SECOND FIVE-YEAR REVIEW REPORT FOR VEGA BAJA SOLID WASTE DISPOSAL SUPERFUND SITE VEGA BAJA, PUERTO RICO

Prepared by

U.S. Environmental Protection Agency
Region 2
New York, New York

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August 12, 2025

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Date

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Contents

Attachments:

List of Abbreviations & Acronyms

ALM	Adult Lead Model
BLL	Blood Lead Level
CD	Consent Decree
CERCLA	Comprehensive Environmental Response Compensation and Liability Act
DNER	Department of Natural and Environmental Resources
EPA	United States Environmental Protection Agency
ESD	Explanation of Significant Differences
FYR	Five Year Review
HHRA	Human Health Risk Assessment
IC	Institutional Control
IEUBK	Integrated Exposure Uptake Biokinetic
MSD	Mass Fraction of Soil in Indoor Dust
µg/dL	Micrograms per deciliter
mg/kg	Milligrams per kilograms
NAQQS	National Ambient Air Quality Standards
NCP	National Contingency Plan
NPL	National Priorities List
O&M	Operation and Maintenance
OU	Operable Unit
PDI	Pre-design Investigation
PRG	Preliminary Remediation Goal
PRLA	Puerto Rico Land Authority
PRPs	Potentially Responsible Parties
RA	Remedial Action
RAO	Remedial Actions Objectives
RAWP	Remedial Action Work Plan
RD	Remedial Design
RI	Remedial Investigation
ROD	Record of Decision
RML	Removal Management Level
RSL	Residential Screening Level
UU/UE	Unlimited Use/Unrestricted Exposure

I Introduction

The purpose of a five-year review (FYR) is to evaluate the implementation and performance of a remedy in order to determine if the remedy is and will continue to be protective of human health and the environment. The methods, findings, and conclusions of reviews are documented in FYR reports such as this one. In addition, FYR reports identify issues found during the review, if any, and document recommendations to address them.

The U.S. Environmental Protection Agency (EPA) is preparing this FYR review pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Section 121, consistent with the National Contingency Plan (NCP) (40 CFR Section 300.430(f)(4)(ii)), and considering EPA policy.

This is the second FYR for the Vega Baja Solid Waste Disposal Superfund Site (Site). The triggering action for this statutory review is the completion date of the previous FYR in September 2020. The FYR has been prepared because hazardous substances, pollutants or contaminants remain at the site above levels that allow for unlimited use and unrestricted exposure (UU/UE).

The Site consists of two OUs. OU2 addresses soil and is included in this FYR. OU1 covers groundwater and was addressed by a no action Record of Decision (ROD) and is therefore not included in this FYR.

The Vega Baja Solid Waste Disposal Superfund Site FYR was led by Yomari E. Soto López, EPA Remedial Project Manager. EPA Participants included Abbey States, EPA Human Health Risk Assessor, Charles Nace, EPA Ecological Risk Assessor, and Lilliana Alemán Román, Community Involvement Coordinator. Additional participants included the public potentially responsible parties (PRPs), as well as the Puerto Rico Department of Environmental and Natural Resources (DNER). The PRPs were notified of the initiation of the five-year review. The review began on October 1, 2024.

Site Background

The Site, located in Vega Baja, Puerto Rico, is a 72-acre area that was formerly operated by the Municipality of Vega Baja as a solid waste disposal facility from approximately 1948 until 1979 on property owned by the Puerto Rico Land Authority (PRLA). The municipality used the Site as an open burning facility that received commercial, industrial, and domestic waste. Local residents began constructing homes on portions of the Site beginning in the late 1970's. The Site includes a 55-acre Residential area, and a 17-acre uninhabited area referred to as the "Non-Residential Area." Some of the properties contained lead-impacted soils as a result of the past waste burning activities. In addition, trash mounds, up to eight feet in height, remained in localized areas within the Site.

The Site was listed on EPA's National Priorities List (NPL) on July 22, 1999. In October 1999, EPA started a removal action on three of the lots with the highest levels of lead. The Site was fully investigated later in two separate operable units: OU1, a groundwater study conducted by EPA, and OU2, a soil study conducted by the PRPs identified by EPA.

FIVE-YEAR REVIEW SUMMARY FORM

SITE IDENTIFICATION		
Site Name: Vega Baja Solid Waste Disposal Superfund Site		
EPA ID: PRD980512669		
Region: 2	State: PR	City/County: Vega Baja
SITE STATUS		
NPL Status: Final		
Multiple OUs? Yes	Has the site achieved construction completion? Yes	
REVIEW STATUS		
Lead agency: EPA		
Author name (Federal or State Project Manager): Yomari E. Soto López		
Author affiliation: EPA		
Review period: 10-1-2024 - 7-17-2025		
Date of site inspection: 6-5-2025		
Type of review: Statutory		
Review number: 2		
Triggering action date: 9-30-2020		
Due date *(five years after triggering action date)*: 9-30-2025		

II Response Action Summary

Basis for Taking Action

The results of the risk assessment (both human health and ecological) indicated that the only contaminant for which a cleanup goal is necessary is lead.

Site-related risks from potential exposure to lead at the site were estimated in the Human Health Risk Assessment (HHRA). Based on Integrated Exposure Uptake Biokinetic (IEUBK) and Adult Lead model (ALM) modeling results, several residential properties, the Drainage Ditch, the Trash Mounds, and the Non-Residential Area were identified as having the potential to cause an increase in blood lead (i.e., greater than 5% of the population exceeding 10 ug/dL of lead in the blood) to residents living on the site. Based on the potential for increased blood lead concentrations in

residents at the site, it was determined that a remedial action was warranted to reduce the potential exposures from lead at the site.

Based on the results of the Screening Level Ecological Risk Assessment (SLERA), elevated risks to populations of ecological receptors at the site, especially avian species represented by the Red-legged thrush and Northern bobwhite, were determined to be associated with exposure to lead. Exposure to other compounds detected at the site were determined not to pose an unacceptable risk to ecological receptors, and the compounds did not warrant a remedial action. Thus, protection of avian receptor populations from exposure to lead was identified as a remedial action objective. A cleanup value of 450 mg/kg was determined to be protective of avian populations that use the site.

Response Actions

On September 30, 2010, EPA issued a ROD addressing all contaminated soils for the site. The remedy included the following components:

- Performance of a remedial design to provide the details necessary for the construction and monitoring of the remedial action;
- Pre-design investigation (PDI) to include detailed surveying of property features and topography, soil sampling at two properties where access could not be obtained during the OU-2 remedial investigation (RI), additional soil sampling at a minimum of eight properties where more lead concentration data are needed to support design, additional drainage ditch soil sampling for lead, and delineation and surveying of the horizontal extent and top elevations of the existing trash mounds based on visual observations and the basemap survey;
- Removal of lead-contaminated soils above the cleanup goal of 450 milligrams per kilogram (mg/kg) from residential yards, trash mounds, a drainage ditch, and a portion of an area referred to as the "Non-Residential Area;"
- Consolidation of excavated materials/soils in an approximately 8.5-acre area of the Non-Residential Area that contains lead above screening criteria based on the delineation activities performed during the OU-2 RI;
- Installation of a cover system over the consolidated excavated materials in the approximately 8.5-acre contaminated area in the Non-Residential Area. The final design of the cover system will be determined during detailed design, but it is anticipated that it will include a non-woven geotextile overlain by 12 inches of clean soil consistent with the Superfund Lead-Contaminated Residential Sites Handbook. The soil cover will be vegetated to prevent erosion that could otherwise potentially result in unacceptable exposure to underlying materials;
- Placement of clean soil in the residential yards where excavation occurs and revegetation to restore pre-excavation conditions, to the extent practicable;
- Imposition of institutional controls (a) to protect the integrity of the cover system in the Non-Residential Area where a cover is used to contain contaminated materials; (b) restricting contact with soils beneath structures on properties where soil removal is undertaken; (c) restricting contact with soils under paved areas and/or buildings immediately adjoining an area where soil removal is undertaken; (d) restricting contact

with soils in areas where final post-excavation sampling indicates lead concentrations remain above the cleanup goal; and (e) restricting contact with soils under roadways adjacent to properties where soil removal is undertaken;

