485,405	1.50		
10	631,781	401,284	1.57		
11	667,031	398,483	1.67		
12	738,235	433,836	1.70		
13	795,117	460,017	1.73		
14	801,079	463,095	1.73		
15	850,712	496,798	1.71		
16	955,826	566,619	1.69		
17	1,011,736	614,140	1.65		
18	1,003,830	617,907	1.62		
19	719,071	477,068	1.51		
20	504,648	354,250	1.42		
21	387,814	282,857	1.37		
22	340,988	253,955	1.34		
23	257,436	199,036	1.29		
24	184,517	142,896	1.29		

Run	Header Item:	Item Value
	Report Description:	Summary Report
	Report Date/Time:	2026-3-23 12:49:21
	MOVES Output Database:	PR_545
	Emission Process:	All
5	Run Date/Time:	2026-03-23 12:32:58.0
5	Run Specification:	C:\Users\Public\EPA\MOVES\MOVES5.0\PR5SO2
5	Run Spec File Date/Time:	2026-03-23 12:32:52.0
5	Run Spec Description:	State Road PR-5 Extension Bayamon, Puerto Rico
5	Mass Units:	g
5	Energy Units:	J
5	Distance Units:	mi
5	Time Units:	hour

Run	Year	Hour	SO2	TotalEnergy	Distance
5	2026	1	160	463695740928	93502
5	2026	2	102	294597754880	59469
5	2026	3	82	237425868800	47952
5	2026	4	75	219419344896	44246
5	2026	5	112	325329551360	66316
5	2026	6	294	854770384896	175340
5	2026	7	745	2160466198528	435709
5	2026	8	1202	3479496556544	660291
5	2026	9	1076	3113391226880	576703
5	2026	10	890	2573965721600	476759
5	2026	11	895	2587055620096	473431

5	2026	12	991	2862275624960	515434
5	2026	13	1066	3076877189120	546539
5	2026	14	1071	3092032520192	550196
5	2026	15	1154	3329386872832	590238
5	2026	16	1328	3829410299904	673191
5	2026	17	1443	4158538383360	729769
5	2026	18	1460	4206906310656	734126
5	2026	19	1070	3089805869056	566797
5	2026	20	765	2212908236800	420879
5	2026	21	600	1735544799232	336058
5	2026	22	532	1541150081024	301720
5	2026	23	412	1193406103552	236472
5	2026	24	293	848971956224	169773
5	2046	1	96	315122384896	78700
5	2046	2	61	200144748544	50055
5	2046	3	49	162144714752	40360
5	2046	4	46	150438232064	37242
5	2046	5	67	221870931968	55818
5	2046	6	177	580863000576	147582
5	2046	7	445	1458154110976	366732
5	2046	8	716	2324156645376	555760
5	2046	9	640	2076666101760	485405
5	2046	10	529	1718856712192	401284
5	2046	11	531	1726618664960	398483
5	2046	12	586	1901584580608	433836
5	2046	13	629	2036906459136	460017
5	2046	14	633	2048420347904	463095

5	2046	15	681	2201320161280	496798
5	2046	16	783	2524550529024	566619
5	2046	17	850	2737147740160	614240
5	2046	18	860	2763680645120	617907
5	2046	19	633	2047386451968	477068
5	2046	20	454	1475573317632	354250
5	2046	21	356	1161284026368	282857
5	2046	22	317	1034489692160	253955
5	2046	23	246	803240083456	199036
5	2046	24	175	573870899200	142896

Category	Field	Value	Description

State Road PR-5
Bayamon, Puerto Rico

MOVES 5.0.1 Algorithm Results Summary
Sulfur Dioxide Emissions

Year	Emission Factor [g/mi]	PR-5 Length [mi]	Sulfur Dioxide Emissions [g]	Sulfur Dioxide Molecular Weight [g/mol]	Volume of Air [m3]	Sulfur Dioxide Concentration [ppb]	NAAQS Standard [ppb]
2046 1 hr	1.29E-03	3.125	4.03E-03	64.07	1,030,000.0	1.49E-03	75
2046 8 hr	1.30E-03	3.125	4.06E-03	64.07	1,030,000.0	1.50E-03	500

