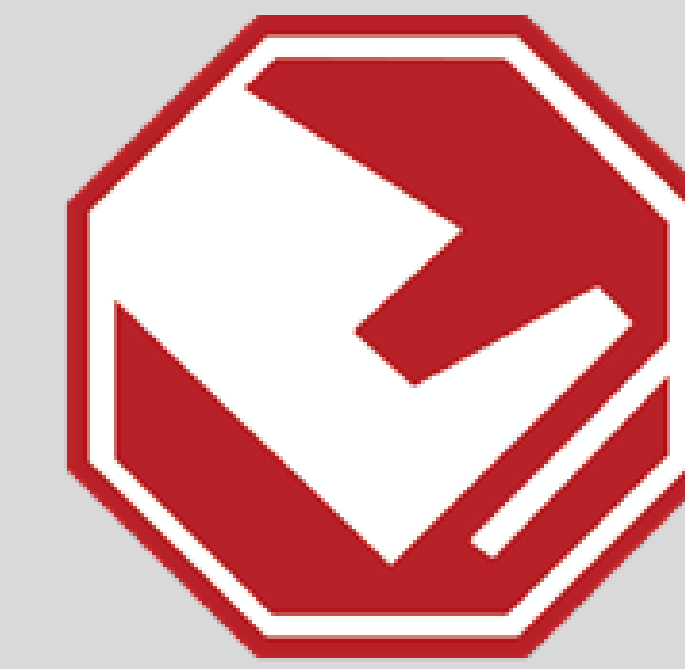




# Integrating Multiple Linear Referencing Methods into a Web-Based GIS for Crash Mapping

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Departamento de Transportación  
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## Introduction

- ◆ Many DOTs use Geographic Information Systems (GIS) to map, manage, and analyze vehicle crashes.
- ◆ Puerto Rico Traffic Safety Commission is developing a tool for crash mapping and analysis.
- ◆ PR DTOP is transitioning to the newly expanded Highway Performance Monitoring System (HPMS) requirement entitled the All Road Network of Linear Referenced Data (ARNOLD).
- ◆ ARNOLD requires all public roads to be on one network, instead of only federally-aided routes.
- ◆ Both agencies are coordinating to develop an enterprise GIS combining crash safety mapping with the HPMS initiative.

## Objectives

Create a linear referenced roadway network capable of handling multiple LRMs on all public routes within Puerto Rico

Use GIS to:

- ◆ Merge existing DTOP route networks
- ◆ Create/transfer multiple linear referencing systems (LRSs)
- ◆ Integrate multiple linear referencing methods (LRMs): route-kilometer, intersection, and link-section

## Methodology

1. Merge existing DTOP route networks using edge-matching techniques

2. Linear Referencing Systems:

Cartographic Shape Length

- Local Routes
- Calculate shape length of routes in segmented network to generate routes

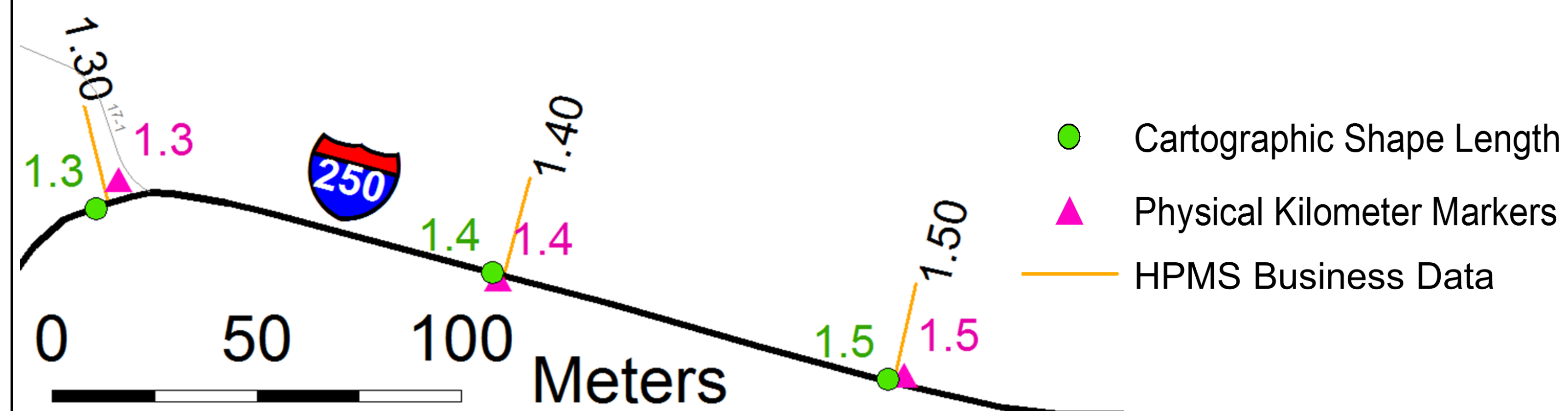
Linear Referenced Roadway Network

Physical Kilometer Markers

- State Routes
- Spatially join markers to segmented line endpoints to transfer kilometer data