- Indoor dust monitoring and management program to include engineering controls during remedial activities such that migration of lead in fugitive dust into homes is minimized, as well as post-remediation confirmation sampling three months after completion of the excavation activities associated with the selected remedy at the two properties where elevated levels of indoor dust lead were measured in the OU-2 RI;
- An off-site disposal option for large materials which may be encountered in the trash mounds or the Non-Residential Area (e.g., large/bulky debris, putrescent materials, etc.), as well as lead contaminated soils which violate the land disposal restrictions, that may prove to be unsuitable for on-site consolidation;
- A surface water management and erosion control plan to provide for the effective control of surface water runoff during the implementation of the remedy and to minimize soil erosion from covered areas;
- Construction/performance monitoring to ensure the effectiveness of the remedy including post excavation sampling, air monitoring to ensure protection of workers and nearby residents, and performance monitoring including cover inspections and maintenance to confirm long-term effectiveness.

The remedial action objectives (RAOs) for the Site were:

- Prevent or minimize human exposure in the Residential area (including the drainage ditch) to soil lead concentrations greater than the cleanup goal.
- Eliminate potential exposure to the remaining trash mounds in the Residential area.
- Mitigate human exposure to lead in the Non-Residential Area above the cleanup goal.
- Protect populations of avian receptors from unacceptable exposure to lead by using a cleanup value of 450 mg/kg, which has been determined to be protective of ecological receptors, including avian populations, at the Site.

Status of Implementation

A Remedial Design (RD)/Remedial Action (RA) Consent Decree (CD) between EPA and three private party respondents (the "Private Parties") for the construction of the OU2 remedy was entered by the federal district court for the District of Puerto Rico in February 2012. The Private Parties completed the RD, and EPA approved the Final RD Report in September 2013. The Private Parties engaged a contractor to implement the RA, and the Remedial Action Work Plan (RAWP) was approved by EPA in February 2015.

Construction was completed in July 2015 and consisted of the following activities:

- Set up of a staging area for equipment and construction personnel near the corner of Alturas St. and Trio Vegabajeño Ave.
- Clearing, grubbing, and other site preparation activities as required to complete site activities.
- Removal of lead contaminated soils and trash mounds from residential yards and consolidation of this material at the Non-Residential Area.

- Backfill of Residential excavations with clean fill.
- Construction of a minimum 1-foot-thick soil cover system and associated drainage features over the consolidated material at the Non-Residential area.
- Restoration of all disturbed areas and site features.
- Performance of air monitoring.

Between January and July 2015, approximately 9,587 cubic yards of lead-impacted soil and trash mound materials were excavated from Residential Area properties as part of the RA construction. These materials were transported to the Non-Residential Area and incorporated into the sub-grade prior to placement of the soil cover. The Residential area property excavations were backfilled with clean fill and the properties were restored to their previous conditions.

The Non-Residential Area also was remediated in accordance with the remedial design. Approximately 7.8 acres of the Non-Residential Area was cleared and graded consistent with the design grading plan, with stormwater being directed to a runoff reduction feature at the north end of the Non-Residential Area adjacent to the Drainage Ditch. Once all vegetation, boulders, trash mounds, and lead-impacted soil were consolidated within the Non-Residential Area and the final grading was complete, the soil cover system was constructed over the entire area. The soil cover system included placement of a geotextile demarcation layer followed by a minimum 12-inch-thick soil layer capable of supporting vegetation. A permanent 8-foot-high security fence was constructed around the perimeter of the Non-Residential Area to prevent unauthorized access to the area. The Non-Residential Area was hydroseeded and irrigated until permanent vegetation was established.

Because of physical limitations, excavation of all properties to bedrock was not possible and some soils were left in place above the cleanup goal. A geotextile layer was placed and deed restrictions will be required for those properties.

Deeds with institutional controls established have been completed for three of the properties and implementation of institutional controls are in progress for 22 more properties. Deeds with institutional controls were also completed for the Non-Residential Area.

Institutional Controls Summary Table

Table 1: Summary of Planned and Implemented ICs

Media, engineered controls, and areas that do not support Unrestricted Use/Unrestricted Exposure (UU/UE) based on current conditions	ICs Needed	ICs Called for in the Decision Documents	Impacted Parcel(s)	IC Objective	Title of IC Instrument Implemented and Date (or planned)
Soils	Yes	Yes	22 parcels	Deed of Imposition of Restrictions of use and/or excavation of Soil in Non-Residential Area & in the Residential Area to protect the integrity of the cover system and to restrict contact with contaminated soils remaining beneath structures, roads, and other paved areas.	Estimated to be completed by March 2027
Soils	Yes	Yes	Non-Residential Area		IC executed on August 16, 2021, and registered in August 2021.
Soils	Yes	Yes	Property 5782		IC executed on August 30, 2023, and registered on March 25, 2024
Soils	Yes	Yes	Property 5376		IC executed on September 27, 2023, and registered on February 26, 2024
Soils	Yes	Yes	Property 5572		IC executed on November 8, 2023, and registered on April 5, 2024

System Operations/Operation and Maintenance

In April 2013, the federal district court for the District of Puerto Rico entered a separate CD between EPA and three public entities, PRLA, the Puerto Rico Housing Department, and the Puerto Rico Electric Power Authority, to implement the institutional controls and provide for long-term operation and maintenance (O&M) of the remedy. The public entities assumed responsibility of the site maintenance in September 2015. O&M activities are on-going and consist of the following:

- Implementation of institutional controls to restrict contact with contaminated soils that remain in place beneath structures and paved areas and/or locations where final post-excavation testing indicates lead concentrations remain above the cleanup goal.

A summary of the planned and implemented ICs is included in Table 1. IC deed restriction for the Non-Residential Area was settled and registered in August 2021, and deeds of restrictive covenants of three of the properties, Property 5376, Property 5782 and Property 5572 were registered in February, March and April 2024, respectively.

- Inspection, maintenance, and repair of the site features at the Non-Residential Area, including vegetation, drainage features, and fencing, as appropriate and inspection and repair of the paved areas in the residential areas and roads, where the paved areas are used to contain contaminated materials.

  From 2020 through 2021, site maintenance services of mowing and trimming vegetation and herbicide application at the Non-Residential Area were performed by Lands Pro GM Corp of Vega Alta. The public entities retained the services of ERTEC, PSC Environmental Consultants (currently ERTEC LLC) for the implementation of the O&M plan for the site in December 2021. From 2022 to 2025 PRLA has been conducting the site maintenance activities. Site Inspection Reports describing findings and including recommendations have been completed and submitted by ERTEC. In 2024, two meetings were conducted at the Vega Baja municipality to discuss project update and maintenance requirements within the site surroundings. In addition, monthly meetings with EPA, DNER, public entities and municipality representatives have been performed since September 2024 to discuss operation and maintenance activities status and further action.

  During this period, the public parties have been addressing Site maintenance activities issues observed during site inspections, such as clearing of overgrown vegetation, installation of new warning signs within the perimeter of the cyclone fence securing the Non-Residential Area, fixing areas of the cyclone fence that have been damaged, removing the discarded refrigerator and other debris observed inside the property.

- Inspection, maintenance, and repair of the cover system in the Non-Residential Area where the cover is used to contain contaminated materials.