Year 2046					
Hours	SO2 Emissions [g}	Distance [mi]	Emission Factor [g/mi]	Emission Factor 1 hr [g/mi]	Emission Factor 8 hrs. [g/mi]
1	96	78,700	0.0012	1.29E-03	1.30E-03
2	61	50,055	0.0012		
3	49	40,360	0.0012		
4	46	37,242	0.0012		
5	67	55,818	0.0012		
6	177	147,582	0.0012		
7	445	366,732	0.0012		
8	716	555,760	0.0013		
9	640	485,405	0.0013		
10	529	401,284	0.0013		
11	531	398,483	0.0013		
12	586	433,836	0.0014		
13	629	460,017	0.0014		
14	633	463,095	0.0014		
15	681	496,798	0.0014		
16	783	566,619	0.0014		
17	850	614,240	0.0014		
18	860	617,907	0.0014		
19	633	477,068	0.0013		
20	454	354,250	0.0013		
21	356	282,857	0.0013		
22	317	253,955	0.0012		
23	246	199,036	0.0012		
24	175	142,896	0.0012		

State Road PR-5
Bayamon, Puerto Rico

MOVES 5.0.1 Algorithm Results Summary
PM 2.5 Emissions

Year	Emission Factor [g/mi]	PR-5 Length [mi]	PM 2.5 Emissions [g]	Volume of Air [m3]	PM 2.5 Concentration [µg/m3]	NAAQS Standard [µg/m3]
2046 24 hr	2.51E-03	3.125	7.85E-03	1,030,000	7.62E-03	35

Year 2046				
Hours	PM 2.5 Total Emissions [g]	Distance [mi]	Emission Factor [g/mi]	Emission Factor 24 hr [g/mi]
1	179	78,700	2.27E-03	
2	110	50,055	2.20E-03	
3	99	40,360	2.45E-03	
4	105	37,242	2.82E-03	
5	150	55,818	2.69E-03	
6	366	147,582	2.48E-03	
7	835	366,732	2.28E-03	
8	1,373	555,760	2.47E-03	
9	1,271	485,405	2.62E-03	
10	1,063	401,284	2.65E-03	
11	1,110	398,483	2.79E-03	
12	1,203	433,836	2.77E-03	
13	1,268	460,017	2.76E-03	2.51E-03
14	1,268	463,095	2.74E-03	
15	1,328	496,798	2.67E-03	
16	1,457	566,619	2.57E-03	
17	1,545	614,240	2.52E-03	
18	1,577	617,907	2.55E-03	
19	1,193	477,068	2.50E-03	
20	861	354,250	2.43E-03	
21	674	282,857	2.38E-03	
22	587	253,955	2.31E-03	
23	435	199,036	2.19E-03	
24	311	142,896	2.18E-03	

State Road PR-5
Bayamon, Puerto Rico

MOVES 5.0.1 Algorithm Results Summary
Nitrogen Oxides Emissions

Year	Emission Factor [g/mi]	PR-5 Length [mi]	Nitrogen Oxides Emissions [g]	Nitrogen Oxides Molecular Weight [g/mol]	Volume of Air [m3]	Nitrogen Oxides Concentration [ppm]	NAAQS Standard [ppm]
2046 1 hr	0.1037	3.125	0.324	46.01	1,030,000	0.0002	0.1
Annual	0.0814	3.125	0.254	46.01	1,030,000	0.0001	0.053

