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250

 RPUG  
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**HONORING THE PAST. PAVING THE FUTURE.**

# AUTOMATED CRACK LENGTH ESTIMATION

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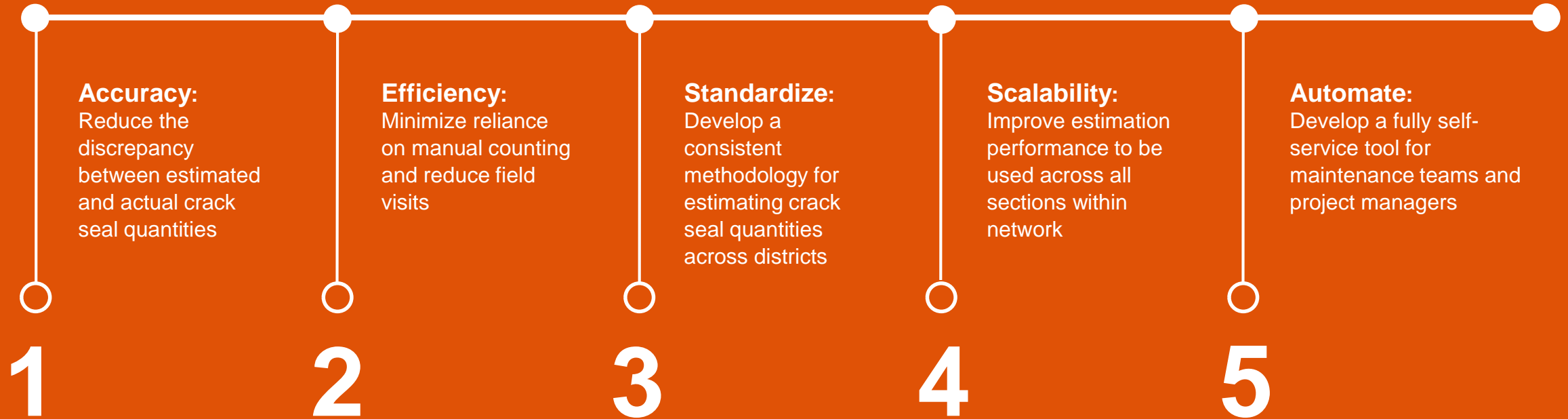