  Inspections of the area following Hurricane Maria in September 2017 showed some areas of the roadways, which serve as caps, were eroded. It is not clear whether the erosion was from Hurricane damage or regular wear and tear. Repairs were performed by municipality personnel. In September 2022, a site reconnaissance after the effects of Hurricane Fiona was conducted by ERTEC. Dense vegetation was observed throughout the Non-Residential Area, on the surface water management system conveyance channels and overflow weir, and on the east, northeast and northern area of the cyclone fence. In addition, a discarded refrigerator and horses were observed inside this area. During the site reconnaissance conducted within the Residential Area, four potholes were observed at Alturas Street near the intersection with Principal Street. Clearing of dense vegetation, removal of the discarded refrigerator, repairs to the cyclone fence and installation of warning signs to avoid unauthorized access to the Non-Residential Area were performed by the PRPs. Disposal of the discarded refrigerator and street repairs were performed by the municipality personnel.

Remedy Resilience

Based on findings from potential impacts from severe weather events that have been assessed, there is no risk of flooding, sea level rise or landslides within the site. However, the remedy may be impacted by more frequent and severe hurricanes. Damages to the Non-Residential Area from severe storms have been addressed by the PRPs and damages to the roadways have been addressed by the municipality personnel. Inspections following severe storms are required as part of the O&M plan and will continue. Appendix A includes a summary of the remedy resilience analysis performed.

III Progress Since Last Five-Year Review

This section includes the protectiveness determinations and statements from the **last** FYR (Table 2) as well as the recommendations from the **last** FYR and the current status of those recommendations (Table 3).

Table 2: Protectiveness Determinations/Statements from the 2020 FYR

OU #	Protectiveness Determination	Protectiveness Statement
OU2	Short-term Protective	The remedy is protective of human health and the environment in the short-term because exposure pathways have been addressed by the soil remedy. However, in order for the remedy to be protective in the long-term, institutional controls need to be put in place.

Table 3: Status of Recommendations from the 2020 FYR

OU#	Issue	Recommendations	Current Status	Current Implementation Status Description	Completion Date (if applicable)
2	Institutional controls have not been implemented	Implement final institutional controls in the form of deed restrictions in the Non-Residential Area on residential properties where contamination was left at depth.	Ongoing	See text below.	

In August 2021, IC restriction for the Non-Residential Area was settled and registered in the Property Registry. In 2022, a database was completed including the property owner's information and a draft deed of restrictive covenants. In August 2023, the deed of restrictive covenants signed for Property 5782, and registered in March 2024. In September 2023, the deed of restrictive covenants was signed for Property 5376, and registered in February 2024. In November 2023, the deed of restrictive covenants was signed for Property 5572, and registered in April 2024. During monthly meetings performed since September 2024, the PRPs have been discussing alternatives to expedite the implementation of the ICs and a plan that would be provided to the EPA for their review.

In addition to this formal issue and recommendation, the following suggestions were provided:

- The Post-Hurricane Area report indicates that there are disturbances/erosion in the street pavement cover. It is recommended that these areas be evaluated and repaired in the near future (prior to the next five-year review).

  Disturbances/erosion observed on the street pavement cover have been repaired by the Municipality of Vega Baja personnel. The PRP's contractor has been conducting quarterly inspections of the residential and non-residential areas since 2022, and reporting findings and observations of any street pavement cover disturbance/erosion observed.

- Because the scientific understanding of lead exposure is still evolving, it is recommended that the nine properties not included in the remedial action continue to be evaluated and visually inspected during future five-year reviews to ensure continued protectiveness.

  Since the last FYR, EPA has released new guidance that revises its approach to residential lead cleanups (see discussion in Question B below). Additional site investigation activities will be conducted, including site inspections and soil sampling activities at previously investigated properties with average lead concentrations above 200 mg/kg and in additional areas potentially affected by lead contamination. These activities are expected to be performed during the fourth quarter of 2025, and soil sampling results and reporting are expected to be completed by the first quarter of 2026.

IV Five-Year Review Process

Community Notification, Involvement & Site Interviews

On August 7, 2024, EPA Region 2 posted a notice on its website indicating that it would be reviewing site cleanups and remedies at Superfund sites in New York, New Jersey, and Puerto Rico, including the Vega Baja Solid Waste Disposal site. The announcement can be found at the following web address: https://www.epa.gov/superfund/R2-fiveyearreviews.

In addition to this notification, the EPA Community Involvement Coordinator (CIC) for the site, Lilliana Alemán Román, posted a public notice on the EPA site webpage www.epa.gov/superfund/vega-baja-disposal and provided the notice to the Vega Baja Municipality by email on August 13, 2025, with a request that the notice be posted in municipal offices and on the municipality webpages. This notice indicated that a Five-Year Review (FYR) would be conducted at the Vega Baja Solid Waste Disposal Superfund site to ensure that the cleanup at the site continues to be protective of human health and the environment. No comments or questions were received as a result of these notices. Once the FYR is completed, the results will be made available at the following repository: Vega Baja Municipality Public Library "Biblioteca Regional de Vega Baja Trinidad Fontanez". In addition, the final report will be posted on the following website: www.epa.gov/superfund/vega-baja-disposal. Efforts will be made to reach out to local public officials to inform them of the results."

Data Review

As described in Section III of this FYR, additional site assessment including inspections and soil sampling activities at properties initially evaluated with average remaining lead concentrations above 200 mg/kg and in additional areas potentially affected but had not been previously evaluated have been recommended. No other data has been collected in support of this review.

Site Inspection

The inspection of the site was conducted on June 5, 2025. In attendance were Yomari E. Soto López, and Lilliana Alemán Román, EPA; Pascual Velazquez, DNER; Angel Rodríguez, PRLA; Ruth Dones and Blanche González, PREPA; Richelle Vázquez, Housing Department and Wanda Morales and Roberto De Jesús, ERTEC. During the site inspection, EPA confirmed that the cap over the Non-Residential Area has been maintained in a manner consistent with the ROD and the final design documents. The access controls and restrictions that were implemented in the form of fences, locked gate and signs around the site were observed in good repair. New signs indicating that the landfill is a Superfund site and that unauthorized personnel are not allowed were installed at each side of the cyclone fence that is securing the area. The surface water management system was observed in good condition. Some trees were observed growing between the cyclone fence at the southwest and east sides of the landfill and part of the fence was observed broken on the south area. A deteriorated concrete ditch was observed at Los Angeles Street near the intersection with Alturas Street and a deteriorated area was observed at the bridge located on Principal Street near the intersection with Alturas Street. An area with deteriorated asphalt was observed at Alturas Street as well. In addition, an excavation was observed at a property remediated in 2015 located east, adjacent to the landfill, where a septic tank was reportedly installed, according to construction crew working in the property during the site visit.

V Technical Assessment

Question A: Is the remedy functioning as intended by the decision documents?

The remedy selected for soil was removal with on-site consolidation and cover in the Non-Residential Area. The remedy provided for the excavation and removal of lead-contaminated soils at approximately 16 residential properties, the trash mound materials, and the drainage ditch where lead concentrations were above the Site cleanup goal for lead of 450 mg/kg. Excavated materials were transported to the Non-Residential Area and consolidated. Although 16 residential properties were initially identified, based upon remedial design sampling, 25 properties were included in the final soil removal remedy.

Excavated materials were consolidated in the approximately 8.5 acres of the Non-Residential Area. The Non-Residential Area was subsequently covered with a membrane and soil cover system. The soil cover system included placement of a geotextile demarcation layer followed by a minimum 12-inch-thick soil layer capable of supporting vegetation. A permanent 8-foot-high security fence was constructed around the perimeter of the Non-Residential Area to prevent unauthorized access to the area. The Non-Residential Area was hydroseeded and irrigated until permanent vegetation was established.