Year 2046					
Hours	NOx Emissions [g}	Distance [mi]	Emission Factor [g/mi]	Emission Factor 1 hr [g/mi]	Emission Factor 8 hrs. [g/mi]
1	6,159	78,700	0.0783	0.1037	0.0814
2	3,864	50,055	0.0772		
3	4,195	40,360	0.1039		
4	4,966	37,242	0.1333		
5	5,890	55,818	0.1055		
6	12,124	147,582	0.0822		
7	23,277	366,732	0.0635		
8	40,552	555,760	0.0730		
9	41,726	485,405	0.0860		
10	33,874	401,284	0.0844		
11	37,369	398,483	0.0938		
12	37,124	433,836	0.0856		
13	38,061	460,017	0.0827		
14	39,252	463,095	0.0848		
15	39,509	496,798	0.0795		
16	42,304	566,619	0.0747		
17	43,936	614,240	0.0715		
18	45,185	617,907	0.0731		
19	34,005	477,068	0.0713		
20	24,090	354,250	0.0680		
21	18,789	282,857	0.0664		
22	17,132	253,955	0.0675		
23	12,253	19,906	0.6155		
24	9,564	142,896	0.0669		

Run	Header Item:	Item Value
	Report Description:	Summary Report
	Report Date/Time:	2026-3-23 14:41:8
	MOVES Output Database:	PR_545
	Emission Process:	All
7	Run Date/Time:	2026-03-23 13:03:41.0
7	Run Specification:	C:\Users\Public\EPA\MOVES\MOVES5.0\PR5SO2
7	Run Spec File Date/Time:	2026-03-23 13:03:35.0
7	Run Spec Description:	State Road PR-5 Extension Bayamon, Puerto Rico
7	Mass Units:	g
7	Energy Units:	J
7	Distance Units:	mi
7	Time Units:	hour

Run	Year	Hour	State	NOx	Distance
7	2026	1	72	18022	93502
7	2026	2	72	11279	59469
7	2026	3	72	10188	47952
7	2026	4	72	10589	44246
7	2026	5	72	14358	66316
7	2026	6	72	34295	175340
7	2026	7	72	78906	435709
7	2026	8	72	130208	660291
7	2026	9	72	121176	576703
7	2026	10	72	99457	476759
7	2026	11	72	103656	473431

7	2026	12	72	110508	515434
7	2026	13	72	116857	546539
7	2026	14	72	118149	550196
7	2026	15	72	123898	590238
7	2026	16	72	138055	673191
7	2026	17	72	148219	729769
7	2026	18	72	151503	734126
7	2026	19	72	114025	566797
7	2026	20	72	82540	420879
7	2026	21	72	65048	336058
7	2026	22	72	57605	301720
7	2026	23	72	42962	236472
7	2026	24	72	31216	169773
7	2046	1	72	6159	78700
7	2046	2	72	3864	50055
7	2046	3	72	4195	40360
7	2046	4	72	4966	37242
7	2046	5	72	5890	55818
7	2046	6	72	12124	147582
7	2046	7	72	23277	366732
7	2046	8	72	40552	555760
7	2046	9	72	41726	485405
7	2046	10	72	33874	401284
7	2046	11	72	37369	398483
7	2046	12	72	37124	433836
7	2046	13	72	38061	460017
7	2046	14	72	39252	463095

7	2046	15	72	39509	496798
7	2046	16	72	42304	566619
7	2046	17	72	43936	614240
7	2046	18	72	45185	617907
7	2046	19	72	34005	477068
7	2046	20	72	24090	354250
7	2046	21	72	18789	282857
7	2046	22	72	17132	253955
7	2046	23	72	12253	199036
7	2046	24	72	9564	142896

Category	Field	Value	Description
	stateID	72	PUERTO RICO

State Road PR-5
Bayamon, Puerto Rico

Benzene Emissions

Year	Emission Factor [g/mi]	PR-5 Length [mi]	Benzene Emissions [g]	Benzene Molecular Weight [g/mol]	Volume of Air [m3]	Benzene Concentration [ppm]	Benzene Concentration [ppb]	VPD	VMT [mi/day]	Emissions [lb/day]
2046 1 hr	0.0025	3.125	0.008	78.11	1,030,000	2.36E-06	2.36	95,136	297,300	1.63
Annual	0.0024	3.125	0.008	78.11	1,030,000	2.30E-06	2.30	95,136	297,300	1.59

