APPENDIX K – COVERED PROJECT ANALYSIS & DESCRIPTION

I. Project Description and Eligibility

Project Scope

The proposed PR-10 (Utuado – Adjuntas) project is an approximate 7.6 kilometer segment designed to comply with the requirements of the latest construction codes of the AASHTO Design and Construction of Highway and Bridges to provide a resilient facility for future natural events (i.e., storms, hurricanes, and earthquakes). The project consists of the construction of a new roadway facility including twenty (20) bridges spanning over twenty to thirty (20-30) creeks and water bodies along one (1) of the steepest terrains in Puerto Rico. The bridges will provide free flow to the storm runoff water which is the major cause of erosion and landslides of the highway embankments. See the red dotted line route for PR-10 construction in map on Figure 1.

The construction of the proposed project will take place within the Central Mountain Range of Puerto Rico (Cordillera Central). This area includes some of the highest peaks and the least accessible terrain in Puerto Rico. These factors can drive up project costs due to the complexities of construction in such terrain with drastic shifts in elevation, not to mention the high cost of bridge construction standards.

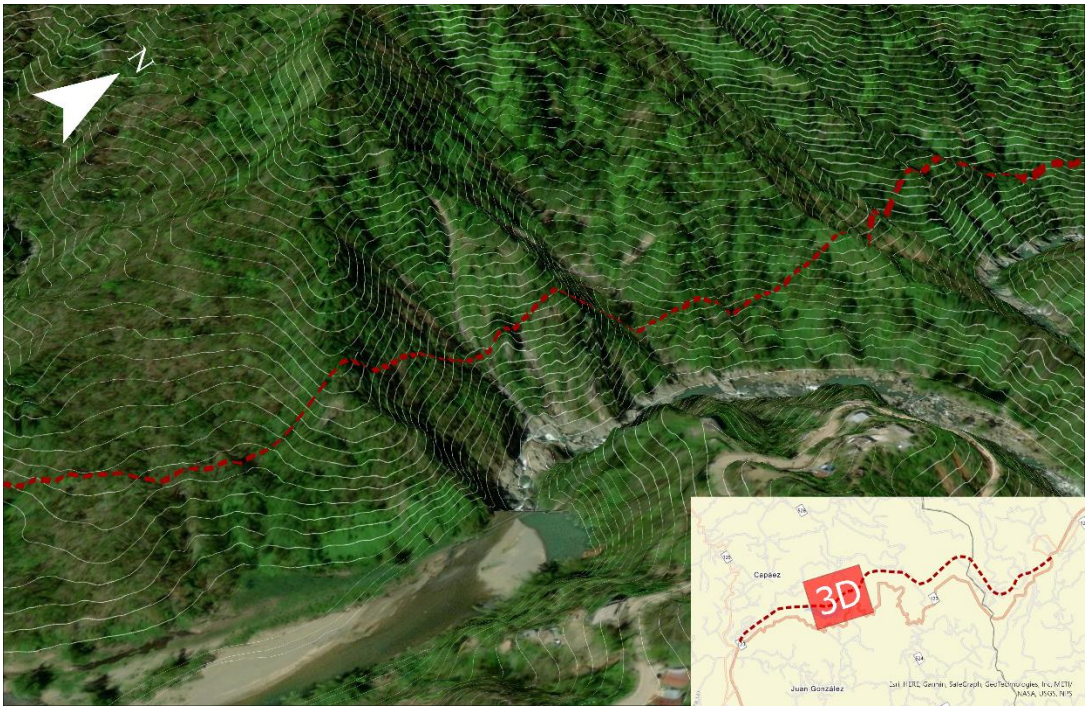

Figure 1. 3D topography map of the PR-10 planned project route

Such cost considerations have proven prohibitive since the original conception of the project. The economic decline pushed the possibility further out of sight. However, at this time, an investment of this nature is imperative. As Irma and María showed us, this critical lifeline upon which others depend, proved non-resilient to an incomplete segment along PR-123 in this region. The impact rendered this main thoroughfare essentially incapacitated limiting ingress/egress of surrounding communities. As evident in the Risk Assessment, a future hazardous event is imminent, and the probability of impact to this area is high.

The project design includes highway sections consisting of two (2) three point six five (3.65) meter lanes and one (1) one point eight zero (1.80) meter shoulder in the uphill segments. It also includes one (1) three point six five (3.65) meter lane and three (3) meter shoulder in the downhill segments. The steep cuts will be reinforced with soil nails system which will protect the roadway against landslides and reduce the volume of cuts resulting in reduced environmental impacts.

In summary, the PR-10 (Utuado – Adjuntas) Project will provide:

- Continuity to the north-south ground commute. This connection reduces the time lost in the transportation of lifeline service equipment and personnel during stable conditions as well as response in the event of partial or holistic instability[1].
- A safe and resilient transportation lifeline facility built to withstand impacts of future natural events in conformance with the latest construction codes of AASHTO Design and Construction of Highway and Bridges.
- Increased capacity within the transportation lifeline, upon which other lifelines depend, to provide the necessary mobility to emergency teams, rescuers, and utility crews to assist communities during a natural event and reduce the loss of lives and economic impacts.
- Reduction of carbon-monoxide emissions along existing PR-123 due to high fuel consumption of heavy and general vehicles.
- Reduction of contamination of the Rio Grande de Arecibo by the acquisition and demolition of existing structures in the upstream side of the river and providing a natural barrier to the remaining land from future development.
- Economic development potential for the surrounding communities.

The project will have all required permits and endorsements from Puerto Rico and Federal regulatory agencies like the Department of Natural Resources and Environment (**DNRE**), Puerto Rico Electric Power Authority (**PREPA**) and its power distributor LUMA Energy, LLC., Puerto Rico Aqueduct and Sewer Authority (**PRASA**), Regulatory Board of Telecommunications (**JRTC** for its Spanish acronym), State Historic Preservation Officer (**SHPO**), and the Puerto Rico Permit Management Office (**OGPe,** for its Spanish acronym) as well as the U.S. Army Corp of Engineers (**USACE**) and U.S. Fish and Wildlife Service.

A protocol to protect the existing flora and fauna during construction was prepared and approved by the DNRE. Biologists and environmental specialists will be sub-contracted by the Puerto Rico Highway and Transportation Authority (**PRHTA**) to oversee the implementation of the protocol.

The proposed project is an infrastructure project as defined by HUD at 84 FR 45838. The project is a group of related activities that develops the physical assets that are designed to provide or

[1] See section of Analysis of Roadway Connectivity & Use

support services to the general public in the Surface Transportation sector (roadways and bridges).

PRHTA will build the four (4) sections that comprise the Project, "Highway PR-10 (Utuado – Adjuntas)" in a single bid within a hybrid combination of conventional and Design-Build construction methods. Due to the complexity of the project, it is imperative to utilize the most advanced design and construction techniques. For bidding and construction purposes, PRHTA has divided the segment in four (4) sections defined in the following table:

PROJECT	UNIT	AC CODE	LENGTH (KMS)	BEGIN STATION	END STATION	BEGIN KILOMETER	END KILOMETER
Section II	UNIT-1	100069	1.571	39+78.73	55+50.36	Km 37.70	Km 36.13
Section III	UNIT-1	100071	1.840	55+50.36	73+90.00	Km 36.13	Km 34.29
Section IV	UNIT-2	100055	2.289	73+90.00	96+85.93	Km 34.29	Km 32.00
Section V	UNIT-2	100076	1.832	96+85.93	115+17.95	Km 32.00	Km 30.17

It is PRHTA's intent that all project construction activities be conducted within the existing Right of Way. The selected contractor shall strictly adhere to the environmental requirements as set forth in the General Conditions and Requirements.

PRHTA will award the construction of the four (4) sections in a single package divided as UNIT-1 and UNIT-2. These units are the following:

UNIT-I (Design/Bid/Build Method)

UNIT-1 includes Section II (AC-100069) and Section III (AC-100071). These segments of the roadway shall be implemented using a Design/Bid/Build Method. Hybrid contracting where the price for the work in the plans and specifications will be bid as a lump sum and pay items with quantity risk will be included as contingency items within a unit price bid by the contractor.

Section II (AC-100069)

Section II has a total length of 1.571 km. Its topography varies from a mild steep slope to steep slope covered with a mild dense forest. In addition to the 1.571 km of new freeway, three (3) local access roads will be constructed to maintain accessibility to adjacent lands of the project. Several drainage structures and open channels will also be constructed along the project.

Proposed work for this project also includes the construction of the following bridges with their corresponding lengths: BR-1 (0.149 km), BR-1A (0.199 km) and BR-1B (0.08 km). Additionally, project scope also includes earthworks, the construction of two (2) retention walls, drainage utilities, pavement markings, signage, safety measures and any other incidental work to complete the job. The Right of Way is fully controlled by PRHTA. The design of this segment is one hundred percent (100%) complete.

Section III (AC-100071)

Section III has a total length of 1.840 km. The major tributaries of Río Grande de Arecibo are overpassed to allow a free flow of the water volumes and avoid environmental impacts on those

water bodies. Its topography and ground cover are like section II. The Right of Way is fully controlled by PRHTA.

The design of this section is seventy percent (70%) complete. Proposed work for this project under **UNIT-1** includes the earthworks, construction of pavement, drainage, utilities, pavement markings, signage, safety measures and any other incidental work to complete the job.

UNIT-2 (Design/Build Method)

UNIT 2 includes Section III (AC-100071) – Bridges and retaining walls, Section IV (AC-100055) and Section V (AC-100076). These segments of the roadway shall be implemented using a Design/Bid/Build Method.

Section III (AC-100071) – Bridges and retaining walls

Under **UNIT-2**, the Contractor will complete the design and construction of the following five (5) new bridges with their corresponding lengths: BR-2 (0.128 kilometers), BR-3 (0.169 kilometers), BR-3A (0.096 kilometers), BR-3B (0.082 kilometers), BR-3C (0.194 kilometers) and three (3) retention walls.

Section IV (AC-100055)

Section IV has a total length of 2.289 km. The existing topography is a steep slope and a very dense forest. All tributaries of Río Grande de Arecibo are overpassed to avoid environmental impacts of the existing water courses. The major structure on this section are seven (7) bridges and six (6) retaining walls. The Right of Way is in process of acquisition by PRHTA. The design of this section is thirty five percent (35%) complete.

Proposed work for this project includes the construction of the following new bridges with their corresponding lengths: BR-4 (0.107 km), BR-4A (0.110 km), BR-4B (0.04 km), BR-5 (0.111 km), BR-6 (0.118 km kilometers), BR-7 (0.151 km), and BR-8 (0.067 km). Additionally, project scope also includes earthworks, the construction of six (6) retention walls, drainage utilities, pavement markings, signage, safety measures and incidental work necessary to complete the job.

Section V (AC-100076)

Section V has a total length of 1.832 km. The section consists of five (5) bridges and three (3) mechanically stabilized earth (MSE)- retaining walls. Like the previous sections, the alignment of this section runs parallel to Río Grande de Arecibo. The Right of Way is fully acquired by PRHTA. The design of this section is thirty-five percent (35%) complete.

Proposed work for this project includes the construction of the following five (5) new bridges with their corresponding lengths: BR-9 (0.285 km), BR-10 (0.119 km), BR-11 (0.148 km), BR-12 (0.182 km), and BR-13 (0.075 km). Additionally, project scope also includes earthworks, the construction of three (3) MSE walls, soil nailing walls for slope stability, drainage utilities, pavement markings, signage, safety measures and incidental work necessary to complete the job.

Project Location

The proposed project will be located within the boundaries of the Utuado and Adjuntas municipalities as described below:

Section II (AC-100069)

Section II begins in the municipality of Utuado at kilometer 37.70, at the southern end of the existing northern segment of PR-10, south of the intersection with highway PR-123. Its alignment continues

in a south direction, crosses Río Grande de Arecibo and continues in a south direction parallel to the river for a total length of 1.571 km to end near the intersection with La Chorrera local road.

Section III (AC-100071)
Section III commences in Guaonico ward in the municipality of Utuado. The alignment of this project continues in a parallel route to Río Grande de Arecibo for 1.840 km to end in Capáez ward in the municipality of Adjuntas.

Section IV (AC-100055)
Section IV commences in Capáez ward in the municipality of Adjuntas for a total length of two point two eight nine (2.289) kilometers to end within the municipality of Adjuntas.

Section V (AC-100076)
Section V begins at the end of Section IV and ends at the north approach of an existing bridge of the southern section of the existing PR-10 for a total length of 1.814 km. The totality of this section is within the municipality of Adjuntas.

HUD Eligible Activity

Construction of the PR-10 Project is an eligible activity under Section 105(a)(2) - *Public Facilities and improvements* of Title I of The Housing and Community Development Act of 1974 (**HCDA**). The PR-10 project is a Public Facility owned by the PRHTA, a state agency of the Government of Puerto Rico.

