

Proven Practices for Puerto Rico Address Data Management

Puerto Rico Address Data Working Group (PRADWG)
Report to the Federal Geographic Data Committee (FGDC)
Address Subcommittee

June 27, 2019

Introduction.....	3
1. Background.....	3
a. Disaster Recovery and Preparedness.....	3
b. Hurricanes Irma and Maria.....	3
c. Challenges with Puerto Rico Address Data.....	3
d. Puerto Rico Address Data Workshop, October 2018.....	4
e. Puerto Rico Address Data Working Group (PRADWG).....	4
2. Purpose Statement.....	4
a. Purpose of this Report.....	5
b. Participating Federal Agencies.....	5
c. Proven Practices Template.....	5
3. Agency Reports.....	6
a. Use Data As Is.....	7
i. Federal Emergency Management Agency.....	7
b. Custom Tools and Processes.....	7
i. Census Bureau.....	7
ii. U.S. Postal Service.....	8
iii. U.S. Army Corps of Engineers.....	8
c. Third Party Data or Services.....	9
i. Department of Housing and Urban Development.....	9
ii. U.S. Department of Agriculture.....	9
4. Conclusion.....	10

Appendices:

1. Department of Housing And Urban Development (HUD) Proven Practices
2. Federal Emergency Management Agency (FEMA) Proven Practices
3. U. S. Army Corps of Engineers (USACE)-National Structure Inventory (NSI) Proven Practices
4. U.S. Census Bureau Proven Practices
5. U.S. Department of Agriculture (USDA)-Farm Service Agency Program Proven Practices
6. U.S. Postal Service (USPS) Proven Practices (DRAFT)
7. Available Resources, Activities, and Standards for Managing Puerto Rico Addresses

Introduction:

The Puerto Rico Address Data Working Group (PRADWG), formed on March 20, 2019, has produced an inventory of federal agency proven practices for collecting, managing, and sharing Puerto Rico addresses. This effort is the result of multiple agency submissions during the 90-120 day lifecycle period of the [PRADWG Charter](#) (approved by vote on May 3, 2019). The following report is a summary of these proven practices presented to the Federal Geographic Data Committee's (FGDC's) Address Subcommittee for their consideration as recommended proven practices. Individual agency proven practices submissions are included in the appendices to this report.

1. Background:

- a. Disaster Recovery and Preparedness: As Hurricane Irma headed for the U.S. island territories in the Caribbean in the early days of September 2017, Federal Emergency Management Agency staff realized that the absence of island-wide authoritative address data would require modifications of standard geospatial practices and procedures to carry out response and recovery efforts. Prior to Hurricane Irma, Puerto Rico's most recent disaster declarations were Hurricane Irene and Tropical Storm Maria. Since that time, FEMA performed preliminary damage assessments using aerial photography, in order to provide early assistance to households. This enabled households to receive federal aid prior to completing assessments on the ground, particularly for areas that were inaccessible due to storm damage. However, the large number of un-geocoded addresses and lack of a standard addressing system across Puerto Rico meant that aerial assessments for households filing for assistance were often impossible to link to a mailing or location address on the ground.
- b. Hurricanes Irma and Maria: Hurricane Irma was followed less than two weeks later by Hurricane Maria, which severely impacted all of Puerto Rico with a complete shut-down of the power grid, interruption of water supplies, and damage to structures caused by wind, flooding, and landslides. Flooding and landslides also caused extensive damage to the road network, washing out bridges and closing roads all over the island. By the time the major storm and continuing rainfall were over, Puerto Rico had experienced over 42,000 landslides. Almost 470,000 applications for individual assistance were approved by FEMA following these hurricanes.
- c. Challenges with Puerto Rico Addresses Data: Hurricanes Irma and Maria highlighted the challenges for Federal agencies that rely on residential addresses to supply services in Puerto Rico. Relief efforts during the 2017 hurricane season were hampered by the absence of an island-wide system of addressing and the lack of physical addresses for approximately one third of the island. As people registered for assistance, a variety of addressing formats were used within the municipalities, and few were tied to a national address content standard. For example, there were complications from the repeated use of street names within an individual municipality. Required urbanization names were often unavailable, and there were a predominant use of P.O. Boxes, mail stops, and kilometer markers instead of a street address or geographic location. Aerial surveys of damage could quantify overall damage, but these damages could often not be

geocoded or linked to an address. Local guides accompanied damage inspectors and “blue roof”¹ teams to homes, but with a compromised road network from washouts and landslides, travel to some locations was challenging. All of these circumstances delayed needed services to survivors in distress.