Access restrictions were implemented in the form of fences and signs around the Site. The existing fence is inspected and upgraded, as necessary, to ensure that the fence surrounds the contaminated area. Signs indicating that the landfill is a Superfund Site (with the Housing Department and PRLAs telephone numbers for information) are posted on the fence securing the Non-Residential Area. Ongoing maintenance of the fence and signs is being performed by the public entities. Based on this information, the remedy within the Non-Residential Area is functioning as intended for human health and ecological receptors because the exposure pathways have been eliminated.

All residential yards where excavation was conducted were backfilled and re-vegetated to restore pre-excavation conditions. However, since the last FYR, EPA has released new guidance that revises its approach to residential lead cleanups (as further explained under Question B below). Consequently, additional residential property inspections and sampling activities need to be performed to ensure the remedy selected for the Residential area remains protective.

While the implemented access and engineered controls are adequate to protect the public and the environment, the selected remedy includes final institutional controls (deed restrictions), that have been completed for the Non-Residential Area, but only partially completed for the residential properties.

Question B: Are the (a) exposure assumptions, (b) toxicity data, (c) cleanup levels, and (d) remedial action objectives (RAOs) used at the time of the remedy selection still valid?

Land use considerations used in the baseline human health risk assessment are still valid. The exposure assumptions and toxicity values that were used to estimate the potential risks and hazards to human health followed the general risk assessment practice at the time the risk assessment was performed. Although the risk assessment process has been updated and specific parameters and toxicity values may have changed, the risk assessment process that was used is still consistent with current practice and the need to implement a remedial action remains valid.

Site-related risks from potential exposure to lead at the Site were also estimated in the HHRA, based on modeling results (IEUBK and ALM). Several residential properties, the Drainage Ditch, the Trash Mounds, and the Non-Residential Area were identified as having the potential to cause an increase in blood lead (at the time of the ROD, this was greater than 5% of the population exceeding 10 ug/dL of lead in the blood) to residents living on the site. Based on the potential for increased blood lead concentrations in residents at the site, it was determined that a remedial action was warranted to reduce the potential exposures from lead at the site.

The cleanup goal that was chosen for lead at the Vega Baja site was based upon the IEUBK lead model. At the time, the blood lead level (BLL) target was 10 µg/dL, which typically corresponded to a residential cleanup level in soil of 400 mg/kg. However, consideration of site-specific exposure parameters (primarily the mass fraction of soil in indoor dust (MSD)) utilized in the model yielded a value of 450 mg/kg, which was selected as a cleanup goal for lead in soil.

On January 17, 2024, EPA Office of Land and Emergency Management (OLEM) released the "Updated Residential Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities" (2024 Updated Soil Lead Guidance), which updates the residential soil lead screening level (RSL) and removal management level (RML) for the CERCLA and RCRA programs and

provides additional guidance for setting residential lead preliminary remediation goals (PRGs) and cleanup levels. The 2024 Updated Soil Lead Guidance recommends that regions use the most current version of the Integrated Exposure Uptake Biokinetic (IEUBK) model, with 5 µg/dL as the 95th percentile target blood lead level and site-specific environmental data (e.g., lead concentrations in various media and bioavailability) to develop PRGs and cleanup levels for residential land use. If an additional source of lead (e.g., lead water service lines, lead-based paint, non-attainment areas where the lead concentrations exceed NAAQS) is identified, the 2024 Updated Soil Lead Guidance recommends 3.5 µg/dL as the 95th percentile target blood lead level. The 2024 Updated Soil Lead Guidance also recommends that the EPA region adjust PRGs and cleanup levels to account for uncertainty, technical limitations (i.e., detection/quantification limits), and site-specific soil lead background.

For the Vega Baja site, 5 µg/dL is the appropriate target blood lead level, which correlates with a screening level of 200 mg/kg for a residential property.

For the 25 residential properties included in the remedial action, contaminated soil above 450 mg/kg was excavated and replaced with clean fill that had a lead concentration of 14 mg/kg. An evaluation of the data from these properties indicates that the remaining soil meets the updated RSL of 200 mg/kg. A geotextile demarcation was applied to prevent exposure to any contamination remaining below the remediated area. These properties will require institutional controls for the remedy to be protective in the long term. The updated RSL for lead does not apply to the Non-Residential portion of the site which remains protective with the soil cap and restricted access.

The previous FYR identified nine properties which were initially evaluated but not included in the remedial action that have average remaining lead concentrations above 200 mg/kg. During this FYR period, several additional areas potentially affected by lead contamination were identified that had not been previously evaluated. Forthcoming inspections and sampling events will determine the current conditions and use of these properties and protectiveness for the current residents.

The ecological risk assessment methodology used to support the 2010 ROD, including exposure assumptions and toxicity data, has not substantially changed and remains valid. The conclusion of the ecological risk assessment indicated that exposure to avian species, specifically the red-legged thrush and bobwhite quail were associated with unacceptable risk from exposure to lead in the soil. A more detailed evaluation was conducted to ensure that the selected lead cleanup value would be protective of avian species on a population level by calculating exposure concentrations based on home ranges of the avian species. The evaluation concluded that the lead cleanup value chosen would be protective of the most sensitive ecological receptors (i.e., avian species). This conclusion is still valid. The RAO selected for ecological receptors, protect populations of avian receptors from unacceptable exposure to lead by using a cleanup value of 450 mg/kg, which has been determined to be protective of ecological receptors, including avian populations, at the Site, remains valid. Therefore, ecological receptors are not impacted by site contaminants, and the remedy is protective of ecological receptors.

Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

No, there does not appear to be any other information not already covered in Questions A or B above, that could call into question the protectiveness of the remedy.

VI Issues/Recommendations

Issues/Recommendations
OU(s) without Issues/Recommendations Identified in the Five-Year Review:
None

Issues and Recommendations Identified in the Five-Year Review:

OU(s): 2	**Issue Category: Other** **Updated Guidance**			
	Issue: An updated understanding of lead toxicity and Agency guidance indicates that the existing remedial goal for lead in soil of 450 mg/kg may no longer be protective and that concentrations above the current screening level of 200 mg/kg may be present on some residential properties that were not included in the original remedial action.			
	Recommendation: The nine properties not included in the remedial action and additional step-out properties should be visually inspected and sampled to evaluate residential exposure to lead.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
Yes	Yes	EPA	EPA	9/30/2026

OU(s): 2	**Issue Category:** Institutional Controls			
	Issue: Institutional controls have not been implemented for all impacted residential properties.			
	Recommendation: Implement final institutional controls in the form of deed restrictions for the remaining 22 residential properties where contamination was left at depth.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	EPA	EPA	3/31/2027

Issues and Recommendations Identified in the Five-Year Review *(Continued)*:

OU(s): 2	**Issue Category:** Other			
	Issue: Excavation performed at Property 5779 for the construction of a septic tank was extended below the remediated soils (2 feet of depth) and excavated soil was placed within a northwestern corner of the property. The property is currently vacant.			
	Recommendation: Sample the excavated soil placed at the surface of the northwestern corner of the property to ensure the property has not been recontaminated and that the excavated soil is handled appropriately.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	EPA	EPA	9/30/2026

Other Findings

In addition, the following are recommendations that were identified during the FYR and may improve management of O&M, but do not affect current and/or future protectiveness:

- Trees were observed growing between the cyclone fence at the southwest and east sides of the landfill and part of the fence was observed to be broken on the south area during the site inspection. It is recommended that the trees growing between the cyclone fence are removed and repairs be made to the cyclone fence in the south area.
- A deteriorated concrete ditch was observed at Los Angeles Street near the intersection with Alturas Street and a deteriorated area was observed at the bridge located on Principal Street near the intersection with Alturas Street. An area with deteriorated asphalt was observed at Alturas Street as well. It is recommended that these deteriorated concrete and asphalt areas be repaired.
- An evaluation as to whether additional administrative documentation would be needed to update the remedial goal in support of site completion is suggested.