Project Cost

The PR-10 engineering cost estimate is based on quantity take-off based on the level of completion of each section. Cost estimation was based on the PRHTA unit prices database which is informed by historical prices from different highway projects pre-María. Since this project represents the first transportation infrastructure project of this magnitude in more than ten (10) years (PR-66) and the escalation of prices as a consequence of the latest events (COVID-19, Russian-Ukraine war, energy, and labor turnover), those unit prices are no longer valid.

To work a reasonable cost estimate that takes into account the present economic, global and local, conditions we factorized in the unit prices based on research of the latest RS Means prices and price indexes. Current project costs are shown by activity in the next chart.

As mentioned in the Project Scope, site factors that affect the construction costs of the project include:

- Project completion requires the construction of twenty (20) bridges in the span of 7.6 km.
- Project implementation requires the construction of segments II & V before segment IV can be constructed. This is due to site accessibility considerations in construction.
- Site construction activities requires extensive cut and fill of mountains and valleys.

Overview of Project Costs

Category No.	Project Category Description	Cost
1	Mobilization	$ 13,973,136.00
2	Studies	$ 8,217,200.00

3	Design	$ 17,048,418.00
4	Construction Management and Inspections	$ 12,000,000.00
5	Permits and Endorsements	$ 3,119,900.00
6	Pavement Structure (Include Sub-Base)	$ 25,922,650.00
7	Earthwork	$ 126,273,186.00
8	Utilities	$ 707,020.00
9	Drainage and Erosion Control	$ 19,943,882.00
10	Bridges	$ 283,169,026.00
11	Retaining Walls	$ 35,110,590.00
12	Safety Elements	$ 4,894,672.00
13	Signage & Pavement Marking	$ 1,690,296.00
	Total	**$ 552,069,976.00**

Project Funding

Project Cost Category	State Funds	CDBG-MIT Requested
Mobilization		$ 13,973,136
Studies	$ 8,217,200	
Design		$ 17,048,418
Construction Management and Inspections		$ 12,000,000.00
Permits & Endorsements	$ 3,119,900	
Pavement Structure		$ 25,922,650
Earthwork		$ 126,273,186
Utilities		$707,020
Drainage & Erosion Control		$ 19,943,882
Bridges		$ 283,169,026
Retaining Walls		$ 35,110,590
Safety Elements		$ 4,894,672
Signing & Pavement Marking		$ 1,690,296
Sub-Total	$ 11,337,100	$ 540,732,876
	TOTAL	**$ 552,069,976**

Area of Impact

The impact of this transformative project spans a substantial geographic area. Considering the nature of its use, construction to complete the roadway will yield benefits to the communities and lifeline assets located within those communities that reside within a reasonable commute (in terms of time) of the PR-10 north-south thoroughfare.

The estimated area of impact shown in Figure 2 was derived by performing a drive time analysis of forty-five (45) minutes. The analysis was run utilizing ESRI Business Analyst software from PR-10 termini at Highway 2, the southern termini of the northern segment where it intercepts the norther termini of the proposed PR-10 project, the northern termini of the southern segment where it intercepts the southern termini of the proposed PR-10 project and the PR-10 termini at PR-2 east of Ponce.

Figure 2. Map of PR-10 Project Area of Impact

Impacts to the Population

The population that resides within this area are considered primary beneficiaries according to HUD methodology, but residents with a home outside this area also stand to benefit from the cascading benefits of the interconnected lifelines associated with this activity.

1. As a transportation network it represents an interface between the industrial centers of the PR-2 North Corridor (Arecibo – Aguadilla) and the PR-52 South Corridor (Ponce – Salinas) providing north-south connection to promote the industrial development of both centers and of the adjacent municipalities.
2. PR-10 will become a catalyst to ignite the industrial development of Puerto Rico as an important support element for the Port of Las America (Port of Ponce) and Mercedita International airport in Ponce.
3. Will expedite a faster recovery of damaged utilities and distribution of food, medicines, and other emergency services after a natural event.
4. Will provide an effective ground route for ingress/egress of emergency and healthcare paramedics that will avoid loss of lives during a natural disaster event.

5. Will reduce the loss of hundreds of millions in economic activity in the region during and after a natural disaster.
6. Reduce frequency of vehicular accidents (property damage, injuries, fatalities).
7. Will improve quality of life:
    - Access of health services during an event
    - Maintain the chain of food and services supply
    - Access work during and event
    - Reduces mental stress – (Social Benefits)
    - Reduce environmental pollutants as a result of less miles traveled of motor vehicles.

Acquisition

The project considers the acquisition of seventy-five (75) properties and empty parcels. These properties are located along the upstream side of the proposed highway and presently lack a sanitary sewer system. This lack of formal infrastructure results in contamination of the river (Río Grande de Arecibo), especially during heavy rainfall. Although they use individual septic tanks as sanitary facilities, the topographic conditions of the area may contribute to leakage or flooding of these tanks at any rainfall intensity that may affect the Río Grande de Arecibo.

Acquisitions for sections II, III, and V have already been completed in compliance with the Uniform Relocation Act (**URA**). Additional acquisition activities shall adhere to URA requirements under URA as well as HUD guidance.

Resilient or Mitigative Design Elements

All highway projects with either local or Federal funds must comply with Federal regulations for Highway and Bridge construction. The normative and standards that will dictate the design and construction of PR-10 are as follows:

Normative/Standard	Design/Construction Application
2018 AASHTO Design Manual (Green Book)	Geometric Design of Highways and Streets
PRHTA Design Manual	Application of local Highway standards (Typical sections, Drainage Design Specifications, and local roadways elements)
2017 LFRD AASHTO Bridge Manual	AASHTO LFRD Bridge Design Specification (8th Edition, 2017)
AASHTO Material & Testing	AASHTO Material Standards & Testing (2019 Edition)
MUTCD 2009	2009 Manual on Uniform Traffic Control Devices (Signs, Traffic Signals, Guardrails, Barriers, Construction Signing)
2011 Highway Lighting Design Manual	Design and Installation of Highway Lighting Standards
PRPB Regulation No. 13	PR Hydrologic and Hydraulic Analysis Guide

II. Consistency with Mitigation Needs Assessment

Based on extensive analysis of hazards, risks, and lifeline assets in Puerto Rico, PRDOH has determined that critical lifelines are those upon which other lifelines depend. These include sectors within Energy, Transportation, Communications, and Food, Water, and Shelter. For example, access to both food and healthcare depend on the roads being passable; and no lifeline can be operable without energy and communication. According to FEMA, "[e]fforts to protect lifelines, prevent and mitigate potential impacts to them, and building back stronger and smarter during recovery will drive overall resilience. Increasing and improving resilience in Puerto Rico through mitigation efforts depends upon the immediate stabilization of lifelines and fortification of assets."

III. Analysis of Transportation Lifeline Mitigation

Resilient Corridors for Circulation and Supply Chain Continuity

PRDOH recognizes that within the main mode of transportation for the Island – the road network – there exist critical corridors that connect communities in Puerto Rico to critical ingress/egress routes and necessary supply chain circulation. These corridors are Puerto Ricans' main connection to their work, food, healthcare, community, and the ports and airports. They are the routes by which supplies are moved around the Island, including food, fuel, and medicine. Though many main highways in the primary road system were intact following the hurricanes, many internal roads of the secondary and especially the municipally owned tertiary systems were closed, limiting citizens' access to everything from fresh drinking water to medical assistance.

An extreme event, such as the 2017 Hurricanes Irma and María, can disrupt a supply chain in three (3) primary ways: [2]

1. ***Demand shift*:** A hurricane can distort demand patterns before and after the storm. Demand for gasoline, generators, batteries, and food items often spikes before a hurricane, while demand for bottled water, chainsaws, garbage cans, tarps, and other recovery supplies are usually elevated afterward. Resident efforts to secure such resources can overwhelm or even create bottlenecks, even if only some parts of the supply chain are disrupted by the storm.
2. ***Capacity reduction*:** Examples of capacity reductions that occur in the wake of a hurricane include a production or transportation process that is limited by lack of plant, power, or people: a factory (plant) unable to produce due to physical damage, a retail outlet unable to store perishable products due to lack of electricity (power), trucks unable to deliver goods for lack of drivers (people). Each of these instances was a factor following the 2017 hurricanes in Puerto Rico.
3. ***Communication disruption*:** A hurricane can interrupt the normal channels by which information is communicated up the supply chain. For example, normal operations of a supply chain can be impeded by power or cell phone outages, broadband interruptions, point-of-sale system failures, and absence of key individuals. Furthermore, the exceptional relief supply chains established to deliver essential products in the wake of a hurricane lack the sophisticated communication systems utilized in many commercial supply chains, and therefore, struggle to match supplies with demand.

[2] The National Academies of Sciences, Engineering, and Medicine. *Strengthening Post-hurricane Supply Chain Resilience, Observations from Hurricanes Harvey, Irma and Maria*, Page 21. 2020. Accessed at: https://www.nap.edu/read/25490/chapter/4#21

Investing in Resilient Corridors

This project furthers the PRDOH assertion that CDBG-MIT funding should prioritize mitigation of risk to key Lifeline assets that when stabilized in a disaster event, contribute to the Island's resilience. Transportation assets, including points of entry at airports and seaports and connecting road networks, are essential for movement of people and goods throughout Puerto Rico before, during, and after a disaster event. The map on Figure 3 shows the Freeways (freeway and/or expressway), primary roadways (interstate and primary arterials), secondary roadways, and tertiary roadways in Puerto Rico. These roadways are responsible for the movement of the majority of the population in Puerto Rico as well as freight on a daily basis. The secondary, tertiary, and municipal (not shown) roadways provide access to neighborhoods, residences, and community assets.

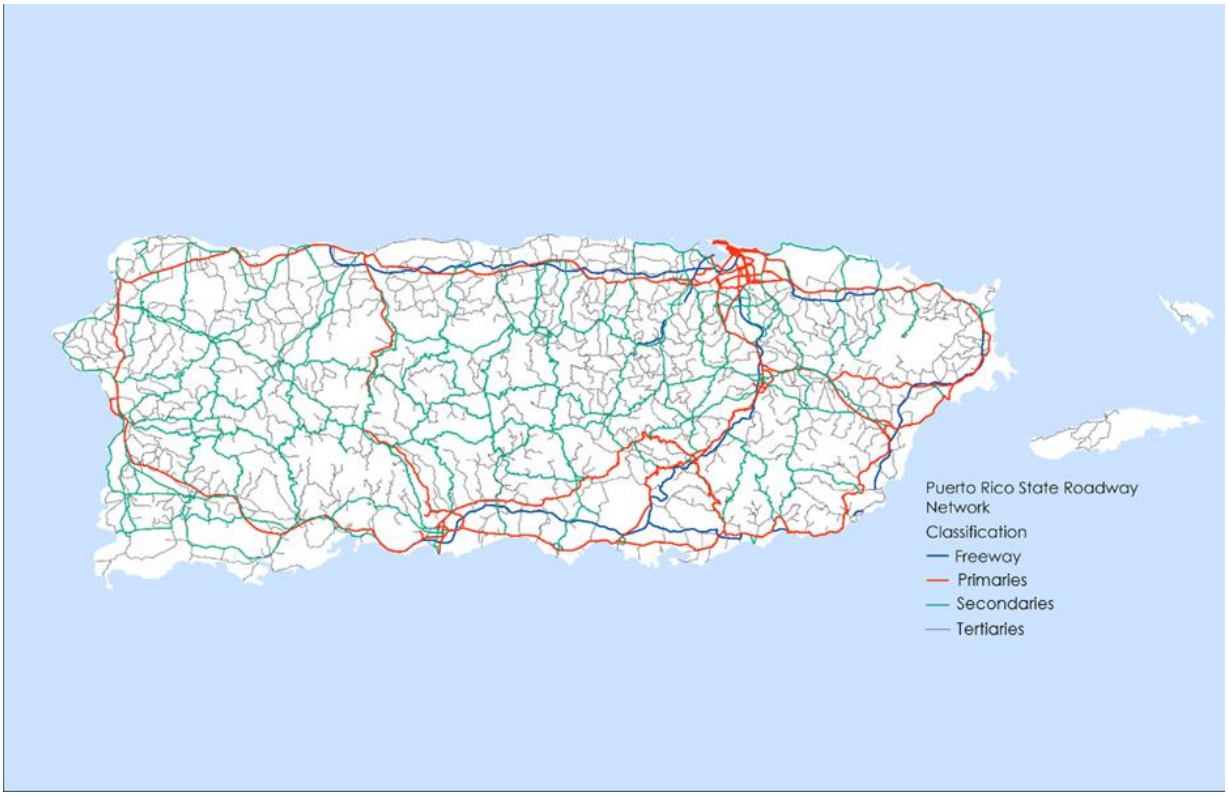

Figure 3. Puerto Rico State Roadway Network

The Puerto Rico Department of Transportation and Public Works (**DTPW**) completed an assessment of the roadway network on October 24, 2017. The map in Figure 4 shows the status of the roadways, excluding tertiary and municipal, assessed as part of that DTPW assessment.