- d. Puerto Rico Address Data Workshop, October 2018 – Recognizing the need for a federal response to the addressing challenges in Puerto Rico, the White House National Science and Technology Council’s Subcommittee on Disaster Reduction (SDR) hosted the Puerto Rico Address Data Workshop on October 3, 2018 at the Eisenhower Executive Office Building (EEOB) in Washington, DC with 39 participants from 12 federal agencies. The agenda for the workshop featured nine presentations by federal agencies on their address data management methodologies and processes for Puerto Rico address data. The U.S. Census Bureau, U.S. Department of Agriculture (USDA), Federal Emergency Management Agency (FEMA), Department of Housing and Urban Development (HUD), and the National Aeronautics and Space Administration (NASA) presented insights and lessons learned from their internal management of Puerto Rico address data. The discussions at the workshop focused on the challenges, successes, and proposed solutions for utilizing and managing Puerto Rico address data. Specific actions from this workshop identified the need to organize a dedicated working group for Puerto Rico address data. The Puerto Rico Address Data Workshop Minutes and the 2019 Puerto Rico Address Data Inventory are available on the Puerto Rico Address Data Working Group Community Page on the GeoPlatform: <https://communities.geoplatform.gov/ngda-address/puerto-rico-address-data-working-group/>.
- e. Puerto Rico Address Data Working Group (PRADWG) - The PRADWG was organized by the Executive Champion, Gregory Hanks (Census Bureau) in March 2019 as a subgroup of the Federal Geographic Data Committee (FGDC) Address Subcommittee to inventory and document proven practices for managing Puerto Rico address data. The kickoff meeting of the PRADWG involved 31 participants from 10 agencies and occurred at the EEOB in Washington, DC on April 2, 2019. At the meeting, opening remarks from Nancy Potok, the Chief Statistician of the United States at the U.S. Office of Management and Budget (OMB) affirmed the need for interagency collaboration on Puerto Rico address data. She noted the PRADWG’s alignment with the Federal Data Strategy (FDS), and relevance to the Geospatial Data Act, the Foundations for Evidence-Based Policymaking Act (Evidence Act), and the Open, Public, Electronic, and Necessary (OPEN) Government Data Act. This working group has met regularly over the last 120 days as specified in their governing charter, to discuss and compare data assets, maintenance processes, address data use cases, and proven practices. This report, *Proven Practices for Puerto Rico Address Data Management*, is a result of these efforts.

2. **Purpose Statement:** The purpose statement for the PRADWG is to provide a structured approach to identifying, documenting, and socializing a collection of federal proven practices in Puerto Rico address data management. The following three goals are associated with this purpose statement:

¹ Operation Blue roof is a program managed by USACE on behalf of FEMA to help protect property and allow residents to stay in their homes after a natural disaster by providing temporary roofs. These blue plastic sheeting or tarp roofs are designed to last approximately 30 days until permanent repairs can be made to eligible homes.

- Promote agency collaboration, transparency, and strategic prioritization in the federal address collection and management process for Puerto Rico;
 - Document use cases representing the various agency requirements for collecting and maintaining Puerto Rico address data; and
 - Align with the goals of the FGDC Address Theme and Subcommittee to contribute to the National Geospatial Data Infrastructure (NSDI).
- a. Purpose of this Report: The PRADWG’s charter specified a 90-120 day lifecycle to identify, document, and socialize a federal agency report on proven practices for Puerto Rico Address Data Management and accompanying materials to the FGDC Address Committee. During the development lifecycle of this report, member agencies met regularly to document individual address data use cases and proven practices. The findings of this proven practices report were presented to the 16 voting member agencies of the PRADWG during a joint meeting with the Address Subcommittee on June 27, 2019.
- b. Participating Federal Agencies: The following agencies provided proven practices documentation for this report :
- HUD
 - FEMA
 - USACE
 - Census Bureau
 - USDA
 - USPS
- c. Proven Practices Template (see Table 1): All members of the PRADWG were invited to complete a proven practices survey relating to their experiences with managing Puerto Rico address data. Each participating agency took different approaches to meeting this objective. Each agency answered questions that were provided in the template (*see Appendices 1-6*).

Table 1

Organization	<i>Name of organization</i>
Point of Contact:	<i>Name Title Email address Phone Number</i>
Proven Practice in a Tweet	<i>Your Proven Practice in 140 characters or less</i>
Submitted On	<i>Date of Submission</i>
Challenge or Opportunity	<ul style="list-style-type: none"> • <i>What problem are you trying to solve?</i> • <i>How is this problem related to the mission of your agency or agencies?</i> • <i>Include project or product history that is relevant, data that demonstrates the scope of the problem, and/or images, including</i>