VII Protectiveness Statement

Protectiveness Statement(s)		
Operable Unit: 02	*Protectiveness Determination*: Protectiveness Deferred	*Planned Addendum Completion Date:* 9/30/2026

Protectiveness Statement:
A protectiveness determination of the remedy cannot be made at this time until further information is obtained. Additional site investigation including site inspections and soil sampling activities will be conducted at properties previously investigated with average lead concentrations above 200 mg/kg and in additional areas potentially affected by lead contamination, based on the new 2024 guidance "Updated Residential Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities." Following these site investigations, it will be determined if additional response actions are needed at the Site to ensure protectiveness. It is expected that these actions would take approximately one year to complete, at which time a protectiveness determination will be made.

Sitewide Protectiveness Statement	
Protectiveness Determination: Protectiveness Deferred	*Planned Addendum Completion Date:* 9/30/2026

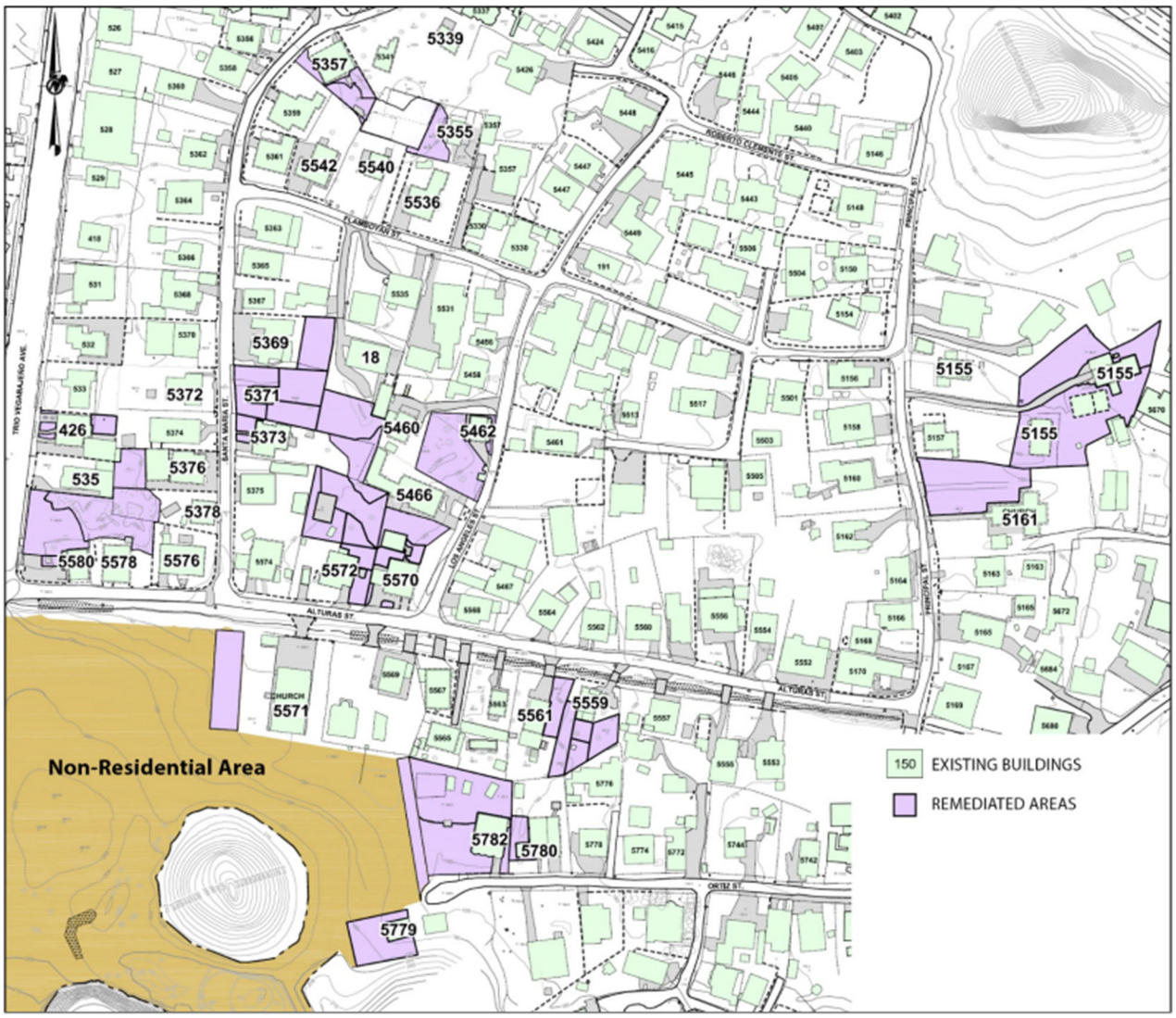
Protectiveness Statement:
A protectiveness determination of the remedy cannot be made at this time until further information is obtained. Additional site investigation including site inspections and soil sampling activities will be conducted at properties previously investigated with average lead concentrations above 200 mg/kg and in additional areas potentially affected by lead contamination, based on the new 2024 guidance "Updated Residential Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities." Following these site investigations, it will be determined if additional response actions are needed at the Site to ensure protectiveness. It is expected that these actions would take approximately one year to complete, at which time a protectiveness determination will be made.

VIII Next Review

The next Five-Year Review for the Vega Baja Solid Waste Disposal Superfund Site will be completed five years from the completion date of this review.

FIGURES

Figure 1: Remediated Areas



APPENDIX A

Documents, Data, and Information Reviewed in Completing the Five-Year Review

Document	Date(s)
Record of Decision OU-1	April 2004
Record of Decision OU-2	September 2010
First Five-Year Review Report	September 2020
Site Inspection Report – May & June 2022	August 2022
Limited Site Reconnaissance Report – September 2022	October 2022
Site Inspection Report – June 2023	March 2024
Site Inspection Report – April 2024	December 2024
Status of Operation and Maintenance (O&M) Procedures at Vega Baja Solid Waste Disposal Site, Consent Order for Case No. 3:12-cv-01988-ADC, Vega Baja, Puerto Rico	March 2025
Site Summary 2020-2025 for EPA FYR Report	May 2025

APPENDIX B – REMEDY RESILIENCE ASSESSMENT

Three tools were utilized to assess the Vega Baja Solid Waste Disposal Site. Figures A-1 through A-9 present the screenshots from each tool assessed.

The first tool used to assess the site was the *CMRA.* The tool examined five hazards for the county the Site fall within. As shown in Figure A-1 (Flooding) and Figure A-2 (Drought), the annual average total precipitation over the next 75 years is expected to fluctuate between 20 to 24 inches, while the annual days with total precipitation > 1 inch are expected to stay within a 1-day timeframe. Figures A-1 and A-2 also show that there will be a decrease in precipitation of at least 1-inch, but up to 4 inches in the next 75 years, and an increase in dry days when compared to current levels. The other three climate hazards examined were wildfire, extreme heat, and coastal inundation. As shown in Figures A-3 and A-4, the CMRA Assessment Tool did not have sufficient data to assign a National Risk Index Rating for wildfire and extreme heat. As shown in Figure A-5, the percent of the county impacted by global sea level rise is anticipated to be 0%. This is likely because the site is located inland from the coast.

The second tool utilized was the *NOAA Sea Level Rise Viewer*. Figure A-6 shows the site locality under current conditions. Figure A-7 shows the same area under a worst-case scenario assuming a 10-foot rise in sea level. As observed in these figures, the in-land portion of Vega Baja where the site is located is not expected to be impacted by this rise in sea level.

The final tool utilized is called the United States Geological Survey (*USGS) U.S. Landslide Inventory & Susceptibility Map.* As shown in Figures A-8 and A-9, there have been no recorded landslides within the site and there is a low landslide potential within the vicinity of the site.