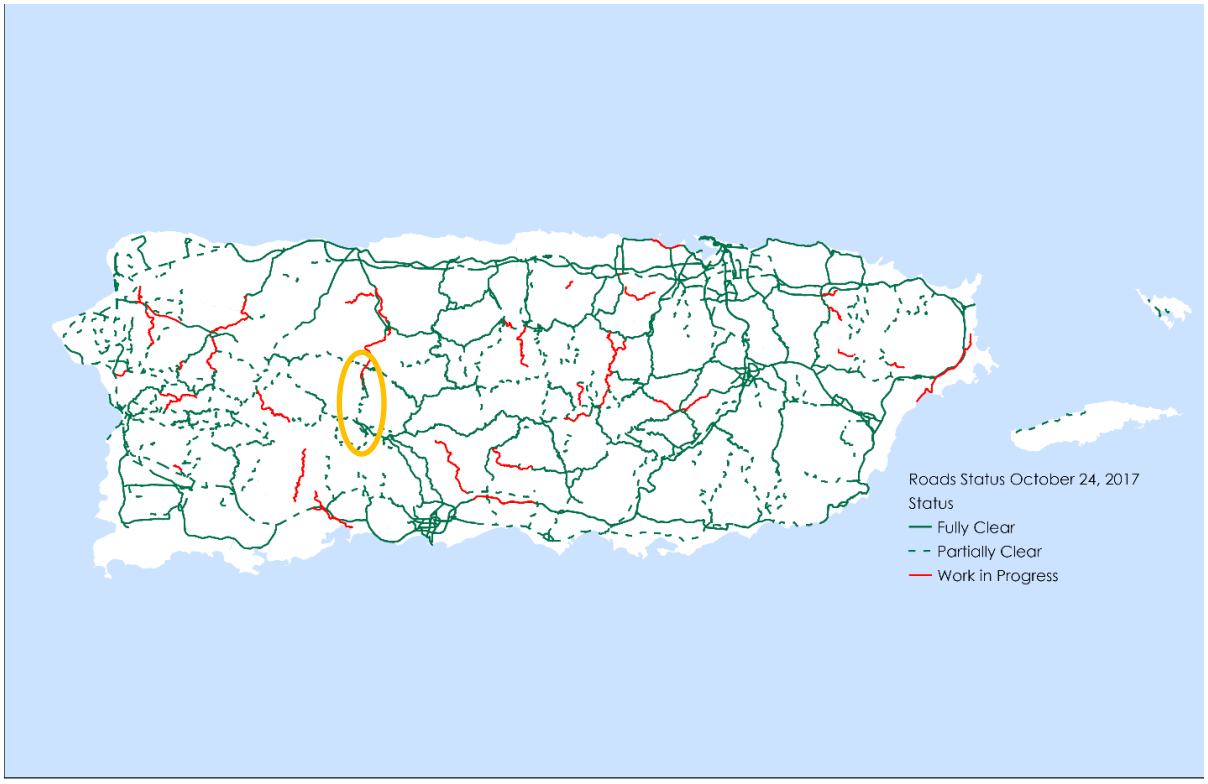

Figure 4. Puerto Rico Freeway, Primary, and Secondary Roadway Status (DR-4336 and DR-4339 - October 24, 2017 Assessment)

The DTPW assessment determined that, just over a month after the 2017 hurricanes, approximately ninety-six percent (96%) of the freeway system was fully clear and functioning at full capacity. Just under sixty-four percent (64%) of the Primary and Secondary Roadways were open and functioning at full capacity and none of the Tertiary Roadways were fully open and/or functioning at full capacity. The table below shows the roadway status, 2,393 km of roadway fully clear, 2,088 km of roadway partially clear, 330 km of roadway with work in progress, 8,295 km totals, and percent of roadway open.

Status of Primary, Secondary, and Tertiary Routes (DR-4336 and DR-4339 - October 24, 2017, Assessment)					
Roadway Class	**Fully Clear (km)**	**Partially Clear (km)**	**Work in Progress (km)**	**Total (km)**	**Percent Fully Functional (%)**
Freeway	557.01		25.66	582.68	**95.60%**
Primary Route	740.95	389.59	27.98	1,158.52	**63.96%**
Secondary Route	1,095.14	515.88	102.21	1,713.23	**63.92%**
Tertiary Route		793.98	174.15	4,840.93	**0%**

The DTPW assessment identifies a very high level of resilience for the Freeway network and moderate resilience for the Primary and Secondary roadways. Approximately seventy percent (70%) of the population of Puerto Rico reside within five (5) miles of a resilient freeway. However, tertiary roadways are highly susceptible to damage from hurricane events. The remaining thirty percent (30%) of the population in Puerto Rico do not have sufficient access to a resilient roadway. Many of these people were trapped because roads had been washed out or buried under landslides. Without access to food, water, fuel, or help and without power or communication systems working their circumstances were desperate. The map in Figure 5 shows populations with a density greater than 500 people every one-half mile and their proximity to the freeway network.

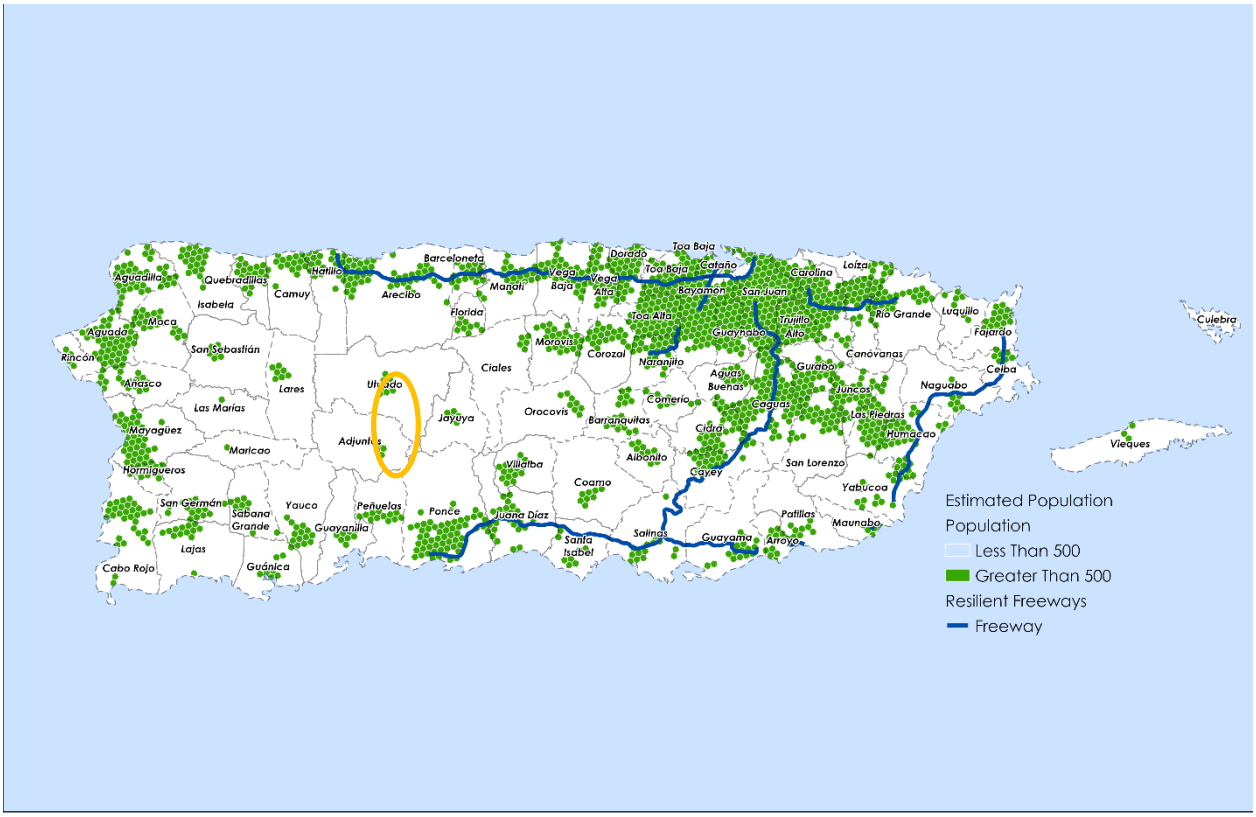

Figure 5. Puerto Rico Population Proximal to Resilient Freeways

Prioritization of CDBG-MIT Funding to Develop a More Extensive Resilient Roadway Network

The Resilient Freeways and Expressways table on the following page identifies the Freeways and expressways in Puerto Rico. These roadways proved resilient after the 2017 hurricanes. These roadways also serve approximately seventy percent (70%) of Puerto Rico's population. The freeways in Puerto Rico proved very resilient, approximately ninety-six percent (96%) opened one (1) month after the 2017 hurricanes. Because these roadways serve seventy (70%) of the population, CDBG-MIT dollars that harden, make more resilient, or mitigate risk to the segments within these roadway systems that did not withstand recent hazards, will mitigate risk for the majority of Puerto Rico's population.

Resilient Freeways and Expressways		
PR-5	PR-52	PR-54
PR-22	PR-53	PR-66

Figure 6 shows the existing PR-123 route and the proposed PR-10 project section adjacent to Highway 123. The segment of PR-123 was identified as partially clear in October of 2017 making ingress/egress in that region difficult. Construction of the proposed PR-10 project will address that failure and provide a resilient corridor connecting the northern region of Puerto Rico to the south.

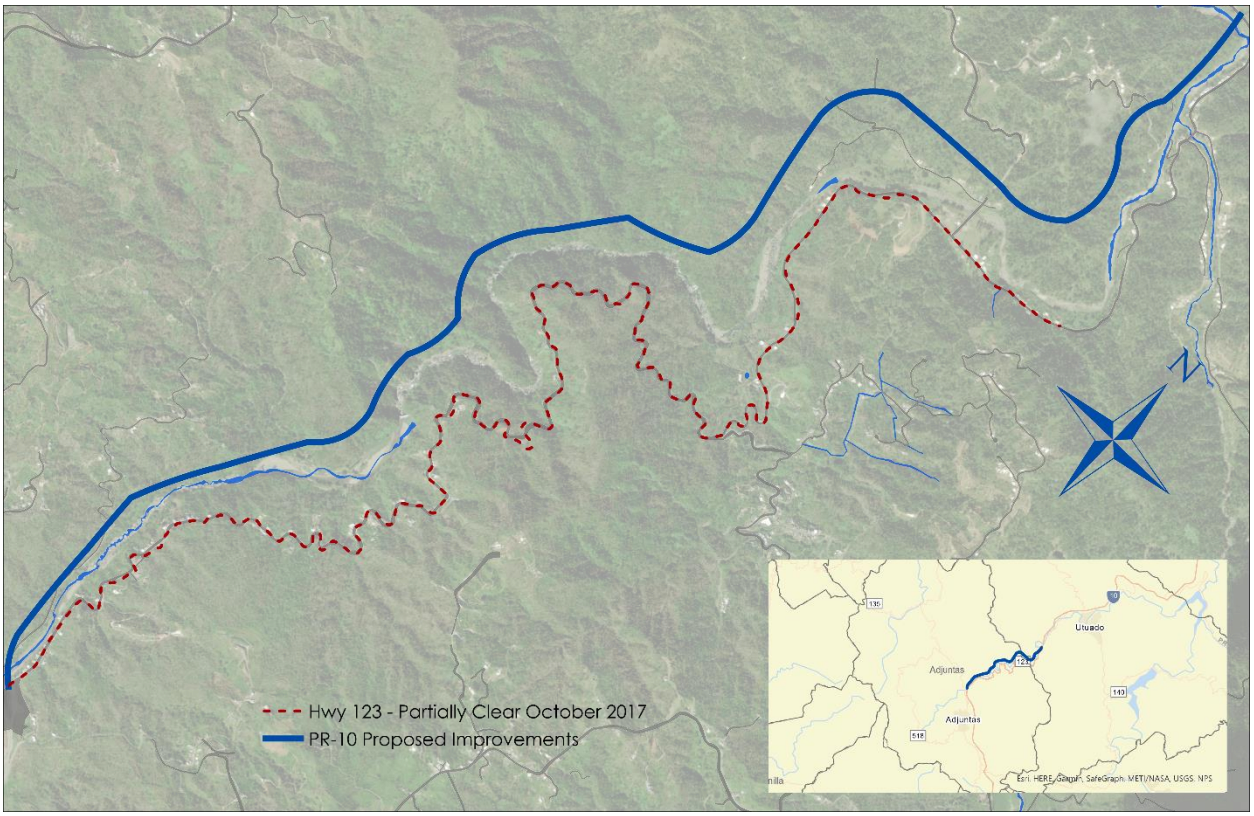

Figure 6. Failure of Highway 123 and the Proposed PR-10 Project Segment

IV. Compliance with National Objective for Covered Projects

The highway PR-10 was conceived as the most important link between the north and south economic centers of the Island. This route, once completed, will be a catalyst for the industrial development in both poles. The Port of Las Américas in Ponce has been dormant since its construction due to the lack of an effective ground connection with the north and center municipalities. Also, the international airport of Mercedita in Ponce has not been used at its capacity. People from the south, north, and center municipalities travel to San Juan international airport instead of using Mercedita Airport due to extended travel times.