Year 2046					
Hours	C6H6 Emissions [g}	Distance [mi]	Emission Factor [g/mi]	Emission Factor 1 hr [g/mi]	Emission Factor 8 hrs. [g/mi]
1	197	78,700	0.0025		
2	141	50,055	0.0028		
3	140	40,360	0.0035		
4	155	37,242	0.0042		
5	185	55,818	0.0033		
6	356	147,582	0.0024		
7	692	366,732	0.0019		
8	1,170	555,760	0.0021		
9	1,196	485,405	0.0025		
10	1,075	401,284	0.0027		
11	1,105	398,483	0.0028		
12	1,122	433,836	0.0026	0.0025	0.0024
13	1,138	460,017	0.0025		
14	1,116	463,095	0.0024		
15	1,145	496,798	0.0023		
16	1,262	566,619	0.0022		
17	1,337	614,240	0.0022		
18	1,387	617,907	0.0022		
19	1,059	477,068	0.0022		
20	774	354,250	0.0022		
21	600	282,857	0.0021		
22	524	253,955	0.0021		
23	390	199,036	0.0020		
24	303	142,896	0.0021		

Run	Header Item:	Item Value
	Report Description:	Summary Report
	Report Date/Time:	2026-3-24 9:32:38
	MOVES Output Database:	PR_545
	Emission Process:	All
8	Run Date/Time:	2026-03-24 07:31:13.0
8	Run Specification:	C:\Users\Public\EPA\MOVES\MOVES5.0\PR5SO2
8	Run Spec File Date/Time:	2026-03-24 07:31:07.0
8	Run Spec Description:	State Road PR-5 Extension Bayamon, Puerto Rico
8	Mass Units:	g
8	Energy Units:	J
8	Distance Units:	mi
8	Time Units:	hour

Run	Year	Hour	Benzene	Distance
8	2026	1	430	93502
8	2026	2	322	59469
8	2026	3	295	47952
8	2026	4	304	44246
8	2026	5	387	66316
8	2026	6	761	175340
8	2026	7	1571	435709
8	2026	8	2610	660291
8	2026	9	2500	576703
8	2026	10	2216	476759
8	2026	11	2208	473431

8	2026	12	2331	515434
8	2026	13	2426	546539
8	2026	14	2363	550196
8	2026	15	2477	590238
8	2026	16	2761	673191
8	2026	17	2975	729769
8	2026	18	3092	734126
8	2026	19	2399	566797
8	2026	20	1791	420879
8	2026	21	1399	336058
8	2026	22	1195	301720
8	2026	23	907	236472
8	2026	24	681	169773
8	2046	1	197	78700
8	2046	2	141	50055
8	2046	3	140	40360
8	2046	4	155	37242
8	2046	5	185	55818
8	2046	6	356	147582
8	2046	7	692	366732
8	2046	8	1170	555760
8	2046	9	1196	485405
8	2046	10	1075	401284
8	2046	11	1105	398483
8	2046	12	1122	433836
8	2046	13	1138	460017
8	2046	14	1116	463095

8	2046	15	1145	496798
8	2046	16	1262	566619
8	2046	17	1337	614240
8	2046	18	1387	617907
8	2046	19	1059	477068
8	2046	20	774	354250
8	2046	21	600	282857
8	2046	22	524	253955
8	2046	23	390	199036
8	2046	24	303	142896

Category	Field	Value	Description

State Road PR-5
Bayamon, Puerto Rico

Acrolein Emissions

Year	Emission Factor [g/mi]	PR-5 Length [mi]	Acrolein Emissions [g]	Acrolein Molecular Weight [g/mol]	Volume of Air [m3]	Acrolein Concentration [ppm]	Acrolein Concentration [ppb]	VPD	VMT [mi/day]	Emissions [lb/day]
2046 1 hr	4.25E-05	3.125	1.33E-04	56.03	1,030,000	5.63E-08	0.056	95,136	297,300	0.03
Annual	4.37E-05	3.125	1.36E-04	56.03	1,030,000	5.78E-08	0.058	95,136	297,300	0.03