Based on findings from the potential site impacts from severe weather events that have been assessed, there is no risk of flooding, sea level rise or landslides within the site. However, the remedy may be impacted by more frequent and sever hurricanes. Erosion on roadways and dense vegetation inside the Non-Residential Area were observed during inspections performed after Hurricane Maria in 2017 and Hurricane Fiona in 2022. Damages observed on roadways have been addressed by the municipality personnel and maintenance of the Non-Residential Area has been performed by the PRPs.

Currently, the site does not have active remedies. Operation and Maintenance (O&M) activities have been in progress, which includes inspections to the roads at the Residential area and maintenance of the remedial action components constructed at the Non-Residential Area of the site such as the soil cover, cyclone fence that secures the area, among others. In addition, inspections following severe storms are required as part of the O&M plan and will continue.

Figure A-1. Risk Factor, Flooding Risks in the Vicinity of Vega Baja Municipality, PR

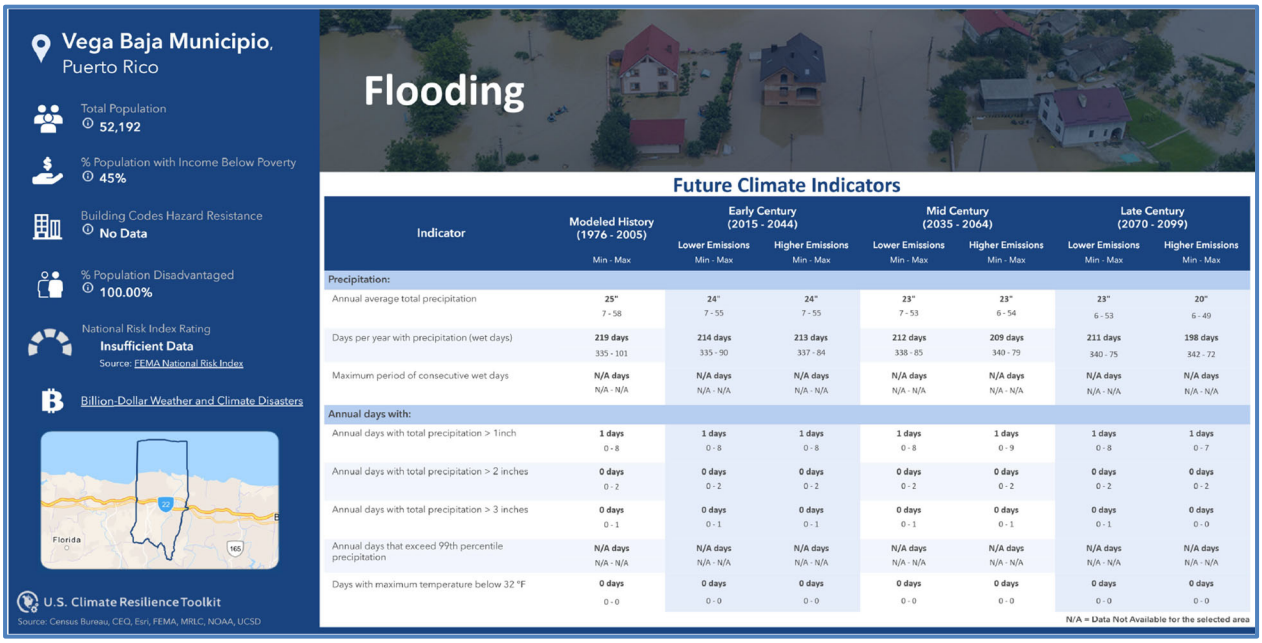


Figure A-2. Risk Factor, Drought Risks in the Vicinity of Vega Baja Municipality, PR

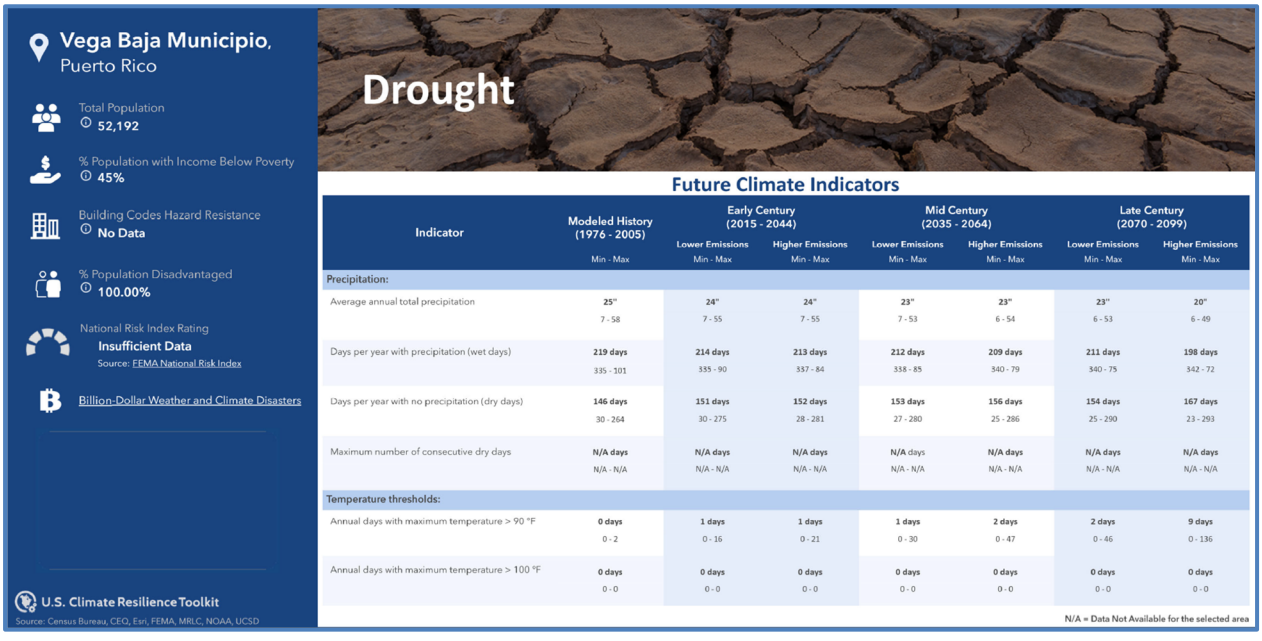
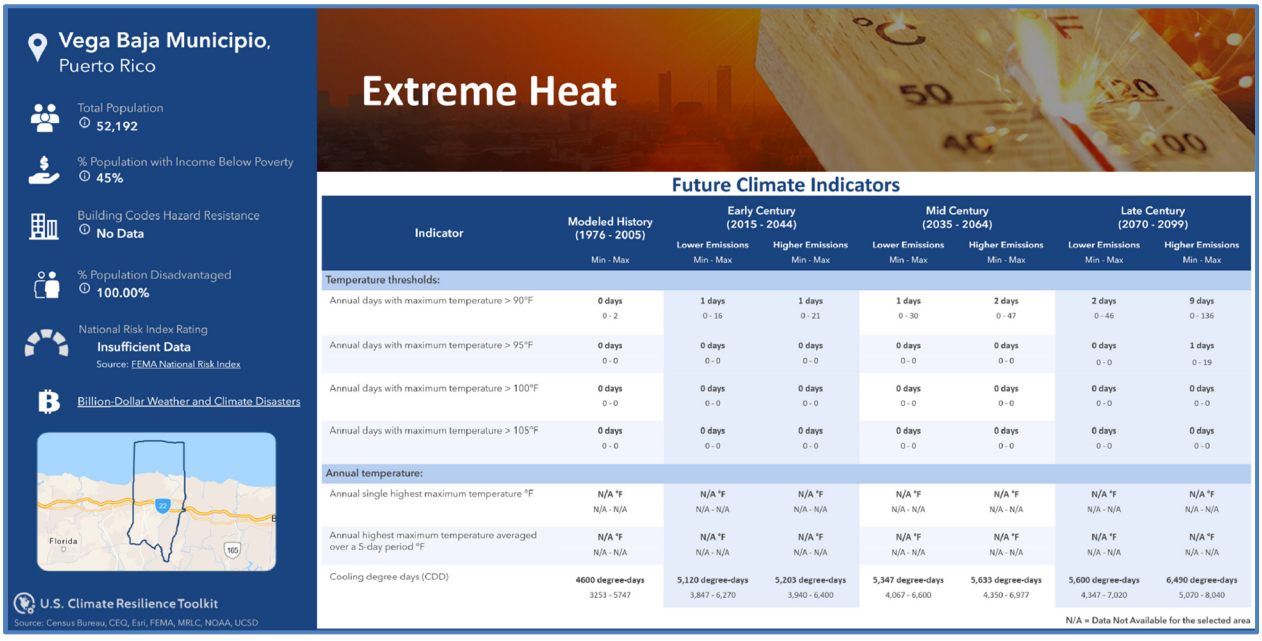