PR-10 will become the main feeder of users to these facilities and industries at north and south of the Island. The central municipalities will benefit from this new road through increased opportunities for tourism and better access to the agricultural markets.

The following Area of Benefit (**AOB**) determination is preliminary in nature and is based on current state of project design, benefit cost analysis and other studies. The determined AOB may change upon completion of design and other studies.

The proposed PR-10 project will directly serve the adjacent residential areas within the Utuado and Adjuntas municipalities; however, because PR-10 is one (1) of the three (3) major north-south ingress/egress corridors utilized to transport persons, emergency services, and essential supplies and materials before, during, and after major storm, landslides, earthquakes or other damage inducing or life threatening events, the indirect area of benefit extends further to the north, south, east and west.

Figure 7 identifies the estimated AOB for the proposed PR-10 project. The AOB is based on the estimated Area of Impact determined by drive time the drive time analysis described above. Census Tracts served by the project are identified on the left and municipalities assumed to receive benefit are identified on the right.

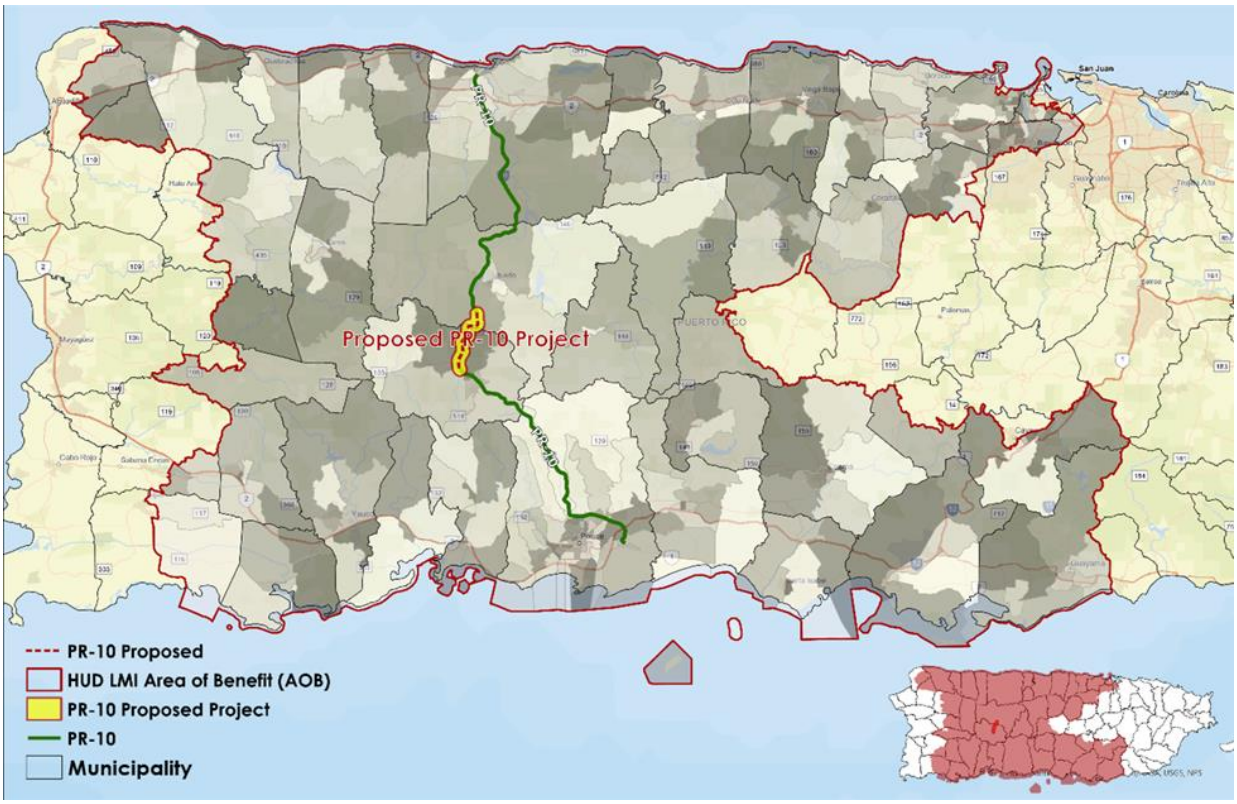

Figure 7. Census Tracts and Municipalities Receiving Benefit from the Proposed PR-10 Project

The next table identifies the total number of beneficiaries, total number of Low- and Moderate-Income (LMI) beneficiaries and the percentage of LMI beneficiaries served by the proposed PR-10 project.

Total Persons, Total LMI Persons, and Percentage of LMI Persons Served *		
Total Persons	Total LMI	Percentage LMI
1,339,276	1,077,416	80.45%

**Source: HUD Adjusted LMI Census Tract data set*

See the PR-10 Adjusted LMI Beneficiaries and Race Gender Ethnicity Table in Appendix I for a detailed list of all census tracts served and income, population, and race, gender, and ethnicity demographics.

Long-term efficacy and sustainability of the project

The PRHTA will implement a plan to monitor and document the planning, implementation, and achievement of key milestones in the delivery of the PR-10 project. This plan will establish the evaluation methodology that will be implemented upon completion and used to establish the level of efficiency of the mitigation activities.

As a division of the DTPW, the PRHTA will develop a plan for the Operations and Maintenance (**O&M**) of the proposed segments of the PR-10 project throughout its useful life. PRHTA and DTPW are the two (2) Puerto Rico Central Government Agencies that have the primary responsibility to design and implement the operation and maintenance of freeways and primary roads in Puerto Rico. These entities have processes in place for managing the short- and long-term operation and maintenance of the roadway network in Puerto Rico. PRHTA Transportation Asset Management Plan (TAMP) for the National Highway System (NHS) for pavements and bridges for the years 2019 to 2028 details current asset management[3].

During the design phase of the project, a detailed O&M Plan will be developed as follows:

a. Require a draft O&M plan as part of the sixty percent (60%) design submittal and review process.
b. Require final O&M plan as part of the ninety percent (90%) Final Design submittal and review process.

The O&M Plan to be developed shall include:

1) Schedules and projections of O&M tasks, staffing, and estimated costs for the useful life of the project.
2) How O&M for CDBG-MIT project is anticipated to be funded and resourced including borrowing authority, retargeting of existing financial resources, proposed changes to tax policy or practices that would be required, or any State or local resources identified to pay for or provide O&M costs.
3) Signed Commitment of Responsible Entity/Entities towards funding and carrying out required O&M, including any MOUs, Service, or other agreements, as necessary, when multiple parties are involved.
4) Infrastructure Maintenance
    a. Short Term Maintenance
    b. Long Term Maintenance
5) Site Management

[3] PRHTA Transportation Asset Management Plan (TAMP) for the years 2019 to 2028 can be found online here: https://act.dtop.pr.gov/wp-content/uploads/2019/10/2028-PRTAMP-Final-Revised-Document-8-Oct-20191.pdf.https://act.dtop.pr.gov/wp-content/uploads/2019/10/2028-PRTAMP-Final-Revised-Document-8-Oct-20191.pdf

a. Roles and Responsibilities
b. Hours of Operation
c. Staffing
d. Security
e. Visitation
f. Communication Plan

At the current stage of development of the project PRHTA has established:

1) That the long-term funding for O&M of the PR-10 project will be included into the operating and capital budgets of the PRHTA and DTPW as a standard asset. Funding will be provided by annual budget assignments from the Central Government.

2) PRHTA will expand the maintenance program of the DTPW to include the new segments of the PR-10 as had been done with the previous sections completed.

3) Legal agreements with the Municipalities of Utuado and Adjuntas will be negotiated to maintain the vegetation and erosion control and cleaning of the water courses and drainage outlets. This strategy has already been implemented in the sections of the PR-10 that are currently in use.

During the planning and design phases of the project, O&M has been estimated on an annual basis based on current conditions.[4] This estimate is incorporated in the BCA analysis provided in the Demonstration of Benefit section. Development and maintenance of the O&M plan will be monitored by PRDOH in accordance with HUD requirements and industry standards.

Year	Maintenance Personnel	Equipment	Materials	Total O&M Cost	7% Discount O&M Cost
Y1	$286,000.00	$28,420.00	$60,000.00	$374,420.00	$305,638.25
Y2	$286,000.00	$28,420.00	$60,000.00	$374,420.00	$285,643.23
Y3	$286,000.00	$28,420.00	$60,000.00	$374,420.00	$266,956.29
Y4	$286,000.00	$28,420.00	$60,000.00	$374,420.00	$249,491.86
Y5	$286,000.00	$28,420.00	$60,000.00	$374,420.00	$233,169.96
Y6	$286,000.00	$28,420.00	$60,000.00	$374,420.00	$217,915.85
Y7	$286,000.00	$28,420.00	$60,000.00	$374,420.00	$203,659.67
Y8	$286,000.00	$28,420.00	$60,000.00	$374,420.00	$190,336.14
Y9	$286,000.00	$28,420.00	$60,000.00	$374,420.00	$177,884.24
Y10	$286,000.00	$28,420.00	$60,000.00	$374,420.00	$166,246.96
Y11	$286,000.00	$28,420.00	$60,000.00	$374,420.00	$155,370.99
Y12	$286,000.00	$28,420.00	$60,000.00	$374,420.00	$145,206.53
Y13	$286,000.00	$28,420.00	$60,000.00	$374,420.00	$135,707.04

[4] The USDOT methodology requires that all dollars be adjusted to a single base year. Maintenance costs are estimated to begin in 2025; costs for the second and third periods have been inflation adjust to the first period annual values.

Year	Maintenance Personnel	Equipment	Materials	Total O&M Cost	7% Discount O&M Cost
Y14	$286,000.00	$28,420.00	$60,000.00	$374,420.00	$126,829.01
Y15	$286,000.00	$28,420.00	$60,000.00	$374,420.00	$118,531.78
Y16	$286,000.00	$28,420.00	$60,000.00	$374,420.00	$110,777.37
Y17	$286,000.00	$28,420.00	$60,000.00	$374,420.00	$103,530.25
Y18	$286,000.00	$28,420.00	$60,000.00	$374,420.00	$96,757.24
Y19	$286,000.00	$28,420.00	$60,000.00	$374,420.00	$90,427.33
Y20	$286,000.00	$28,420.00	$60,000.00	$374,420.00	$84,511.52
Total	**$5,720,000.00**	**$568,400.00**	**$1,200,000.00**	**$7,488,400.00**	**$3,464,597.51**

Changing environmental conditions such as climate sensitive events, more frequent and severe weather events, and localized hazardous events, will be addressed by incorporating risk assessment activities into the O&M plan for the project. Risk assessment for changing climatically conditions will allow:

1) Identification of the Risks related to changing environment. For example, change in frequency of occurrence of natural hazards.
2) Assessment of Consequences. Assess the consequences of the natural hazard events resulting in disaster.
3) Assess the probability. Establish the probability of a specific event occurring.
4) Risk Characterization. Ranking of risk according to severity and potential consequences.

The O&M Plan will be amended and updated according to the results of the risk assessment.

Demonstration of Benefit to Most Impacted and Distressed Area[5]

BCA Methodology

The PR-10 project's benefit cost analysis (BCA) has been completed for the request of HUD CDBG-Mitigation funds. No other federal agency has reviewed or rejected the prepared BCA.

Employment of USDOT BCA Methodology to address a non-correctable flaw in the FEMA BCA Methodology

Under HUD Guidelines, benefit-cost analyses for Covered Projects may employ the FEMA standardized methodology unless one (1) or more of the following conditions is met:

1. A BCA has already been completed or is in progress pursuant to BCA guidelines issued by other Federal agencies such as the Army Corps or the Department of Transportation;
2. It addresses a non-correctable flaw in the FEMA-approved BCA methodology; or
3. It proposes a new approach that is unavailable using the FEMA BCA Toolkit.

[5] See 84 FR 35838, section II. C. Most Impacted and Distressed Areas. The entire Island of Puerto Rico is considered most impacted and distressed area.