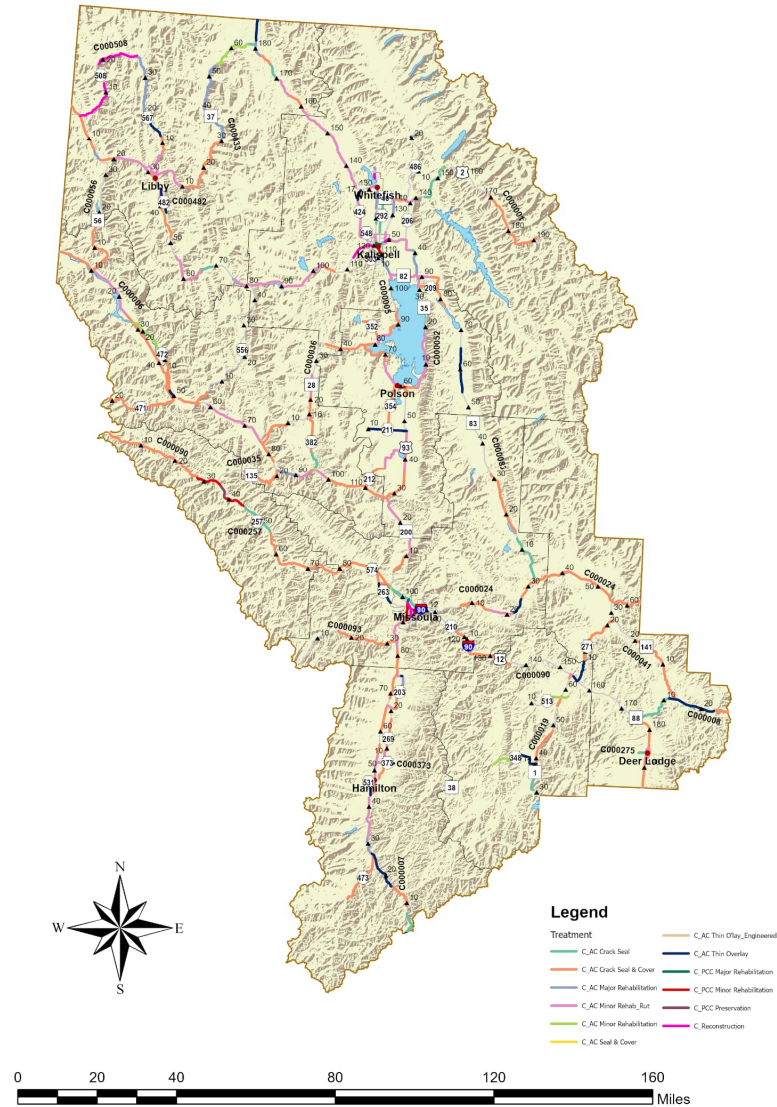
## The Challenge of Crack Estimation

- Crack seal estimation has historically been inconsistent and inaccurate at MDT. Projects have both overran and underrun by over 50% in the past.
- Survey methods vary from windshield surveys to manual counts via online roadway image viewer.
- No standardized, repeatable approach statewide.

