

Automating Guardrail Warrant Analysis with RSA 3D

Kentucky Transportation Cabinet Embankment & Guardrail Warrant Analysis

Using existing LIDAR data, RDV Systems helped KYTC automatically analyze 122.7 roadway miles to identify potential guardrail warrants and support proactive safety planning.



122.7
ROADWAY MILES
ANALYZED



12
ROADWAY
SEGMENTS



~4 HOURS
ANALYSIS
TIME



The Challenge

Roadside embankments can create significant safety concerns when vehicles leave the roadway. Evaluating these conditions requires measurements of shoulder geometry, embankment height and slope, and distance from the roadway. While traditional field and office methods are effective, they can be difficult to scale across large highway networks.

KYTC needed a way to use existing LIDAR data to:

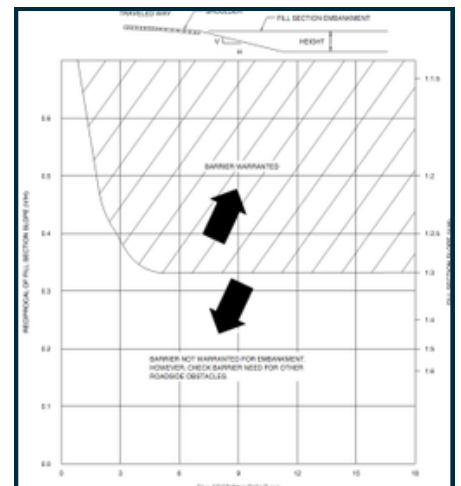
- Automatically measure roadside geometry
- Consistently apply Kentucky-specific guardrail warrant criteria
- Rapidly analyze large roadway networks
- Provide GIS-ready results
- Support engineering judgment



The RSA 3D Solution

RDV Systems configured RSA 3D using Kentucky-specific embankment and guardrail evaluation criteria to automate analysis across 122.7 roadway miles.

Using mobile LiDAR already collected by KYTC, RSA 3D transformed millions of LiDAR points into measurable roadway cross sections and automatically evaluated pavement, shoulders, embankment height, slope, and distance from the roadway.

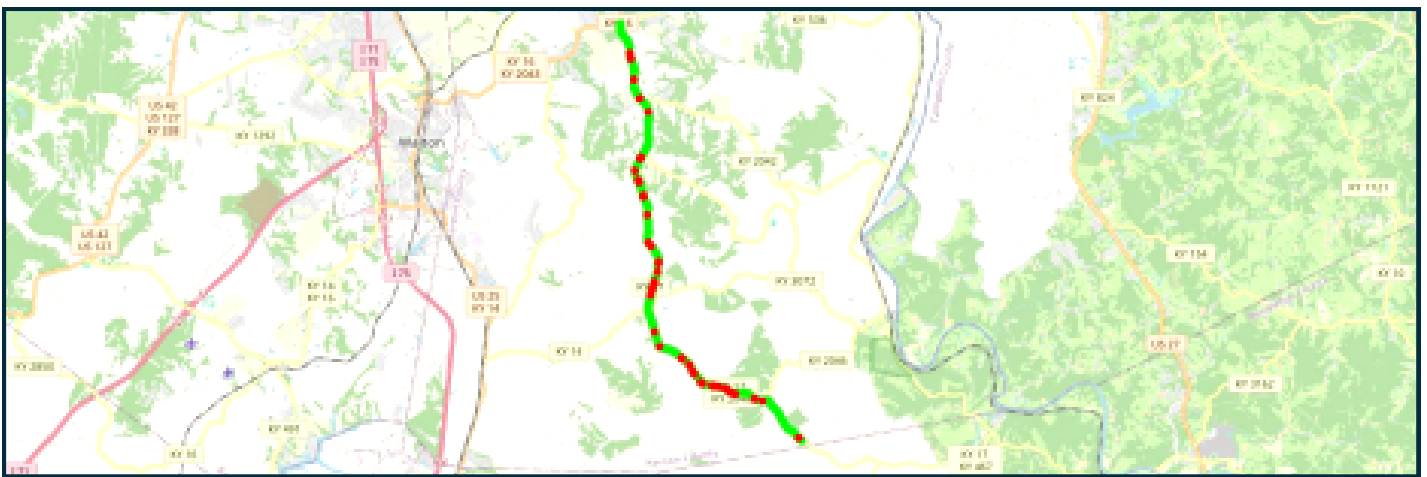


**Comparative Barrier Consideration
for Embankment (U.S. Customary
Units)**

Results and Safety Impact

RSA 3D identified 389 guardrail warrant segments totaling 8.98 miles across 122.7 roadway miles analyzed.

Roadside geometry was evaluated at 10-foot intervals in both travel directions, providing a detailed and consistent assessment of embankment conditions. Rather than manually reviewing large volumes of LIDAR data, KYTC received a dataset identifying specific locations where measured conditions met the defined guardrail warrant criteria. This allowed engineers to focus their review on data-identified locations and provided an objective foundation for comparing and prioritizing potential safety improvements.