The FEMA-approved methodology and Toolkit have been developed geared toward analyzing major natural hazards such as earthquakes, fires, floods, hurricane winds, and tornados. However, due to the substantial cost of the PR-10 project, the following are non-correctable flaws in the FEMA BCA Methodology that should be addressed by applying other methodology:

1. The FEMA BCA Methodology only considers hazard mitigation, so it does not adequately assess the benefit-cost ratio (**BCR**) of such an asset. *The FEMA BCA method currently only addresses the following categories of project benefits as part of the BCA:*
   - *direct benefits related to avoided physical damages, avoided service losses, and avoided emergency management costs;*
   - *some limited indirect benefits related to avoided casualties occurring as a direct result of the hazard;*
   - *limited social benefits related exclusively to projects that directly protect occupants of residential buildings from flooding;*
   - *limited ecosystem service benefit, such as environmental benefits only applicable to projects that purchase or preserve open space.*
2. The only quantifiable benefit associated with transportation projects that can be considered when implementing the FEMA-approved methodology and Toolkit is Travel Time Savings.
3. Although it includes software tools that are ideal for estimating project benefits associated with individual building retrofits or utility facility improvements, those tools are often inadequate to address larger facilities such as highways that can extend for miles. That means that it does not work well for highway projects where the recurrence interval of a single hazard event can vary significantly by one's location along the highway.
   - It does not analyze the multiple and wide-spreading benefits of a highway project like the PR-10 to the LMI population within the project's Area of Benefit, as mentioned below.

As explained, one of the crucial limitations of the FEMA BCA methodology, as it applies to the PR-10 project, is the exclusion of benefits that are generated outside of hazardous events but support the everyday stability of interconnected lifelines. While mitigation and resiliency measured in the BCA Methodology are the driving factors for the proposed project, the daily transportation benefits for this major highway project are also essential to demonstrate cost-effectiveness. In addition, the PR-10 Highway project provides the following additional benefits for the LMI population and the public in general within the Area of Benefit that are not quantified by the FEMA Methodology:

1. Vehicle Operating Costs estimated in $111.2 million discounted benefits over a period of thirty (30) years.
2. Accident Cost Savings that will result from improved roadway safety for passenger cars and trucks. The estimated cost savings is $157.6 million in discounted benefits over a period of thirty (30) years.
3. Emissions Cost Savings estimated in $8.6 million discounted benefits over a period of 30 years.
4. The use of the USDOT methodology provides the opportunity to be able to compare all project benefits with all project costs.
5. The USDOT Methodology also addresses several key benefits that are excluded from the BCA Methodology, such as the avoided casualties associated with reduced traffic accidents and environmental benefits associated with traffic moving more efficiently and reduced vehicle emissions.

The fact that FEMA Guidelines exclude all other quantifiable daily transportation benefits provided to the LMI population within the project's Area of Benefit (**AOB**) constitutes a non-correctable flaw in the FEMA Methodology. As a result, PRDOH proposes to use an alternative approach pursuant to condition number 2 (non-correctable flaw in the FEMA-approved BCA methodology) for the development of the BCA for the proposed PR-10 highway project. USDOT publishes their own annual Benefit-Cost Analysis Guidance to provide some standardized methodologies, monetary values, and general guidelines for their discretionary grant programs. The basic principles of the USDOT BCA methodology are the same as other federal agencies, including the FEMA methodology, and are consistent with OMB Circular A-94. Using the USDOT BCA Guidance it captures accurately the total benefits of a transportation project and provides more flexibility for considering the unique characteristics of the PR-10 project. A BCA pursuant to USDOT guidelines is a required element of all major discretionary grant applications for funding opportunities issued by USDOT. Thus, PRDOH will adopt the USDOT methodology from the PRHTA for this specific project, together with a supporting analysis of hazard mitigation.

USDOT Methodology Overview for PR-10

For this analysis, our methodologies were determined by recommendations made in the 2022 USDOT Benefit Cost Analysis (BCA) for Discretionary Grants Guidance.[6] This USDOT document dictates that any methodology used should show benefits and costs as quantifiable data. The guidelines also indicate that data should be as localized and current as possible, and national or state level data should only be used whenever specific localized data is not available. Whenever methods or data from other sources are used, the source of the method or data is cited and detailed within this narrative. Links to methods and data available online are contained as footnotes, and datasets, reports, or other data sources used are included as supplemental documents with the grant application. Both costs and benefits have been inflation-adjusted to 2020 dollars. All benefits and costs in this analysis are calculated using the yearly compounding discount rate of seven percent (7%), aside from carbon dioxide ($CO_{2)}$ which is discounted by three percent (3%) as recommended by the most recent USDOT BCA Guidance.

Factors considered in the BCA

No Build Scenario

PR-10 is a principal arterial that connects Arecibo in the north and Ponce in the south, passing through the municipalities of Adjuntas and Utuado. The existing PR-10 north segment begins in the interchange with PR-2 and ends in the intersection of PR-123 over the Río Grande de Arecibo River at km 37.70. The PR-10 south segment begins in the PR-9 interchange and ends in the intersection with PR-123 at km 23.26. In its current state, it is a freeway only in the completed portions. The PR-123 is classified as a minor arterial with typical collector characteristics as it provides various direct access points for residential purposes. This 27.5-mile (44.26 km) segment of PR-123 currently offers one (1) lane per direction with mountainous terrain and capacity restrictions as a result of landslides from Hurricane María.

Our "no build" baseline scenario represents the expected outcomes if no changes are made to existing conditions. For the purposes of this analysis, this is represented by three (3) key underlying factors. The first is the added travel time and distance experienced by existing users of the PR-10 corridor that currently travel along PR-123 for sections where PR-10 is not complete. The second is the increased risk of traffic accidents on PR-123 due to its alignment and surface conditions compared to the expected risk for the PR-10 connector. The third crucial factor is directly related

[6] https://www.transportation.gov/sites/dot.gov/files/2022-03/Benefit%20Cost%20Analysis%20Guidance%202022%20%28Revised%29.pdf

to hazard risks associated with the lack of connectivity on PR-10 and the reliance on PR-123 as a major thoroughfare in the region.

Build Scenario

The proposed connector of the PR-10 is 7.6 km long and includes two (2) lanes in the southbound direction and one (1) lane in the northbound direction. The speed limit is thirty-five (35) mph due to the topography and terrain type, whereas the typical highway speed limit is sixty to sixty-five (60 – 65) mph. The new connector will not be tolled and is expected to open in 2027. Benefits generated from this project fall into the following categories:

1. Mitigation of negative impacts caused by natural disasters and resulting roadway closures including delay for response teams and loss of crucial access to goods and services.
2. Time and Distance Saved from the shorter, more efficient route.
3. Decreased risk of crashes from safer roadway alignment and modern design standards.

Key variables for this analysis include modeled traffic counts and travel times, which were sourced from traffic analysis and demand modeling performed in 2019. Modeled daily traffic counts for the existing segments of PR-10 and the future traffic counts for the added segments are shown in the table below. The map of the proposed corridor can be found in Figure 8.

Table: PR-10 Daily Volume

Year	Direction	Existing Segment	Segment 1-2	Segment 3-4
2019	NB	2,349	-	-
2019	SB	1,834	-	-
2019	**2-way**	**4,183**	**-**	**-**
2025	NB	2,479	1,436	1,946
2025	SB	1,951	1,363	1,862
2025	**2-way**	**4,430**	**2,799**	**3,808**
2045	NB	2,914	1,796	2,335
2045	SB	2,341	1,760	2,299
2045	**2-way**	**5,254**	**3,556**	**4,633**

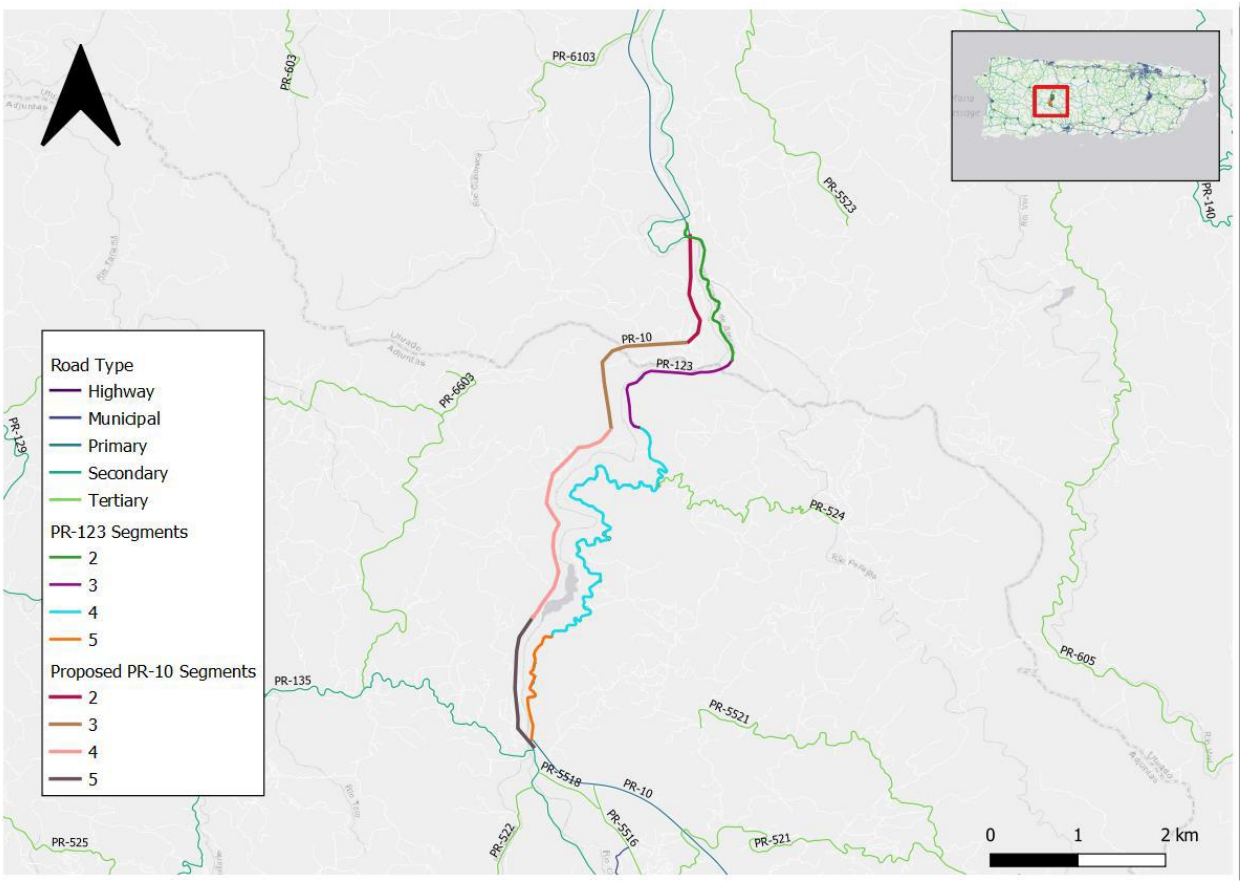

Figure 8. Map of proposed PR-10 corridor

Project Benefits from Hazard Mitigation

Critical Lifelines or Critical Infrastructure hazard mitigation projects directly reduce the risk of physical damage and service losses to the infrastructure as well as nearby structures and utilities from (1) one or more hazards addressed by the project. Additionally, these hazard mitigation projects can indirectly reduce risk to other assets and infrastructure from multiple hazards through the interdependent nature of those assets. This interdependency, in turn, mitigates risk from human or natural hazards for persons and critical or secondary infrastructure in the area of impact. The table *Hazard Risks Mitigated by PR-10 Project and Justification* describes the risks identified in the Puerto Rico CDBG-MIT Action Plan and provides a justification for the mitigation of risk.

Hazard Risks Mitigated by PR-10 Project and Justification			
Hazard Risk	**Project Directly Mitigates Hazard Risk**	**Project Indirectly Mitigates Hazard Risk**	**Justification**
• Landslide • Flood • Earthquake • Severe Storm • Wind • Hurricane Force Winds • Wildfire • Liquefaction	Yes	Yes	Project is expected to directly reduce a hazard-related damages and service losses along PR-10 and will provide enhanced ingress/egress for evacuating populations or enhanced ingress/egress for emergency response and recovery efforts. During and after the event, the enhanced roadway ingress/egress will also allow for more rapid repair and asset recovery efforts.
• Tsunami • Drought • Fog • Hail • High Temperature • Lightning • Tornado • Human Hazard • Storm Surge • Sea Level Rise	No	Yes	Project appears unlikely to directly impact hazard-related damages or service loss. However, PR-10 will provide expedited evacuation of vulnerable populations and provide ingress/egress for emergency response personnel and recovery efforts. During and after the event, the enhanced roadway ingress/egress will also allow for more rapid repair and asset recovery efforts.