# Project Goals



# District 1 Treatment Recommendations 2025

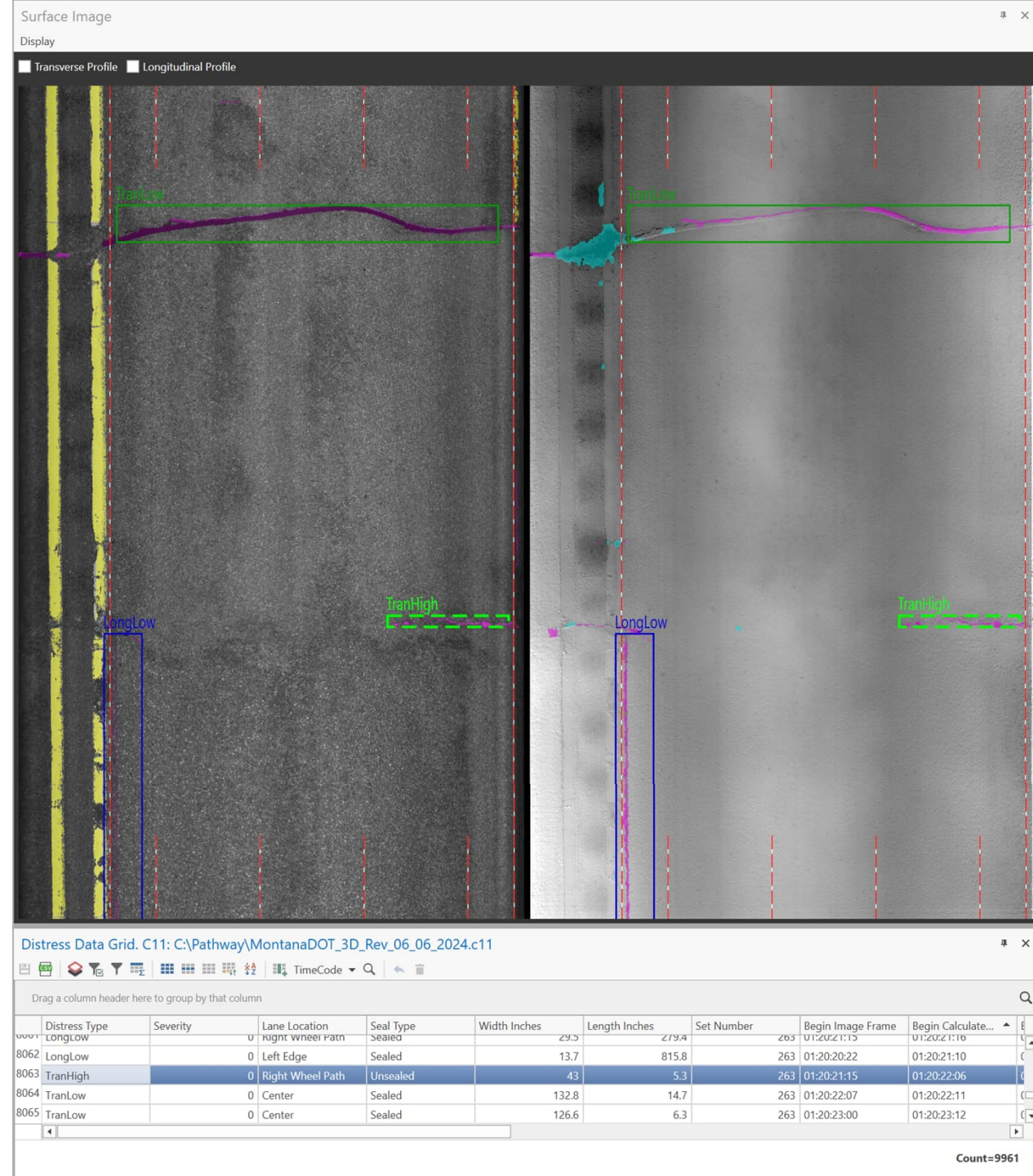


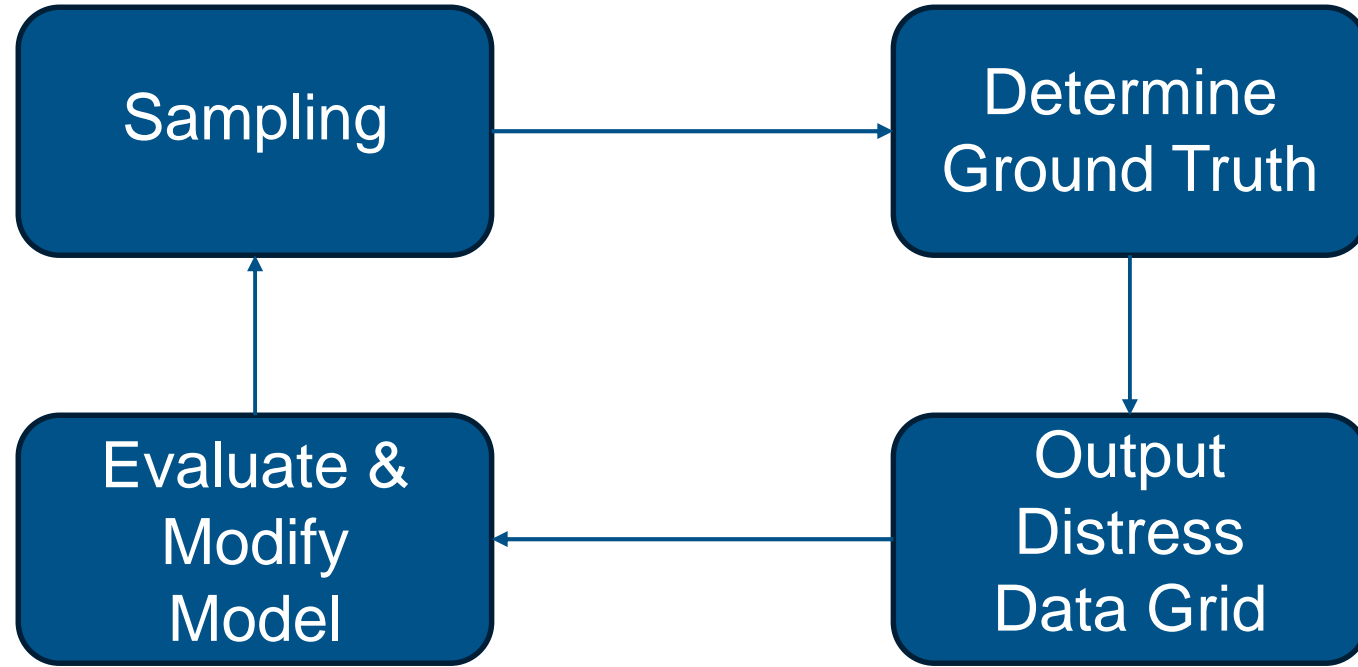
## Leverage Existing Data

- Pavement Management collects 3D surface imagery on all state-maintained roads annually (~24,000 miles).
- Includes laser profiles, distress imagery, and georeferenced data.
- Processed using vendor software from Pathway Services.