Year 2046					
Hours	Acrolein Emissions [g}	Distance [mi]	Emission Factor [g/mi]	Emission Factor 1 hr [g/mi]	Emission Factor 8 hrs. [g/mi]
1	3	78,700	3.81E-05	4.25E-05	4.37E-05
2	2	50,055	4.00E-05		
3	2	40,360	4.96E-05		
4	3	37,242	8.06E-05		
5	3	55,818	5.37E-05		
6	7	147,582	4.74E-05		
7	13	366,732	3.54E-05		
8	23	555,760	4.14E-05		
9	22	485,405	4.53E-05		
10	18	401,284	4.49E-05		
11	19	398,483	4.77E-05		
12	19	433,836	4.38E-05		
13	20	460,017	4.35E-05		
14	20	463,095	4.32E-05		
15	20	496,798	4.03E-05		
16	22	566,619	3.88E-05		
17	23	614,240	3.74E-05		
18	24	617,907	3.88E-05		
19	18	477,068	3.77E-05		
20	13	354,250	3.67E-05		
21	10	282,857	3.54E-05		
22	9	253,955	3.54E-05		
23	6	199,036	3.01E-05		
24	5	142,896	3.50E-05		

State Road PR-5
Bayamon, Puerto Rico

Formaldehyde Emissions

Year	Emission Factor [g/mi]	PR-5 Length [mi]	HCHO Emissions [g]	HCHO Molecular Weight [g/mol]	Volume of Air [m3]	HCHO Concentration [ppm]	HCHO Concentration [ppb]	VPD	VMT [mi/day]	Emissions [lb/day]
2046 1 hr	5.99E-04	3.125	1.87E-03	30.03	1,030,000	1.48E-06	1.48	95,136	297,300	0.39
Annual	6.10E-04	3.125	1.90E-03	30.03	1,030,000	1.51E-06	1.51	95,136	297,300	0.40

Year 2046					
Hours	HCHO Emissions [g]	Distance [mi]	Emission Factor [g/mi]	Emission Factor 1 hr [g/mi]	Emission Factor 8 hrs. [g/mi]
1	44	78,700	0.0006		
2	27	50,055	0.0005		
3	26	40,360	0.0006		
4	29	37,242	0.0008		
5	38	55,818	0.0007		
6	88	147,582	0.0006		
7	196	366,732	0.0005		
8	335	555,760	0.0006		
9	311	485,405	0.0006		
10	247	401,284	0.0006		
11	255	398,483	0.0006		
12	271	433,836	0.0006	0.0006	0.0006
13	286	460,017	0.0006		
14	288	463,095	0.0006		
15	305	496,798	0.0006		
16	343	566,619	0.0006		
17	369	614,240	0.0006		
18	380	617,907	0.0006		
19	278	477,068	0.0006		
20	197	354,250	0.0006		
21	153	282,857	0.0005		
22	136	253,955	0.0005		
23	101	199,036	0.0005		
24	74	142,896	0.0005		

State Road PR-5
Bayamon, Puerto Rico

Butadiene Emissions

Year	Emission Factor [g/mi]	PR-5 Length [mi]	Butadiene Emissions [g]	Butadiene Molecular Weight [g/mol]	Volume of Air [m3]	Butadiene Concentration [ppm]	VPD	VMT [mi/day]	Emissions [lb/day]
2046 1 hr	0.00E+00	3.125	0.000	54.09	1,030,000	0.00E+00	95,136	297,300	0.00
Annual	0.00E+00	3.125	0.000	54.09	1,030,000	0.00E+00	95,136	297,300	0.00