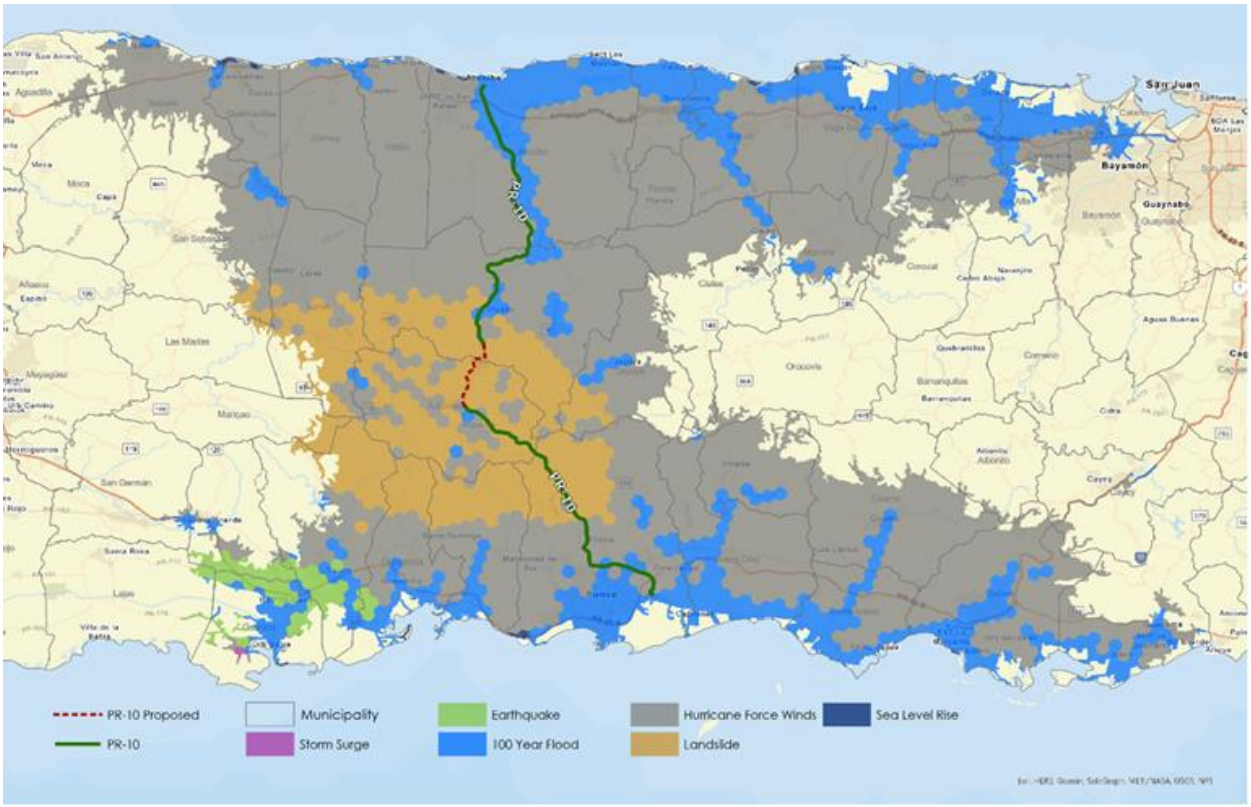

Figure 9. Depiction of highest risk per half-mile hex grid

Landslide presents the highest risk for the area immediately surrounding the current PR-123 route as well as the PR-10 project route. Residents within the area of benefit, however, face the high risk of hurricane force winds, flood, landslide, earthquake, sea level rise, and storm surge. These events have a history of causing significant structural damage to homes, roads, power grid, telecommunications, water service lines and other critical infrastructure. Strengthening this main thoroughfare with a completed resilient highway will permit the rapid flow of response and site repair efforts that are critical to bringing essential services back online.

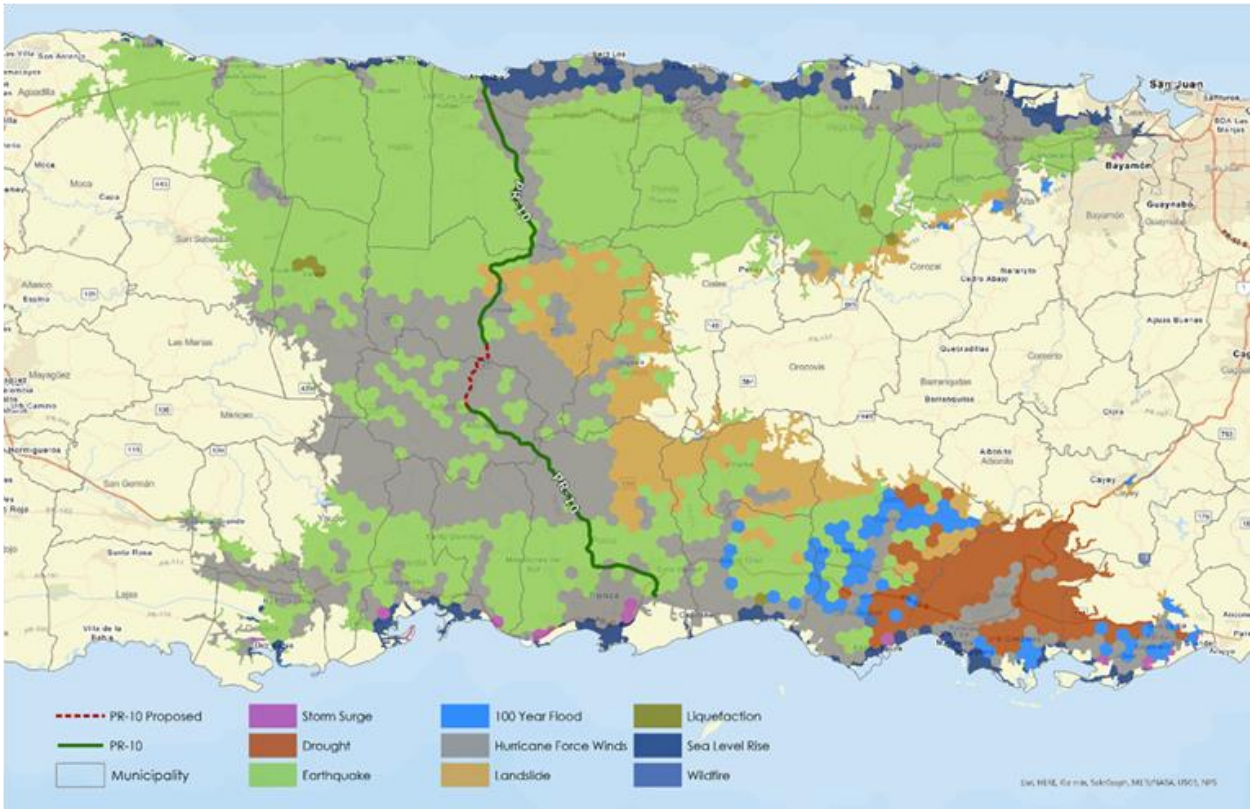

Figure 10. Depiction of second highest risk per half-mile hex grid

As shown in 10, when evaluating the second highest risk per half-mile hex grid, we see the list of hazards expand to include liquefaction, drought, and wildfire. This increased understanding of the varied risks by geographic specification further reinforces the need for a reliable transportation lifeline that connects the central and northwestern to southwestern portions of the Island.

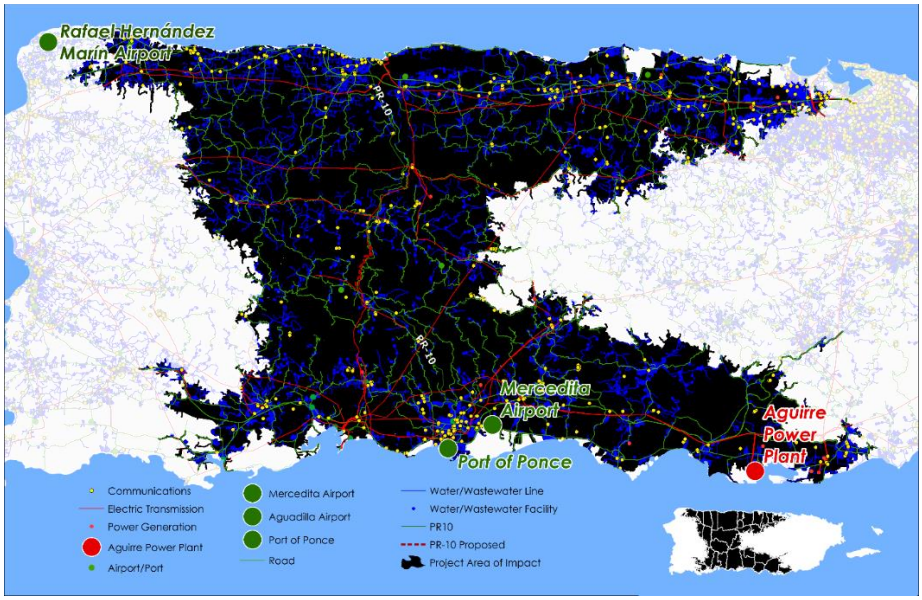

Figure 11. Critical Infrastructure within Area of Impact

Figure 11 identifies key critical infrastructure assets within the area of impact and displays the major communications, electric transmission and generation, airports, ports, roads, and water and wastewater lines and/or facilities. Disruptions caused by a hazard event can lead to cascading failures of other dependent critical or secondary lifeline infrastructure. Identified in the southeastern portion of the area of impact is the Aguirre Power Generation Facility, which is the Island's largest power generation facility. If that facility is disrupted during an event, the potential for loss of power throughout all of Puerto Rico is high. By providing enhanced ingress/egress in the region through the construction of the proposed PR-10 project, the distribution of key personnel or materials to repair that facility will allow for more rapid recovery post event.

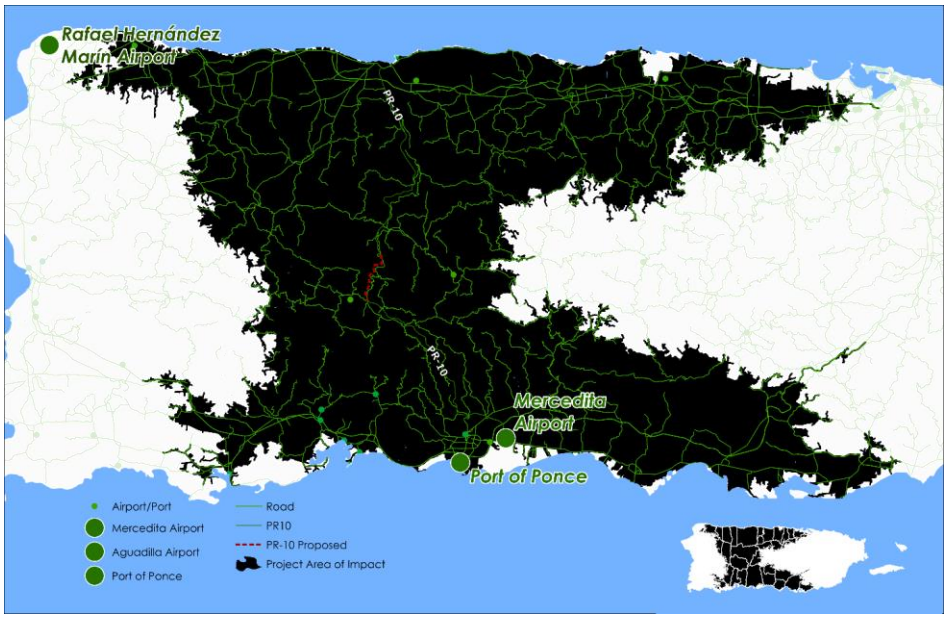

Figure 12. Transportation lifeine facilities and roadways within the area of benefit

There are 18,117 Km of linear roadway located within the area of benefit, as shown in Figure 12. The connectivity of a resilient roadway from north to south reduces the travel time required for service personnel to respond promptly during a disruption. As also noted in this report, the connectivity of the Port of Ponce and Mercedita Airport in Ponce provides for reliable access to critical supply route entryways outside of primary entry at the Port of San Juan and Luis Muñoz Marín International Airport.