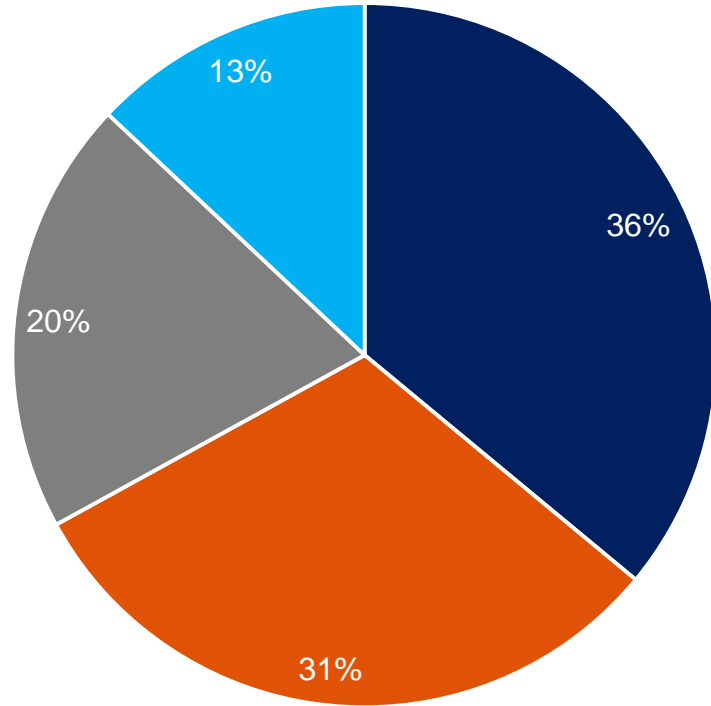
# Key Data Sources

- Utilize our distress rating output file (Distress Data Grid) in conjunction with our ALTIS database (Advanced Linear Transportation Information System) to begin estimation





## Project Methodology



■ Interstate ■ Primaries ■ Secondaries ■ Urban

## Sampling

- 100 random tenth-mile sections selected via stratified random sampling (Interstate, Primary, Secondary, Urban).

# Ground Truth Measurements



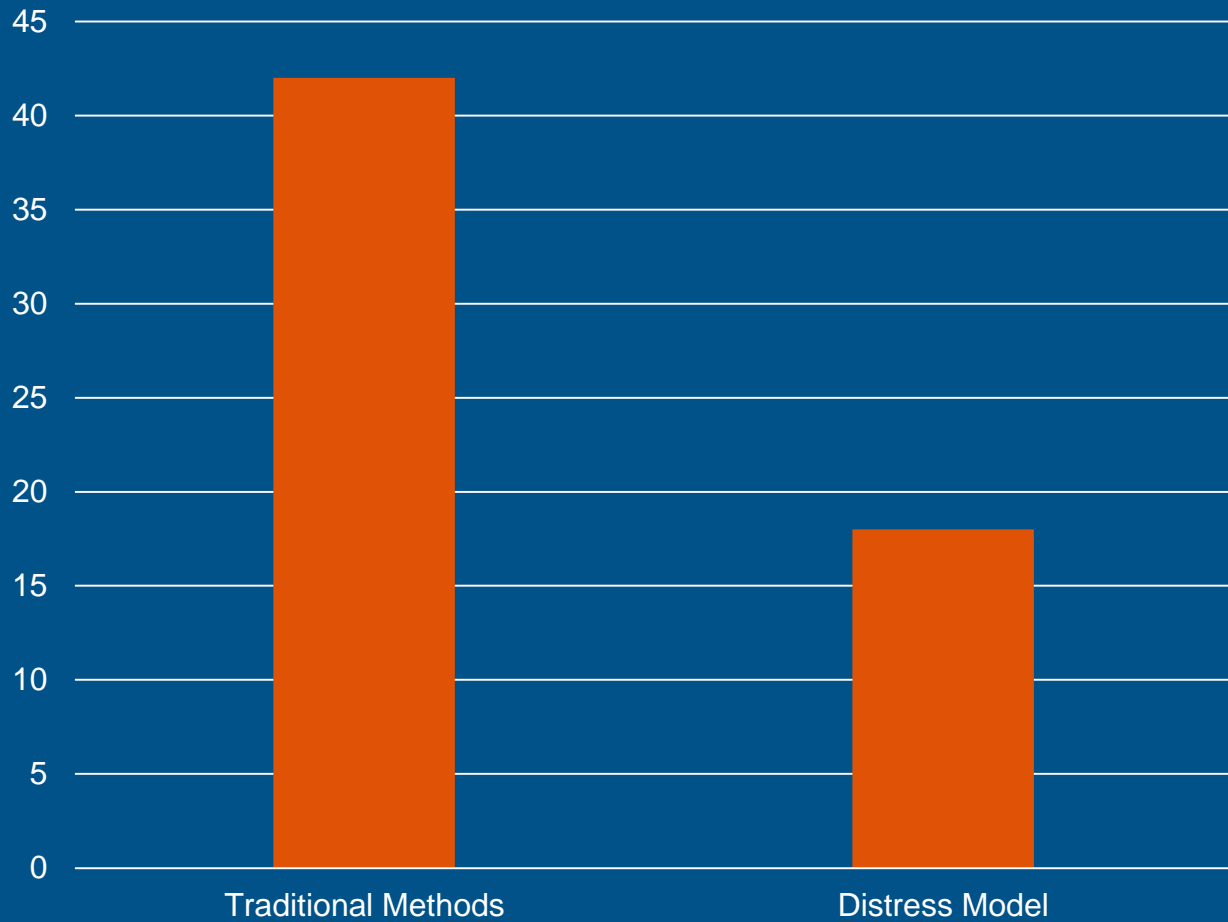
- Ground truth measured manually in PathView, using ROW imagery to identify cracks extending into shoulders.
- Shoulder lengths added using LiDAR or ALTIS measurements.
- Distress Data Grid outputs adjusted using model parameters for likely full-lane or shoulder-spanning cracks.