Year 2046					
Hours	Butadiene Emissions [g]	Distance [mi]	Emission Factor [g/mi]	Emission Factor 1 hr [g/mi]	Emission Factor 8 hrs. [g/mi]
1	-	78,700	0.00E+00		
2	-	50,055	0.00E+00		
3	-	40,360	0.00E+00		
4	-	37,242	0.00E+00		
5	-	55,818	0.00E+00		
6	-	147,582	0.00E+00		
7	-	366,732	0.00E+00		
8	-	555,760	0.00E+00		
9	-	485,405	0.00E+00		
10	-	401,284	0.00E+00		
11	-	398,483	0.00E+00		
12	-	433,836	0.00E+00	0.0000	0.0000
13	-	460,017	0.00E+00		
14	-	463,095	0.00E+00		
15	-	496,798	0.00E+00		
16	-	566,619	0.00E+00		
17	-	614,240	0.00E+00		
18	-	617,907	0.00E+00		
19	-	477,068	0.00E+00		
20	-	354,250	0.00E+00		
21	-	282,857	0.00E+00		
22	-	253,955	0.00E+00		
23	-	199,036	0.00E+00		
24	-	142,896	0.00E+00		

Run	Header Item:	Item Value
	Report Description:	Summary Report
	Report Date/Time:	2026-3-25 6:37:30
	MOVES Output Database:	PR_545
	Emission Process:	All
9	Run Date/Time:	2026-03-24 16:56:26.0
9	Run Specification:	C:\Users\Public\EPA\MOVES\MOVES5.0\PR5SO2
9	Run Spec File Date/Time:	2026-03-24 16:56:19.0
9	Run Spec Description:	State Road PR-5 Extension Bayamon, Puerto Rico
9	Mass Units:	g
9	Energy Units:	J
9	Distance Units:	mi
9	Time Units:	hour

Run	Year	Hour	Butadiene	Acetaldehyde	Distance
9	2026	1	6	93	93502
9	2026	2	4	57	59469
9	2026	3	3	52	47952
9	2026	4	3	59	44246
9	2026	5	4	89	66316
9	2026	6	11	214	175340
9	2026	7	30	480	435709
9	2026	8	49	821	660291
9	2026	9	44	738	576703
9	2026	10	36	589	476759
9	2026	11	37	593	473431

9	2026	12	41	637	515434
9	2026	13	44	678	546539
9	2026	14	44	672	550196
9	2026	15	48	714	590238
9	2026	16	55	791	673191
9	2026	17	60	858	729769
9	2026	18	61	896	734126
9	2026	19	44	670	566797
9	2026	20	31	485	420879
9	2026	21	24	382	336058
9	2026	22	21	326	301720
9	2026	23	17	235	236472
9	2026	24	12	164	169773
9	2046	1	0	44	78700
9	2046	2	0	27	50055
9	2046	3	0	30	40360
9	2046	4	0	39	37242
9	2046	5	0	48	55818
9	2046	6	0	98	147582
9	2046	7	0	185	366732
9	2046	8	0	323	555760
9	2046	9	0	319	485405
9	2046	10	0	251	401284
9	2046	11	0	268	398483
9	2046	12	0	272	433836
9	2046	13	0	280	460017
9	2046	14	0	283	463095

9	2046	15	0	291	496798
9	2046	16	0	313	566619
9	2046	17	0	327	614240
9	2046	18	0	341	617907
9	2046	19	0	254	477068
9	2046	20	0	181	354250
9	2046	21	0	140	282857
9	2046	22	0	124	253955
9	2046	23	0	87	199036
9	2046	24	0	67	142896

Category	Field	Value	Description

Run	Header Item:	Item Value
	Report Description:	Summary Report
	Report Date/Time:	2026-3-25 6:38:31
	MOVES Output Database:	PR_545
	Emission Process:	All
9	Run Date/Time:	2026-03-24 16:56:26.0
9	Run Specification:	C:\Users\Public\EPA\MOVES\MOVES5.0\PR5SO2
9	Run Spec File Date/Time:	2026-03-24 16:56:19.0
9	Run Spec Description:	State Road PR-5 Extension Bayamon, Puerto Rico
9	Mass Units:	g
9	Energy Units:	J
9	Distance Units:	mi
9	Time Units:	hour