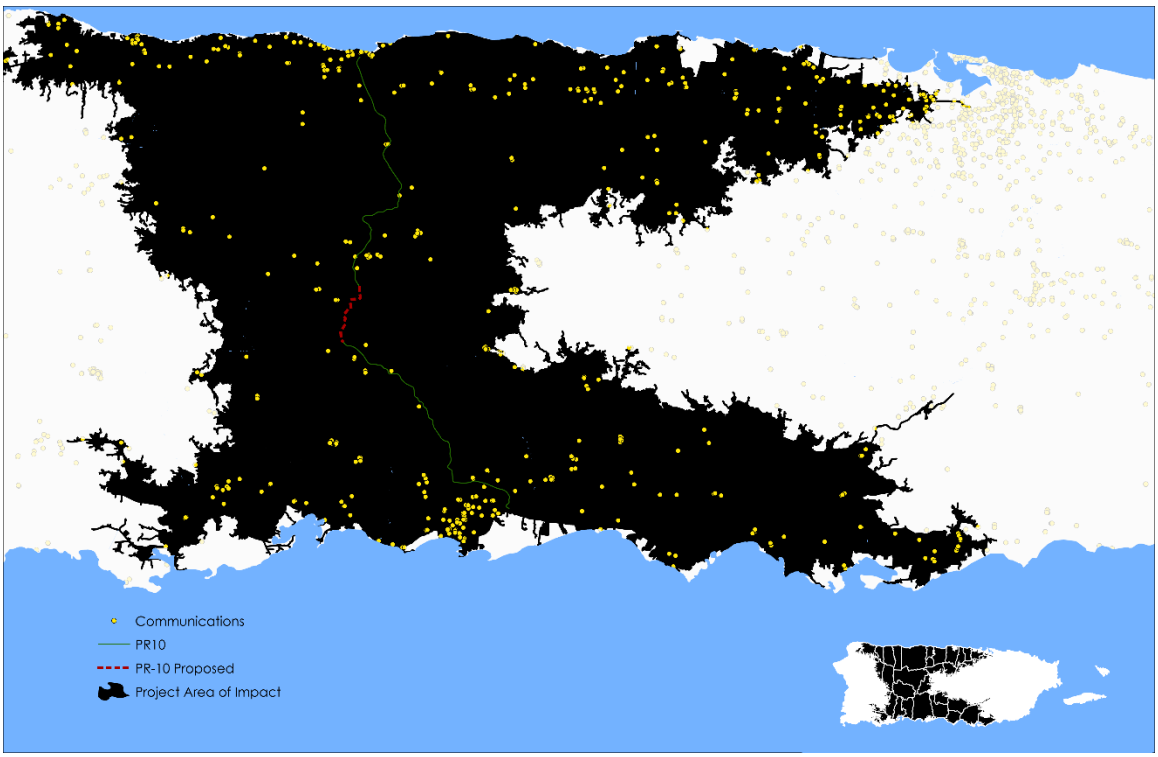

Figure 13. Communications Facilities (Excludes Private Broadband Infrastructure)

There are 2,124 communications facilities located within the area of benefit, as shown in Figure 13. The connectivity of a resilient roadway from north to south reduces the travel time required for service personnel to respond promptly during a disruption.

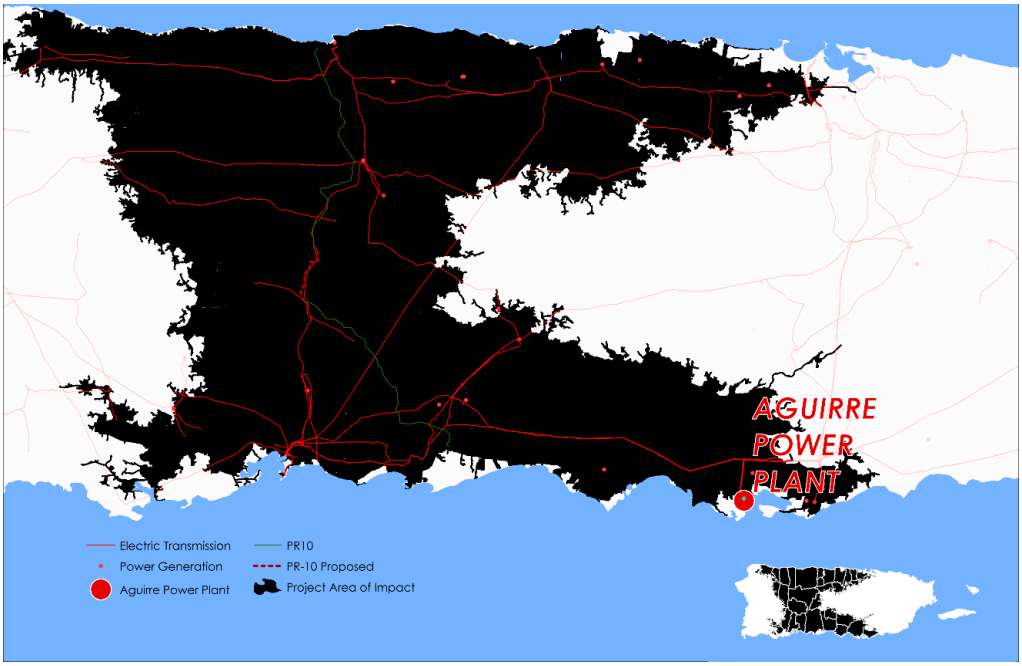

Figure 14. Power Generation and Transmission

There are twenty-five (25) power generation facilities, and approximately 1,296 kilometers of energy distribution lines located within the area of benefit, as shown in Figure 14. This includes the Aguirre Power Plant Complex. The connectivity of main routes expedites travel time required for service personnel to respond promptly during a disruption.

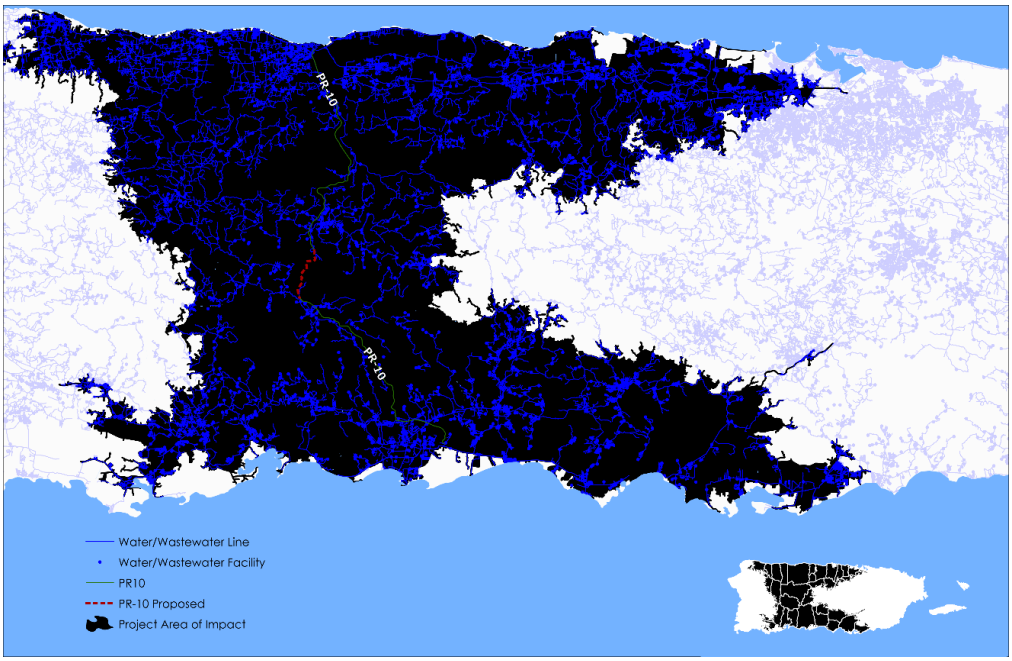

Figure 15. Water and Wastewater Facilities

There are 1,529 water/wastewater facilities located within the area of benefit and 11,454 km of service lines, as shown in Figure 15. The connectivity of a resilient roadway from north to south reduces the travel time required for service personnel to respond promptly during a disruption.

Project Benefits from Regular Travel Time and Distance Saved

The connector will result in significant travel time savings for both passenger and freight vehicles that must currently use PR-123. Based on the findings of the traffic analysis and demand modeling, the estimated average time savings for "on peak" drivers are 11.96 minutes per vehicle. The average time savings for "off peak" drivers is 10.76 minutes per vehicle. Using the modeled on-peak and off-peak traffic counts and vehicle classifications, the estimated reduction in total Vehicle Hours Traveled (VHT) in the first year of benefits is 1,305,946 and 19,127,181 in total hours saved over the analysis period.

In addition to travel time savings, the project will result in substantial decreases in Vehicle Miles Travelled (VMT) for passenger and commercial freight vehicles. The difference in roadway segment length between the new PR-10 connector and the existing comparable portion of PR-123 and the modeled daily traffic counts were used to estimate annual decrease of 3,503,467 total VMT through the analysis period. This VMT reduction is used to derive monetized benefits including vehicle operating cost savings, emissions reductions, and crash reduction. These monetized benefits are described in the BCA Results section of this document.

Project Benefits from Anticipated Lower Crash Rate

Beyond the safety benefits from a net reduction in VMT, the BCA calculates the benefits generated from the project based on the anticipated lower crash rate for the new segments of PR-10 relative to the existing PR-123 route. PRHTA and the Traffic Safety Commission (**TSC**) maintain crash information on the roads of Puerto Rico. PRHTA provided information on all crashes for the PR-123 corridor between 2014 and 2018 from the Strategic Highway Safety Plan. Figure 16 illustrates a summary of the crashes by type and by location along PR-123 with a heat map. The figure illustrates the number and proportion of crashes that resulted in the corridor. For PR-123, no fatalities have been reported with most crashes categorized 'property damage only'.

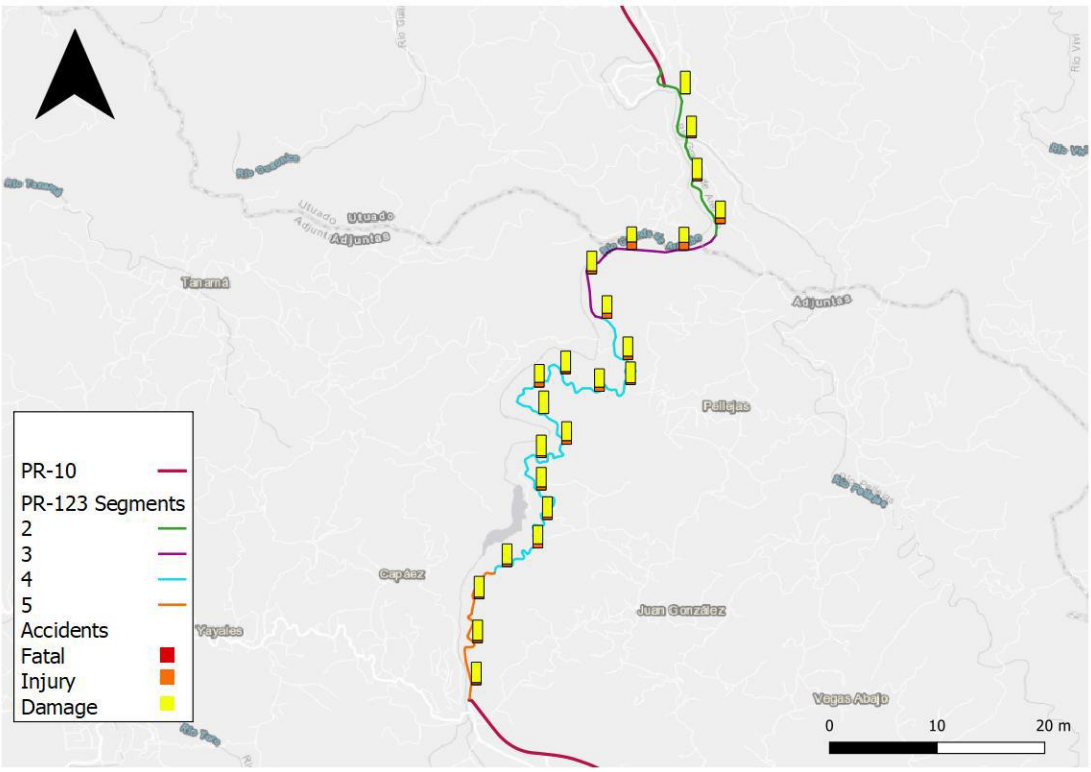

Figure 16. Crash rate by segment

Segment	Fatal	Injury	Property Damage Only	Total	Annual Average Daily Traffic (AADT)	Miles	Crash Rate (Per 1 million VMT)
1	0	3	33	36	4,800	2.14	2.40
2	0	11	42	53	3,765	4.12	2.34
3	0	84	504	588	11,292	18.06	1.98
4	0	14	141	155	13,800	3.19	2.41

Based on the design of the new segments of PR-10 and the existing conditions on PR-123, Crash Modification Factors (**CMFs**) from the FHWA's CMFClearinghouse.org database was selected to estimate the reduced number of accidents in the "build" scenario. Those CMFs are shown in detail in the full BCA memo, subject to HUD approval.

V. Project Costs

Direct project costs for the project were taken from the expenditure year estimate included in the grant application and inflation adjusted to 2020 per the most recent USDOT BCA Guidance. Costs were then discounted by a compound interest rate of seven percent (7%) based on the anticipated year of expenditure. Maintenance costs were estimated at $374,420 per year based on project engineering estimates.

BCA Results

The BCA is a formulaic analysis used to demonstrate that the benefits of a project outweigh its costs, or the BCR is greater than one (1). Benefits are the economic, social, and environmental advantages associated with a proposed hazard mitigation or resilience project. Costs are the sum of the upfront construction costs and the present value of the annual operations and maintenance costs over the useful life of the project.

Consistent with other federally funded hazard mitigation grant programs, PRDOH requires that a mitigation project's BCR must be a one point zero (1.0) or greater to be eligible for funding, unless HUD-permitted conditions can be established through an Alternate Demonstration of Benefits, as described in 84 FR 45838, 45851.