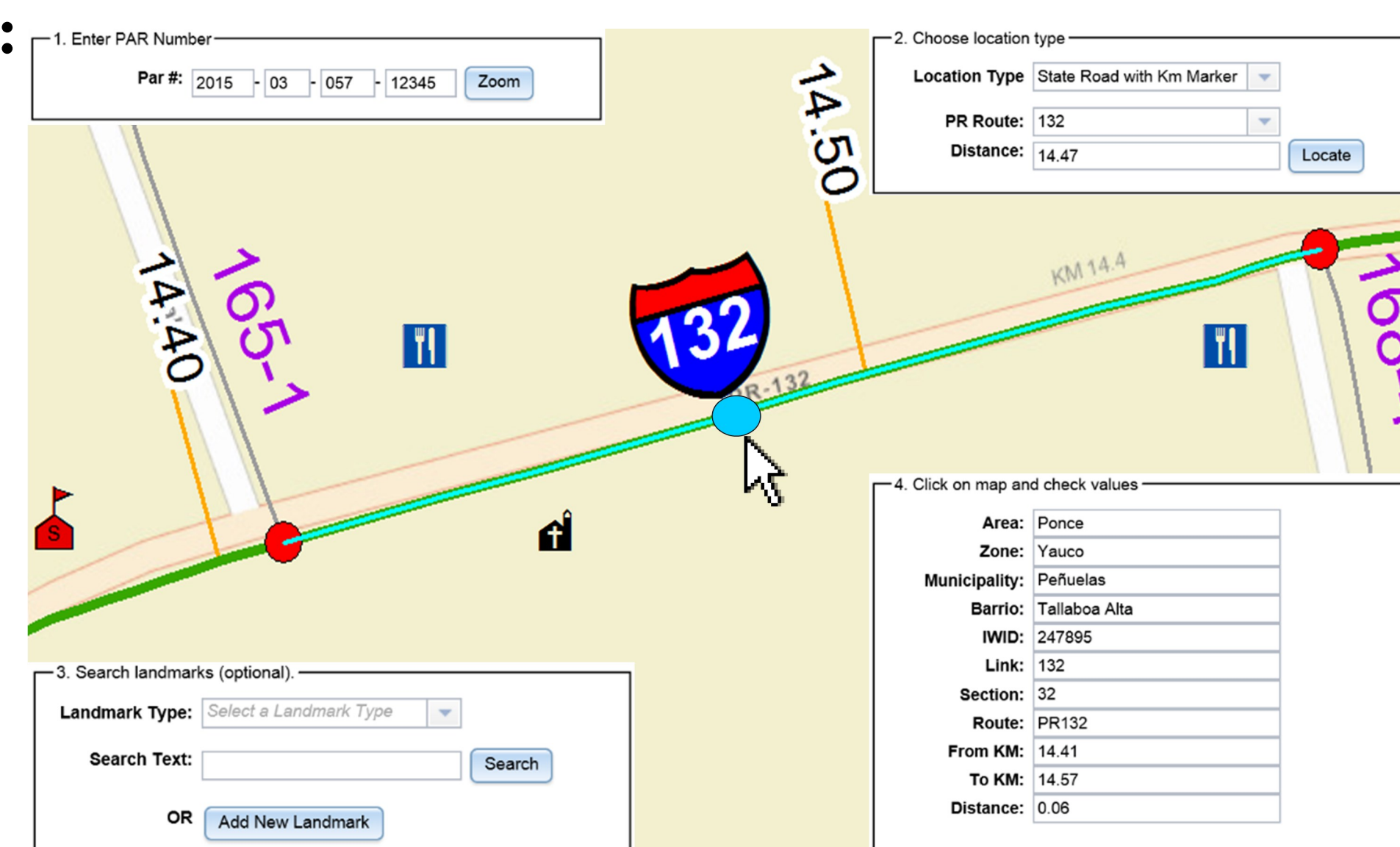
HPMS Business Data

- State Routes and Historic Data
  - Transfer HPMS data from DTOP state route layer to segmented network
- Hatch Mark → Annotation → Point Shapefile → Spatial Join
- QA/QC kilometer posts
  - Generate routes