	<p><i>legacy product images (subject to governing disclosure requirements), which help explain the problem.</i></p> <ul style="list-style-type: none"> • <i>Do other federal data practitioners face similar/related challenges or opportunities?</i>
Solution or Output	<p><i>Please describe your Proven Practice in detail here.</i></p> <ul style="list-style-type: none"> • <i>Be clear on the status: implemented or proposed</i> • <i>Solution description, including:</i> <ul style="list-style-type: none"> ○ <i>Data model/framework and data methods, new or already in use</i> ○ <i>Data access mechanism</i> ○ <i>Datasets involved, both acquired and generated</i> ○ <i>Data platforms or systems, analytics, visualization tools and practices used/developed</i> • <i>Outputs, directly produced from this project or product, including documentation, etc.</i>
Impacts – Focus on Outcomes	<ul style="list-style-type: none"> • <i>Internal improvements: How this solution, if fully implemented, successfully benefits the sponsor? The federal government as a whole? The targeted user groups?</i> • <i>Public-facing: Beyond the value to your agency, help us understand how the impact of this project will be seen and felt by affected policy-makers and residents of Puerto Rico.</i>
Impact Measurements – Qualitative and Quantitative	<ul style="list-style-type: none"> • <i>Include user stories, relevant research, customer citations, and</i> • <i>Identify key metrics (realized or for future) including market indicators etc.</i>
Lessons Learned	<i>The goal is to share and use knowledge derived from experience, both positive and negative, to promote the recurrence of desirable outcomes and preclude the recurrence of undesirable outcomes.</i>
Tips on how to Replicate	<i>Actions, resources or access required to replicate the work</i>
Additional information	<i>Please feel free to attach any relevant diagrams or images.</i>

3. **Agency Reports:** The reporting identified the challenges encountered with Puerto Rico’s address data by each federal agency surveyed, and presented potential solutions and opportunities for collaboration within the federal government to manage these challenges with existing systems and applications. Categories of proven practices emerged from the agency reports submitted. These reports show a variety of practices used to build address databases to support the delivery of printed mail or surveys to individuals within Puerto Rico, as well as the distribution of federal aid to households and farmers following the 2017 hurricane season. These proven practices for collecting, managing and sharing Puerto Rico address data are summarized in Table 2.

Table 2

Agency	a. Use Data As Is	b. Custom Tools and Processes	c. Third Party Data or Services
HUD	x		x
FEMA	x		
USACE	x	x	x
Census Bureau		x	
USDA		x	x
USPS		x	

As reported by the agencies, these are examples of:

a. Use Data As Is

- i. FEMA: The primary usage of address information is to support Individual Assistance (IA) claims and risk assessments to identify at risk persons and/or property. In Puerto Rico, residents contacted FEMA and reported that they needed assistance. They self-registered mostly by calling the call centers or through online registration.

FEMA collects addresses for the damaged dwelling, as well as contact information (phone and address) for where the applicant is residing at the time of contact. Addresses are entered into a web application either by the call-taker or by the applicant (if online). Data extracts from FEMA recovery assistance program databases, as well as addresses, are stored in a database that tracks the status of the case, and actions required: visits, inspections, payouts, and/or appeals.

Inconsistencies in reported (and recorded) addresses in Puerto Rico required FEMA to use local guides and numerous phone calls to homeowners to find physical locations to conduct at site assessments.

b. Custom Tools and Processes

- i. Census Bureau’s Master Address File: The Census Bureau uses Puerto Rico addresses to support the mailing of the Decennial Census questionnaire, the American Community Survey (ACS), and various other surveys and censuses, as well as to identify specific address locations for enumerators in the field. The address data that the Census Bureau collects links individual names and their survey responses to household locations or addresses, and is therefore protected from disclosure by U.S. Code Title 13. The Census Bureau uses five basic strategies and custom tools to create and maintain a Master Address File (MAF) that includes Puerto Rico addresses. There are over 2,700,000 Puerto Rico MAF addresses, with 1.75M eligible for use in 2020 Census enumeration². The MAF for Puerto Rico is updated frequently with the U.S. Postal Service’s Delivery Sequence

² See Appendix 4, Solution or Output section 4 for a more detailed description of how eligible addresses were determined.

File (DSF) and through use of addresses provided by the Commonwealth. Through the following strategies the Census Bureau is able to maintain an approximately 99 percent success rate in generating valid addresses for use in the its censuses and surveys:

1. Standardize the data: use standardized naming conventions to capture and organize data.
2. Clean the data: reorganize and rearrange address fields and formats to allow software to recognize a wide variety of addresses.
3. Match the data: use a whole address matching solution or algorithm to bolster exact or equivocated match formulas.
4. Maintain data source and history: maintain source and history information to enable longitudinal patterns for comparison and validation by other address sources.
5. Gather data regularly: maintain records and capture change in addresses.

ii. U.S. Postal Service Delivery Sequence File: USPS keeps a current, accurate list of all mailing addresses in the United States. Their mission is stated in Section 101(a) of Title 39 of the U.S. Code, the Postal Reorganization Act: “The Postal Service shall have as its basic function the obligation to provide postal services to bind the Nation together through the personal, educational, literary, and business correspondence of the people. It shall provide prompt, reliable, and efficient services to patrons in all areas and shall render postal services to all communities.” For the entire U.S. including Puerto Rico, USPS addresses are contained in the Address Management System (AMS). The AMS contains addresses that have been validated with local addressing authorities.