Figure A-3. Risk Factor, Wildfire Risks in the Vicinity of Vega Baja Municipality, PR

Indicator	Modeled History (1976 - 2005) Min - Max	Early Century (2015 - 2044) Lower Emissions Min - Max	Early Century (2015 - 2044) Higher Emissions Min - Max	Mid Century (2035 - 2064) Lower Emissions Min - Max	Mid Century (2035 - 2064) Higher Emissions Min - Max	Late Century (2070 - 2099) Lower Emissions Min - Max	Late Century (2070 - 2099) Higher Emissions Min - Max
Precipitation:							
Days per year with no precipitation (dry days)	**146 days** 30 - 264	**151 days** 30 - 275	**152 days** 28 - 281	**153 days** 27 - 280	**156 days** 25 - 286	**154 days** 25 - 290	**167 days** 23 - 293
Maximum number of consecutive dry days	**N/A days** N/A - N/A	**N/A days** N/A - N/A	**N/A days** N/A - N/A	**N/A days** N/A - N/A	**N/A days** N/A - N/A	**N/A days** N/A - N/A	**N/A days** N/A - N/A
Days per year with precipitation (wet days)	**219 days** 335 - 101	**214 days** 335 - 90	**213 days** 337 - 84	**212 days** 338 - 85	**209 days** 340 - 79	**211 days** 340 - 75	**198 days** 342 - 72
Temperature thresholds:							
Annual days with maximum temperature > 90°F	**0 days** 0 - 2	**1 days** 0 - 16	**1 days** 0 - 21	**1 days** 0 - 30	**2 days** 0 - 47	**2 days** 0 - 46	**9 days** 0 - 136
Annual days with maximum temperature > 100°F	**0 days** 0 - 0	**0 days** 0 - 0	**0 days** 0 - 0	**0 days** 0 - 0	**0 days** 0 - 0	**0 days** 0 - 0	**0 days** 0 - 0

N/A = Data Not Available for the selected area

Figure A-4. Risk Factor, Extreme Heat Risks in the Vicinity of Vega Baja Municipality, PR



Indicator	Modeled History (1976 - 2005) Min - Max	Early Century (2015 - 2044) Lower Emissions Min - Max	Early Century (2015 - 2044) Higher Emissions Min - Max	Mid Century (2035 - 2064) Lower Emissions Min - Max	Mid Century (2035 - 2064) Higher Emissions Min - Max	Late Century (2070 - 2099) Lower Emissions Min - Max	Late Century (2070 - 2099) Higher Emissions Min - Max
Temperature thresholds:							
Annual days with maximum temperature > 90°F	**0 days** 0 - 2	**1 days** 0 - 16	**1 days** 0 - 21	**1 days** 0 - 30	**2 days** 0 - 47	**2 days** 0 - 46	**9 days** 0 - 136
Annual days with maximum temperature > 95°F	**0 days** 0 - 0	**0 days** 0 - 0	**0 days** 0 - 0	**0 days** 0 - 0	**0 days** 0 - 0	**0 days** 0 - 0	**1 days** 0 - 19
Annual days with maximum temperature > 100°F	**0 days** 0 - 0	**0 days** 0 - 0	**0 days** 0 - 0	**0 days** 0 - 0	**0 days** 0 - 0	**0 days** 0 - 0	**0 days** 0 - 0
Annual days with maximum temperature > 105°F	**0 days** 0 - 0	**0 days** 0 - 0	**0 days** 0 - 0	**0 days** 0 - 0	**0 days** 0 - 0	**0 days** 0 - 0	**0 days** 0 - 0
Annual temperature:							
Annual single highest maximum temperature °F	**N/A °F** N/A - N/A	**N/A °F** N/A - N/A	**N/A °F** N/A - N/A	**N/A °F** N/A - N/A	**N/A °F** N/A - N/A	**N/A °F** N/A - N/A	**N/A °F** N/A - N/A
Annual highest maximum temperature averaged over a 5-day period °F	**N/A °F** N/A - N/A	**N/A °F** N/A - N/A	**N/A °F** N/A - N/A	**N/A °F** N/A - N/A	**N/A °F** N/A - N/A	**N/A °F** N/A - N/A	**N/A °F** N/A - N/A
Cooling degree days (CDD)	**4600 degree-days** 3253 - 5747	**5,120 degree-days** 3,847 - 6,270	**5,203 degree-days** 3,940 - 6,400	**5,347 degree-days** 4,067 - 6,600	**5,633 degree-days** 4,350 - 6,977	**5,600 degree-days** 4,347 - 7,020	**6,490 degree-days** 5,070 - 8,040

N/A = Data Not Available for the selected area

Figure A-5. Risk Factor, Coastal Inundation Risks in the Vicinity of Vega Baja Municipality, PR

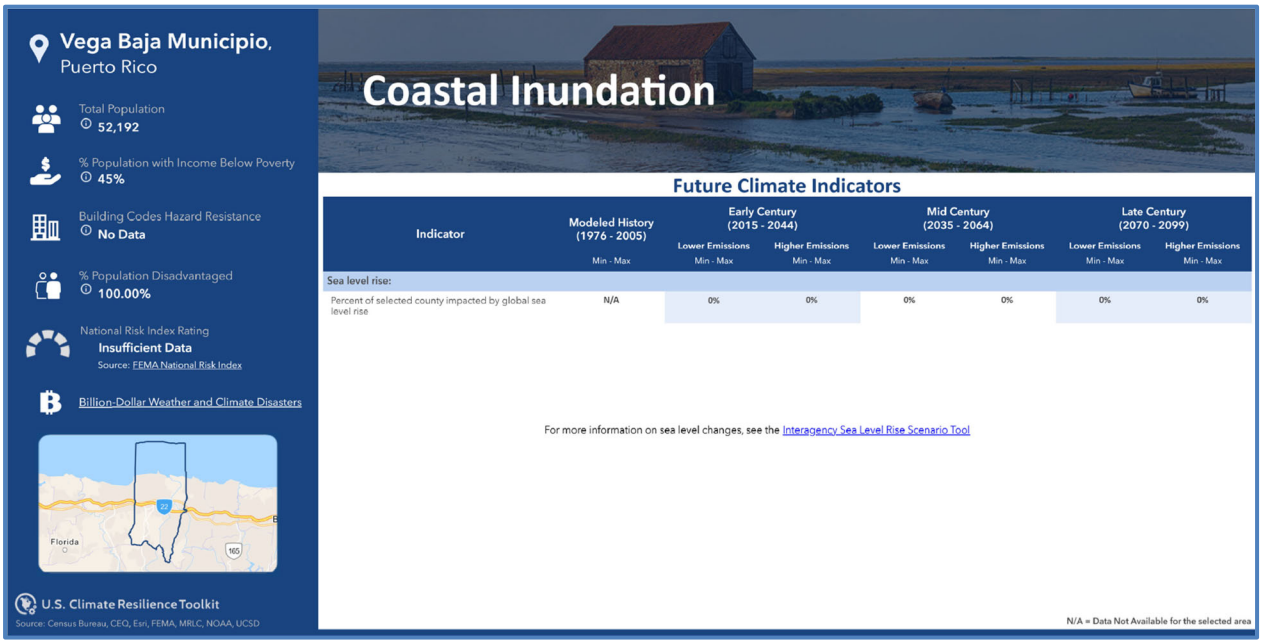


Figure A-6. Risk Factor, Sea Level Rise Risks in the Vicinity of Vega Baja Municipality, PR