Metric	Value	Notes
<b>Crack Identification Accuracy</b>	92%	<p><b>Definition:</b> The percentage of cracks correctly identified compared to ground truth (number of correct detections ÷ total cracks).</p> <p><b>Purpose:</b> It measures AutoCrack's ability to detect the presence of cracks, regardless of length. High identification accuracy ensures that cracks are not being systematically missed.</p>
<b>Total Crack Length Accuracy</b>	94%	<p><b>Definition:</b> The ratio of AutoCrack's total measured crack length to the total ground truth length across all sections.</p> <p><b>Purpose:</b> While total length accuracy shows aggregate performance, it can mask section-level variability, which is why we also use per-section metrics.</p>
<b>Unsealed Total Accuracy</b>	92%	<p><b>Definition:</b> Similar to total crack length accuracy but restricted to unsealed cracks only.</p> <p><b>Purpose:</b> Sealed cracks present unique detection challenges, so separating them helps isolate the performance on untreated surfaces, where accuracy is generally expected to be higher.</p>
<b>Mean Average Percent Error (w/o outliers)</b>	17.9%	<p><b>Definition:</b> The average of the absolute percentage errors between AutoCrack and ground truth, calculated per section.</p> <p><b>Purpose:</b> MAPE is sensitive to section-level deviations, making it a better indicator of real-world reliability. A 17.9% MAPE shows AutoCrack is typically close to ground truth, with room for calibration improvements.</p>
<b>Mean Average Percent Error (with outliers)</b>	36.6%	<p><b>Definition:</b> Same as above, but includes sections where input errors or extreme misclassifications occurred.</p> <p><b>Purpose:</b> Including outliers shows worst-case scenarios and emphasizes the need for improving data inputs and thresholds.</p>

## Model Performance

- Accuracy within ~18% of manual ground truth.
- Significant improvement over previous manual estimation methods.
- This estimate will likely improve with consistent use from project managers.

Average Percent Error



## Results

The results indicate an estimation technique that is an improvement on traditional methods.

However, there is still room for improvement.



**“Don’t let perfect be the enemy of good”  
-Voltaire**

## Crack Seal Estimation Tool (Prototype)

Corridor / Route ID

e.g., I-90

Surface Type

Select Type

Begin RP

e.g., 134.562

End RP

e.g., 139.870

Include Sealed Cracks?

Select Option

Include Centerline Crack?

Select Option

Estimate Crack Lengths

### End Product

- A tool that allows project managers to enter their project area and retrieve total linear feet of cracks, fill quantities and a breakdown of crack types.
- This will provide a standardized, data-driven estimate for crack seal planning.



# Q&A

## Contact

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