Guardrail warrant segments identified in red across the analyzed roadway network

Engineering-Ready Deliverables

RDV provided results in formats designed to support engineering, GIS, planning, and safety workflows, including:



Summary of Findings Report



GIS Shapefiles and Comma-Delimited Data



Browser-Based Reports



Detailed Cross-Sectional Measurements

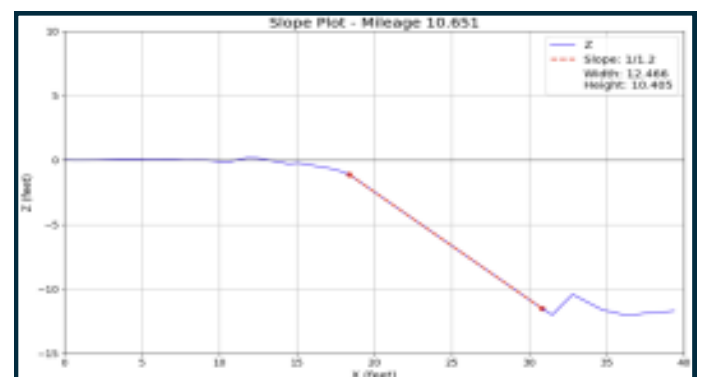
Summary of RSA-3D Findings

RSA-3D Existing Analysis

RDV performed several 3D simulations for the existing roadway conditions to determine if there were any safety concerns. The following section provides an overview of the findings from each simulation.

Below are the segments identified by the RSA-3D simulations with potential Embankment Slope/Height issues. The table identifies the location for the segment along the corridor

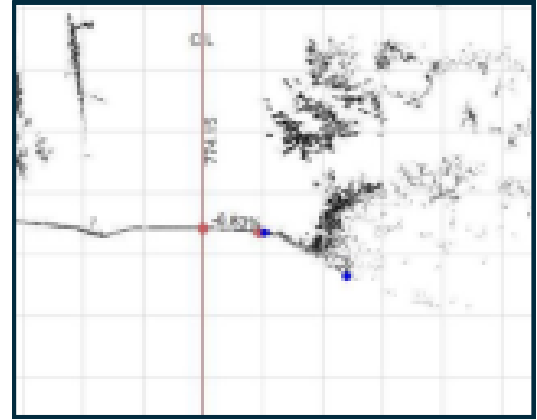
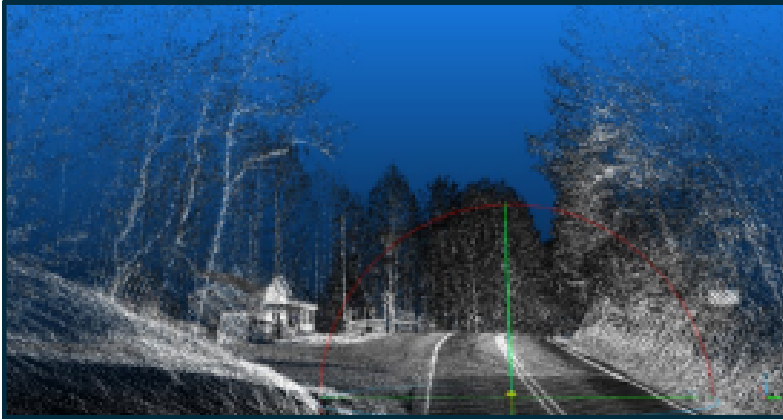
Length (feet)	Direction	From Mile	To Mile	First Slope	Report
100 FEET	P	0.0871	0.1061	1/2.5	Link
90 FEET	P	1.2538	1.2708	1/2.2	Link
130 FEET	P	1.6458	1.6705	1/1.9	Link
70 FEET	P	1.7140	1.7273	1/2.2	Link





Turning Existing Data into New Safety Intelligence

The pilot demonstrated how transportation agencies can gain greater value from existing LiDAR investments. Data originally collected for mapping and asset management can also support automated roadway safety analysis - allowing agencies to evaluate more roadway consistently while reducing manual review.



Model and cross section from LIDAR for analysis

From Corridor Analysis to Network-Level Screening

RSA 3D demonstrated the potential to extend automated analysis beyond individual corridors to larger roadway networks. By applying consistent criteria across large datasets, agencies can identify potential deficiencies, focus engineering resources, and prioritize locations for further investigation.

Why RSA 3D?

RSA 3D transforms LiDAR and roadway data into actionable safety intelligence by automating complex geometric measurements and applying agency-specific evaluation criteria within a repeatable 3D environment. The platform helps agencies identify potential deficiencies, focus engineering review, prioritize improvements, and make more informed, data-driven roadway safety decisions.

Beyond embankment analysis, RSA 3D can also evaluate sight distance, horizontal and vertical curves, flat spots, vertical clearance, shoulder geometry, and other roadway safety conditions.

See RSA 3D in Action

Discover how RSA 3D can support your roadway safety program



CONTACT RDV SYSTEMS