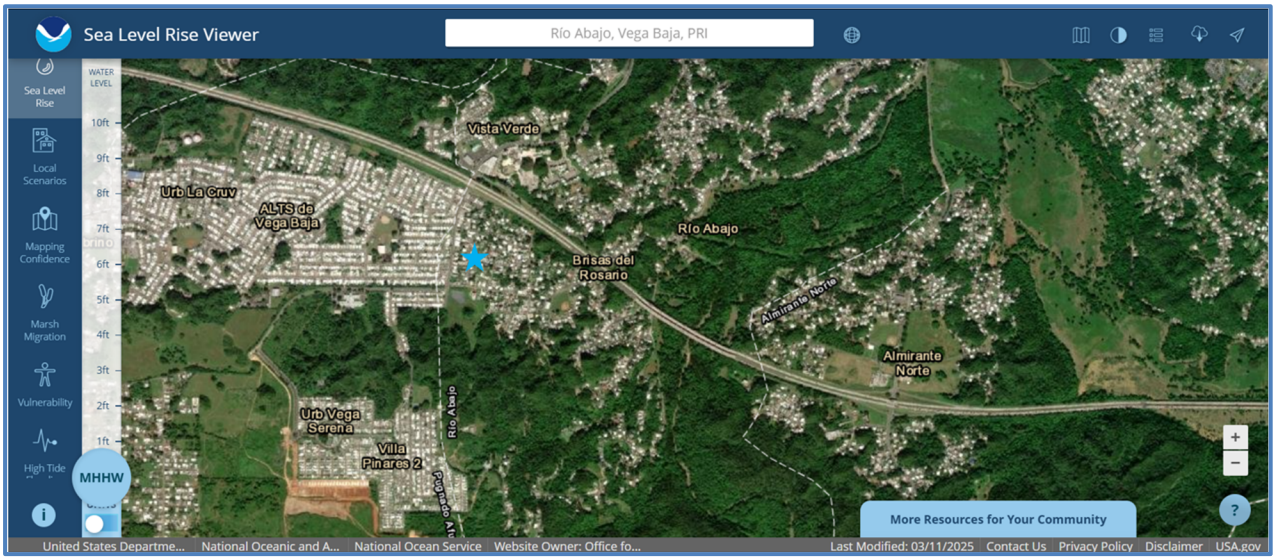


Figure A-7. Risk Factor, Sea Level Rise Risks in the Vicinity of Vega Baja Municipality, PR

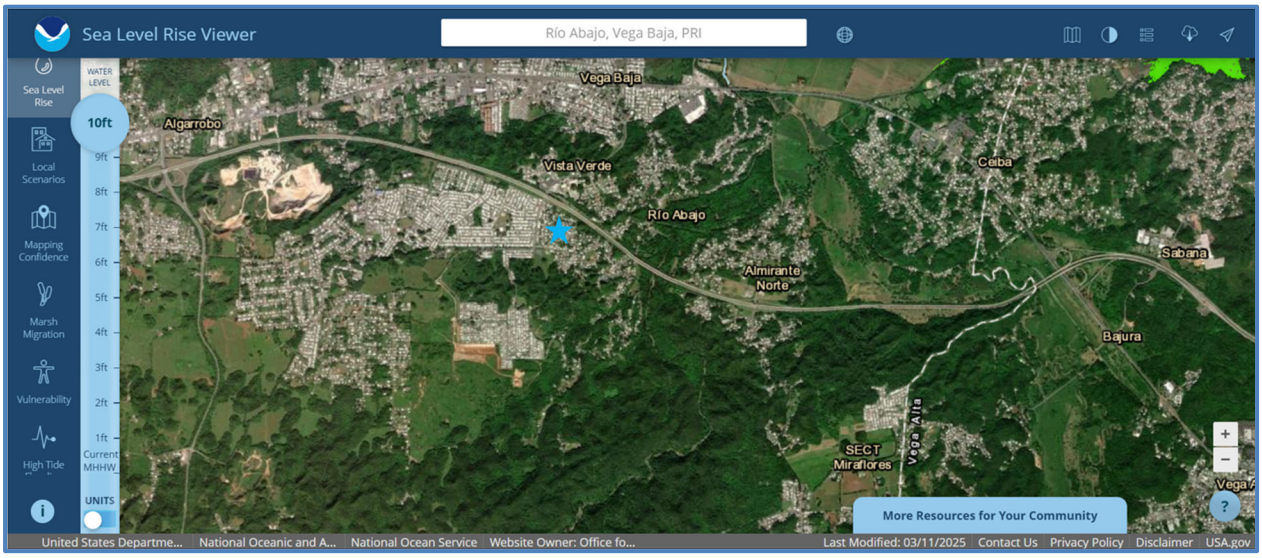


Figure A-8. Risk Factor, Landslide Potential in the Vicinity of Vega Baja Municipality, PR

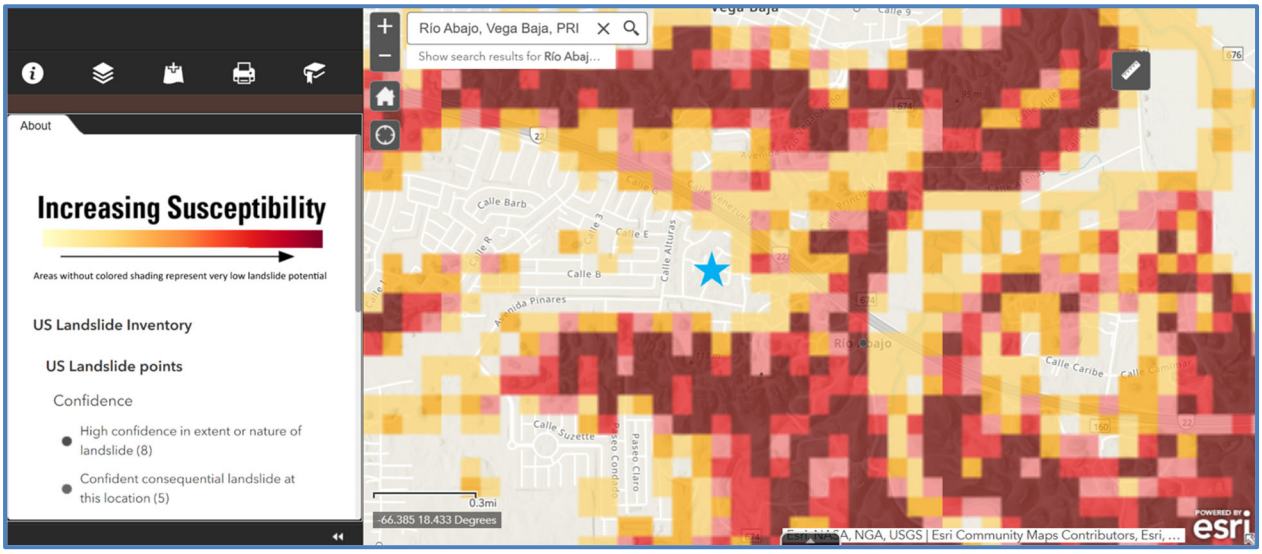


Figure A-9. Risk Factor, Landslide Potential in the Vicinity of Vega Baja Municipality, PR