Run	Year	Hour	Acrolein	Formaldehyde	Distance
9	2026	1	8	110	93502
9	2026	2	5	69	59469
9	2026	3	4	59	47952
9	2026	4	5	60	44246
9	2026	5	7	88	66316
9	2026	6	17	222	175340
9	2026	7	40	542	435709
9	2026	8	67	919	660291
9	2026	9	61	822	576703
9	2026	10	48	661	476759
9	2026	11	48	663	473431

9	2026	12	52	724	515434
9	2026	13	56	775	546539
9	2026	14	55	773	550196
9	2026	15	59	828	590238
9	2026	16	66	940	673191
9	2026	17	72	1025	729769
9	2026	18	75	1056	734126
9	2026	19	55	774	566797
9	2026	20	40	552	420879
9	2026	21	31	433	336058
9	2026	22	27	377	301720
9	2026	23	20	282	236472
9	2026	24	14	199	169773
9	2046	1	3	44	78700
9	2046	2	2	27	50055
9	2046	3	2	26	40360
9	2046	4	3	29	37242
9	2046	5	3	38	55818
9	2046	6	7	88	147582
9	2046	7	13	196	366732
9	2046	8	23	335	555760
9	2046	9	22	311	485405
9	2046	10	18	247	401284
9	2046	11	19	255	398483
9	2046	12	19	271	433836
9	2046	13	20	286	460017
9	2046	14	20	288	463095

9	2046	15	20	305	496798
9	2046	16	22	343	566619
9	2046	17	23	369	614240
9	2046	18	24	380	617907
9	2046	19	18	278	477068
9	2046	20	13	197	354250
9	2046	21	10	153	282857
9	2046	22	9	136	253955
9	2046	23	6	101	199036
9	2046	24	5	74	142896

Category	Field	Value	Description

State Road PR-5
Bayamon, Puerto Rico

Acetaldehyde Emissions

Year	Emission Factor [g/mi]	PR-5 Length [mi]	Acetaldehyde Emissions [g]	Acetaldehyde Molecular Weight [g/mol]	Volume of Air [m3]	Acetaldehyde Concentration [ppm]	Acetaldehyde Concentration [ppb]	VPD	VMT [mi/day]	Emissions [lb/day]
2046 1 hr	6.02E-04	3.125	1.88E-03	44.05	1,030,000	1.01E-06	1.01	95,136	297,300	0.3948
Annual	6.18E-04	3.125	1.93E-03	44.05	1,030,000	1.04E-06	1.04	95,136	297,300	0.4048

Year 2046					
Hours	Acetaldehyde Emissions [g]	Distance [mi]	Emission Factor [g/mi]	Emission Factor 1 hr [g/mi]	Emission Factor 8 hrs. [g/mi]
1	44	78,700	0.0006		
2	27	50,055	0.0005		
3	30	40,360	0.0007		
4	39	37,242	0.0010		
5	48	55,818	0.0009		
6	98	147,582	0.0007		
7	185	366,732	0.0005		
8	323	555,760	0.0006		
9	319	485,405	0.0007		
10	251	401,284	0.0006		
11	268	398,483	0.0007		
12	272	433,836	0.0006	0.0006	0.0006
13	280	460,017	0.0006		
14	283	463,095	0.0006		
15	291	496,798	0.0006		
16	313	566,619	0.0006		
17	327	614,240	0.0005		
18	341	617,907	0.0006		
19	254	477,068	0.0005		
20	181	354,250	0.0005		
21	140	282,857	0.0005		
22	124	253,955	0.0005		
23	87	199,036	0.0004		
24	67	142,896	0.0005		

Run	Header Item:	Item Value
	Report Description:	Summary Report
	Report Date/Time:	2026-3-25 14:52:25
	MOVES Output Database:	PR_545
	Emission Process:	All
10	Run Date/Time:	2026-03-25 06:50:53.0
10	Run Specification:	C:\Users\Public\EPA\MOVES\MOVES5.0\PR5SO2
10	Run Spec File Date/Time:	2026-03-25 06:50:46.0
10	Run Spec Description:	State Road PR-5 Extension Bayamon, Puerto Rico
10	Mass Units:	g
10	Energy Units:	J
10	Distance Units:	mi
10	Time Units:	hour