Most project benefits occur over a period into the future, while most of the project costs are incurred up front and in the present. In accordance with OMB Circular A-94, PRDOH requires that BCAs be prepared on a net present value basis, meaning the present value of the benefits gained over the life of the project are compared to the total project costs to establish the BCR. Because most project benefits accumulate over time, project benefits can be calculated on an average annual basis ("annualized") and then multiplied by a Present Value Coefficient (PVC).

By this methodology, and through multiple sensitivity analysis, PRDOH has determined the PR-10 project to have a benefit cost ratio (BCR) between a range of 1.03 and 1.75. The project is therefore eligible for funding as it has been determined to deliver a BCR above one (1), demonstrating according to BCA standards that the project produces more benefit than it costs.

Additional Economic impacts

The relationship between lifeline disruption and societal impact is best demonstrated in economic disruption. Lifeline services depend on functioning transportation infrastructure for supply route continuity, the system of organizations, people, and activities involved in the production and distribution of a commodity.

Considering the communities' enhanced economic development potential, PR-10 is an important element of the Puerto Rico transportation network since it is an interface between the industrial centers of the PR-2 North Corridor (Arecibo – Aguadilla) and the PR-52 South Corridor (Ponce – Salinas) providing a mid-island north-south connection to promote the industrial development of both centers and of the adjacent municipalities.

Having the Port of Las Américas and Mercedita International airport in Ponce and the industrial conglomerate and the international airport in Aguadilla, PR-10 will become a catalyst to help sustain and even ignite the industrial development of Puerto Rico.

VI. Consistency with Other Mitigation Activities

The completion of PR-10 does not increase the risk of loss of life or property in a way that undermines the benefits from other uses of CDBG–MIT funds. Rather, the completion of this road, as described throughout this project description, provides a greater connectivity for a greater number of lifelines that depend on the circulation of supplies, people, and services. A further analysis of the economic impacts and connectivity of this transportation lifeline route demonstrate this.

Environmental and Historic Impacts

Final Environmental Impact Statement (**FEIS**) for the total length of the PR-10 (Arecibo to Ponce) was approved and adopted by the Federal Highway administration in March 1979. Subsequently

the construction of the road was initiated and at this moment 50.4 km of the 58 km of the road have been completed. The 50.4 km represent eighty-six-point nine percent (86.9%) of the entire project. The approximately 7.6 km that remain to be constructed represent the proposed project. During the construction of the portions that have already been completed reevaluations of the original FEIS have been performed to establish that the environmental conditions and the alignment of the segments that are to be constructed remain substantially the same as the originally approved project and that the approved FEIS is still applicable and appropriate. The most recent reevaluation and determination that was concurred by FHWA was in September of 2016. On September 15, 2016, the FWHA concurred with PRHTA's determination that the FEIS as approved originally for the project in 1979 is still applicable and appropriate for the proposed segments that were to be constructed. Recently, the PRHTA has once again performed a new reevaluation of the proposed project and has determined that the approved FEIS for the project is still applicable and appropriate for the proposed action. The reevaluation and determination were submitted to FHWA for concurrence on April 6, 2022. The FHWA is currently reviewing the reevaluation and supporting documents.

The following are specific items that were agreed to be considered by PRHTA and FHWA for the completion of the project:

1. **Noise evaluation** – With respect to noise impacts, the current analysis validates the findings about this subject discuss in the FEIS since no noise sensitive areas have been identified close to the project Right of Way (ROW) as required by Section VI.B of the Noise Policy.

2. **Endangered Species** – The U.S. Fish and Wildlife Service (USFWS) stated: No suitable habitat for the species (Broad Winged Hawk and Puerto Rican Shinned Hawk) is located along the proposed alignment nor individual or nest sites were observed. Therefore, it has been determined that action would not affect the broad winged hawk and Puerto Rican Sharp-shinned hawk. Special conditions were established that require that the contract documents incorporate conditions for monitoring of the Puerto Rican Boa and that vegetation clearing and earth work should be performed outside the breeding season of the Puerto Rican sharp shinned hawk and the broad winged hawk.

3. **Section 106 consultation** – The State Historic Preservation Office (SHPO) issued a finding of no historic properties affected determination for all the remaining highway sections under the terms and conditions of a Section 106 consultation.

4. **Hazardous Substances** – Test results of a Phase II report of a suspected property that was acquired resulted in no Volatile Organic Compounds, Total Petroleum Hydrocarbons Oil Range Organics, and Total Petroleum Hydrocarbons Diesel Range Organics were found.

5. **Clean Water Act (CWA)** – The project will cross over jurisdictional area of USACE and direct as well as indirect impacts are anticipated during the performance of the construction activities. Therefore, a Joint Permit Application will be required from USACE.

6. All the years of studies and evaluation of environment along the corridor of the proposed PR-10 Highway produced a bank of invaluable data about the composition of the existing flora and fauna resources of the area. As a mitigation measure, PRHTA acquired a forty-three (43) acre parcel (Hacienda Verde) in Adjuntas whose ownership was transferred to the Department of Natural and Environmental Resources to be preserved in perpetuity for the protection of the flora and fauna.

Analysis of Roadway Connectivity & Use

Usage

The traffic data for existing condition and projected to 2045 was performed by a transportation specialist company. The traffic volume for the existing condition was estimated in 5,354 Annual Average Daily Traffic (AADT). This volume is expected to increase with the new PR-10 segment since the conditions of existing PR-123 are a deterrent to the users and instead they use other routes to get to their destination. A high percent of the existing users are local residents and some workers traveling north-south to their workplace. Other workers, and commercial vehicles prefer to use other routes that although longer are safer.

With the construction of the new PR-10 segment we expect to revert this trip patterns that will result in economy for the users, less vehicle crashes (injuries, property damages and potential of fatalities) and less use of healthcare resources by the government of Puerto Rico.

Connectivity

As we mention in the previous section, the conditions of the existing segment of PR-123 represent a deterrent to the users to travel north-south along the existing route. Those conditions are a limitation for an effective use for food and medicine supplies, transportation of goods and services and utilities.

Once PR-10 (Utuado-Adjuntas) is complete, the highway will become an important route that connects the industrial centers located in the south (Ponce, Coamo, Juana Diaz) with the industrial zone of Aguadilla-Moca and the agricultural district of Camuy-Hatillo-Quebradillas-Isabela.

Alternative Routes

Whenever PR-123 becomes unavailable a detour must be taken. Alternate route for PR-123 is PR-10-PR-135-PR-129-PR-111-PR-10. This alternate route has a travel time of 1 hour and 20 minutes at an average speed of 21.72 mph. Additional time per one-way detour trip is 57.0 minutes, obtained from subtracting the alternate route detour time of approximately eighty (80) minutes, from the average time of twenty-three (23) minutes under normal conditions. Similarly, the additional distance per one-way detour is estimated at 17.21 miles. This was the result of subtracting the detour distance of 28.96 miles from the distance of 11.75 miles under normal conditions.

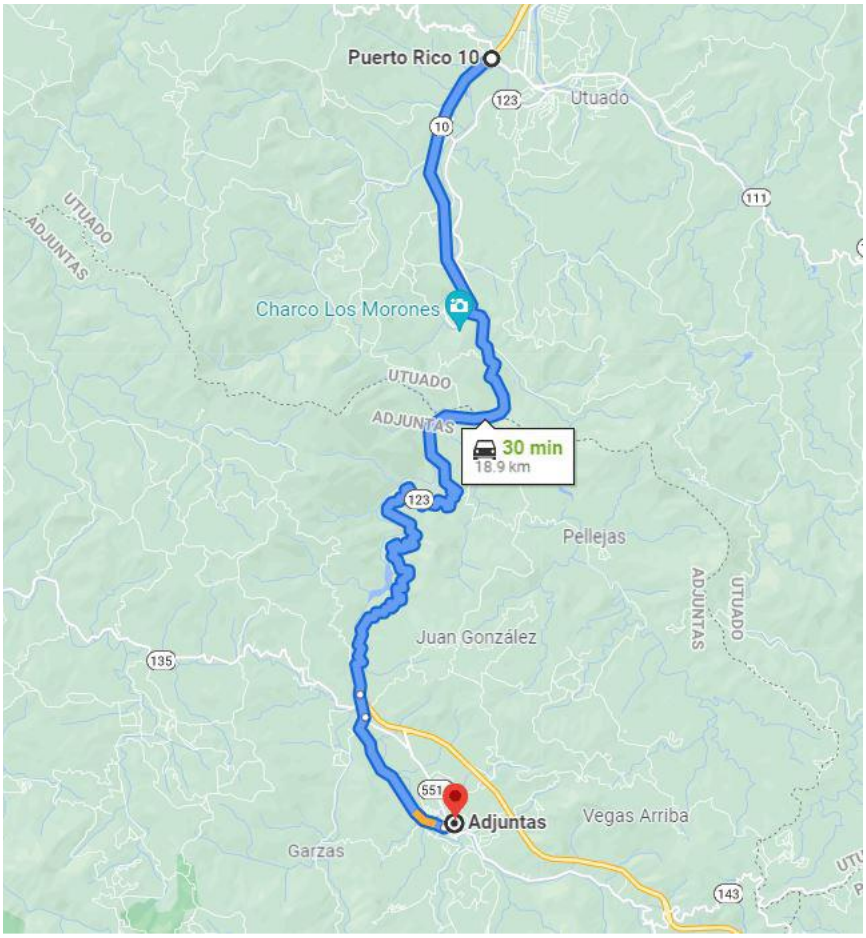

Figure 17. Utuado to Adjuntas route travel time of thirty minutes

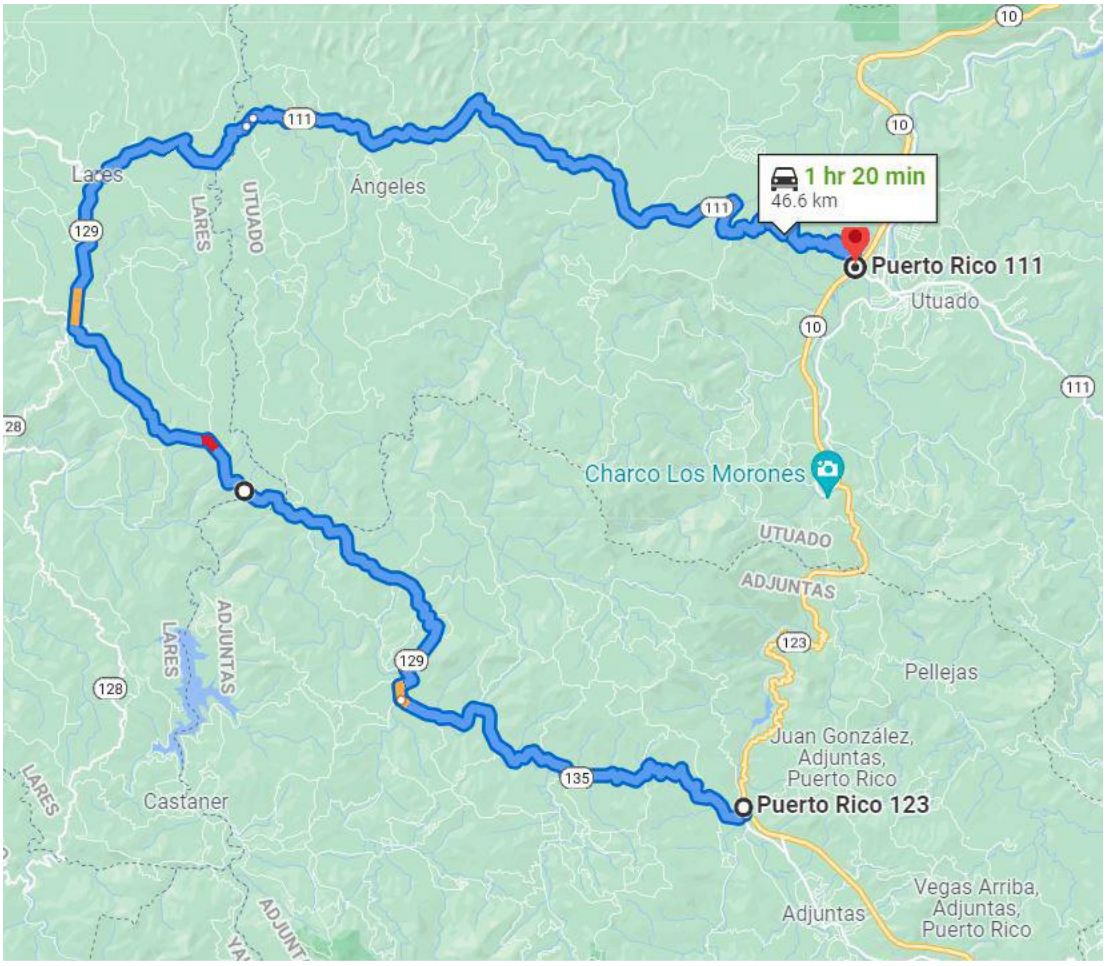

Figure 18. Utuado to Adjuntas alternate route travel time of one hour twenty minutes

END OF NARRATIVE