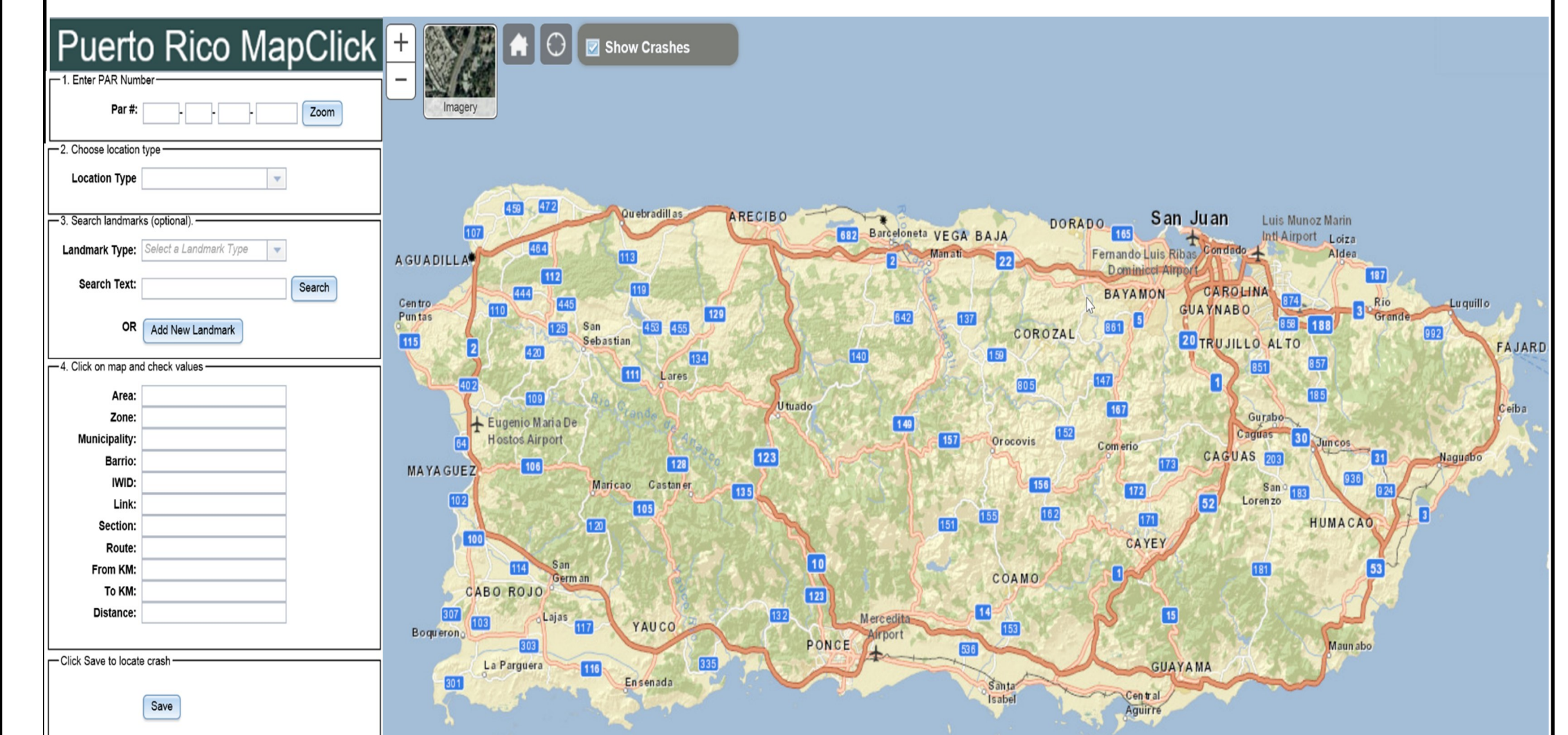
3. Linear Referencing Methods:

- ◆ State-state intersection
- ◆ State-local intersection
- ◆ Local-local intersection
- ◆ State route w/kilometer
- ◆ Road with section number
- ◆ Road w/o kilometer or section
- ◆ Unknown



## Results and Conclusions

Both state routes and local roads are included in a linear referenced roadway network. Layer can be used for both the HPMS initiative and crash safety mapping.



## Future Work

- ◆ Use web portal to map crashes and HPMS business data
- ◆ Use open source data to supplement missing road names
- ◆ Create topology to allow routing and improve data management and integrity

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