Run	Hour	CO2	CO2_Equiv	N2O	TotalEnergy	Distance
10	1	54010364	54588068	1939	778818158592	172202
10	2	34317180	34668756	1180	494742503424	109524
10	3	27720752	28007152	961	399570567168	88312
10	4	25664144	25939248	923	369857560576	81488
10	5	37927332	38340156	1385	547200499712	122134

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    10     6            99484080          100548296               3571
1435633319936         322923
    10     7           251202528          253840352               8852
3618620309504         802441
    10     8           404335328          408652384              14487
5803653201920        1216051
    10     9           361701216          365756192              13607
5190057459712        1062108
    10    10           298769600          302293088              11824
4292822695936         878043
    10    11           300149248          303929184              12684
4313674153984         871914
    10    12           331603712          335874240              14331
4763860074496         949270
    10    13           356150912          360696992              15255
5113783517184        1006555
    10    14           357990144          362538144              15262
5140452999168        1013291
    10    15           385323968          390097728              16019
5530706771968        1087037
    10    16           443086080          448334016              17611
6353960566784        1239811
    10    17           481225696          486774496              18620
6895685861376        1344010
    10    18           486894400          492499616              18810
6970586693632        1352032
    10    19           358018880          362221280              14102
51371024520
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5137192452096        1043865
    10    20           256561376          259552192               10036
3688481685504        775130
    10    21           201346976          203668208                7789
2896828825600        618916
    10    22           178939008          180920144                6648
2575639773184        555676
    10    23           138615344          140091104                4952
1996646121472        435508
    10    24            98724328           99752808                3451
1422842920960        312669


 Category Field      Value  Description
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State Road PR-5
Bayamon, Puerto Rico

Greenhouse Gases Emissions

Year	Emission Factor [g/mi]	PR-5 Length [mi]	CO2,eq Emissions [g]	CO2 Molecular Weight [g/mol]	Volume of Air [m3]	CO2,eq Concentration [ppm]	CO2,eq Concentration [ppb]	VPD	VMT [mi/day]	Emissions [lb/day]
2046 1 hr	3.37E+02	3.125	1.05E+03	44.09	1,030,000	5.66E-01	566,296.45	95,136	297,300	220,608.09
Annual	3.39E+02	3.125	1.06E+03	44.09	1,030,000	5.71E-01	570,604.88	95,136	297,300	222,286.50

Year 2046					
Hours	CO2,eq Emissions [g]	Distance [mi]	Emission Factor [g/mi]	Emission Factor 1 hr [g/mi]	Emission Factor 8 hrs. [g/mi]
1	54,588,068	172,202	317.0002		
2	34,668,756	109,524	316.5403		
3	28,007,152	88,312	317.1387		
4	25,939,248	81,488	318.3199		
5	38,340,156	122,134	313.9188		
6	100,548,296	322,923	311.3693		
7	253,840,352	802,441	316.3352		
8	408,652,384	1,216,051	336.0487		
9	365,756,192	1,062,108	344.3682		
10	302,293,088	878,043	344.2805		
11	303,929,184	871,914	348.5770		
12	335,874,240	949,270	353.8237	336.5831	339.1438
13	360,696,992	1,006,555	358.3480		
14	362,538,144	1,013,291	357.7829		
15	390,097,728	1,087,037	358.8633		
16	448,334,016	1,239,811	361.6148		
17	486,774,496	1,344,010	362.1807		
18	492,499,616	1,352,032	364.2662		
19	362,221,280	1,043,865	347.0001		
20	259,552,192	775,130	334.8499		
21	203,668,208	618,916	329.0725		
22	180,920,144	555,676	325.5857		
23	140,091,104	435,508	321.6729		
24	99,752,808	312,669	319.0365		