1. Addresses in the AMS are regularly updated by carrier knowledge and the Address Change Service (ACS).
2. The DSF that the Census Bureau and other agencies use to validate their own address data is generated from the AMS.

iii. The United States Army Corps of Engineers Structure Inventories: USACE supported Puerto Rico after Hurricane Maria in numerous ways. USACE developed a National Structure Inventory with FEMA. Data to support structure inventories in Puerto Rico is unavailable, and if it does exist, it is not dependable or high-quality. During the time of the 2017 hurricanes, the USACE relied upon aerial photography and personal judgement to evaluate risks posed by various failures in infrastructure. They collected data on “life loss potential” due to major infrastructure failures (i.e., dams). Their modelling efforts required geospatial structure inventories with:

1. Structure classifications: Structure classifications come from the Homeland Infrastructure Foundation-Level Data (HIFLD) version of the CoreLogic™ parcels for the majority of structures. For schools USACE uses the National Center for Education Statistics (NCES) data and the Esri business layer for structure classification for non-residential structures.

2. Valuations - Structure valuations come from a variety of sources much like the structure classifications. In some cases structure values are derived from attributes (non-residential) or based on the improvement value (total value less property value) for residential structures.
3. Populations - Populations are primarily based on the Longitudinal Employer-Household Dynamic (LEHD) data, assigned to each structure based on the structure's classification. In the case of schools, the number of teachers and students are based on the NCES data.

c. Third Party Data or Services

- i. Department of Housing and Urban Development: HUD struggled to provide assistance to necessary sites following Hurricane Maria due to poorly geocoded or incomplete addresses. HUD collected data for 15 percent of addresses in Puerto Rico, of which only 20 percent (3 percent of the total universe) could be validated as legitimate addresses. As a result, HUD sought assistance in cleaning their address databases with the help of Puerto Rico-based firm called Digital Media Creations™ (DMC). The effort improved their validation rate substantially. Their practices are listed below:
 1. Address Cleansing: Employed local subject matter experts from DMC to manually edit existing address content.
 2. Guidance Document: DMC provided this to help HUD personnel and the general public format Puerto Rico addresses.
 3. On-site technical training sessions: Designed to help HUD staff convert Puerto Rico addresses to U.S Postal Service standards (Publication 28).
 4. Recertification program: Reached out to property owners and HUD program participants to modify existing addresses (using DMC output) during their recertification application to participate in HUD programs.

- ii. U.S. Department of Agriculture: The Farm Service Agency's (FSA's) system of record for the address data for producers and farms is called MIDAS CRM (Modernize and Innovate the Delivery of Agricultural Systems Customer Relationship Management). The "Business Partner" component of MIDAS CRM is a web-based registration that is validated against quarterly retrievals of USPS addresses. This generated a 79 percent validation rate of addresses from participants in the program. Most of the applicants visited FSA buildings in person to collect assistance after Hurricane Maria, resulting in a majority of valid addresses collected during recovery efforts. Farm records in MIDAS CRM delineate farm, tract, & field boundaries. Their practices are listed below:
 1. Gather USPS address lists: USPS sends address directories to SAP (Cloud business software company).
 2. Cleansing/Matching: MIDAS CRM downloads USPS address directories from SAP Market Place—refreshed every 3 months.

3. Address Validation: Data is loaded/edited in MIDAS CRM/Business Partner and validated against the most current directory.

4. Conclusion

A collection of proven practices were captured from the agency responses to the survey. Three proven practices were common to all the federal agencies responding to the survey:

- Recognizing the differences in Puerto Rico addresses and accounting for them in the data model (e.g., adding urbanizacion name field)
- Standardizing and cleaning the data whether through manual or automated methods
- Validating the data through fieldwork or a source such as the US Postal Service.

The PRADWG recommends the following actions for the FGDC Address Subcommittee to consider:

- Recommend that all federal agency Puerto Rico address data stakeholders adopt one or more of the proven practices identified in this report, especially the top three proven practices
- Request that federal agencies publish their proven address data practices, tools, and procedures to an open platform
- Recommend a Phase II for the PRADWG to document federal agency requirements for Puerto Rico address data.

Continuing efforts to collaborate and share best practices on collecting, managing, and sharing Puerto Rico address data will further the goal of improved address data, for the federal government, Puerto Rico, and its local governments. This challenge has many facets that require commitment from all stakeholders and careful consideration as solutions are proposed and evaluated.