Development of Simplified Mechanistic-Empirical Design Tool for Pennsylvania Rigid Pavements

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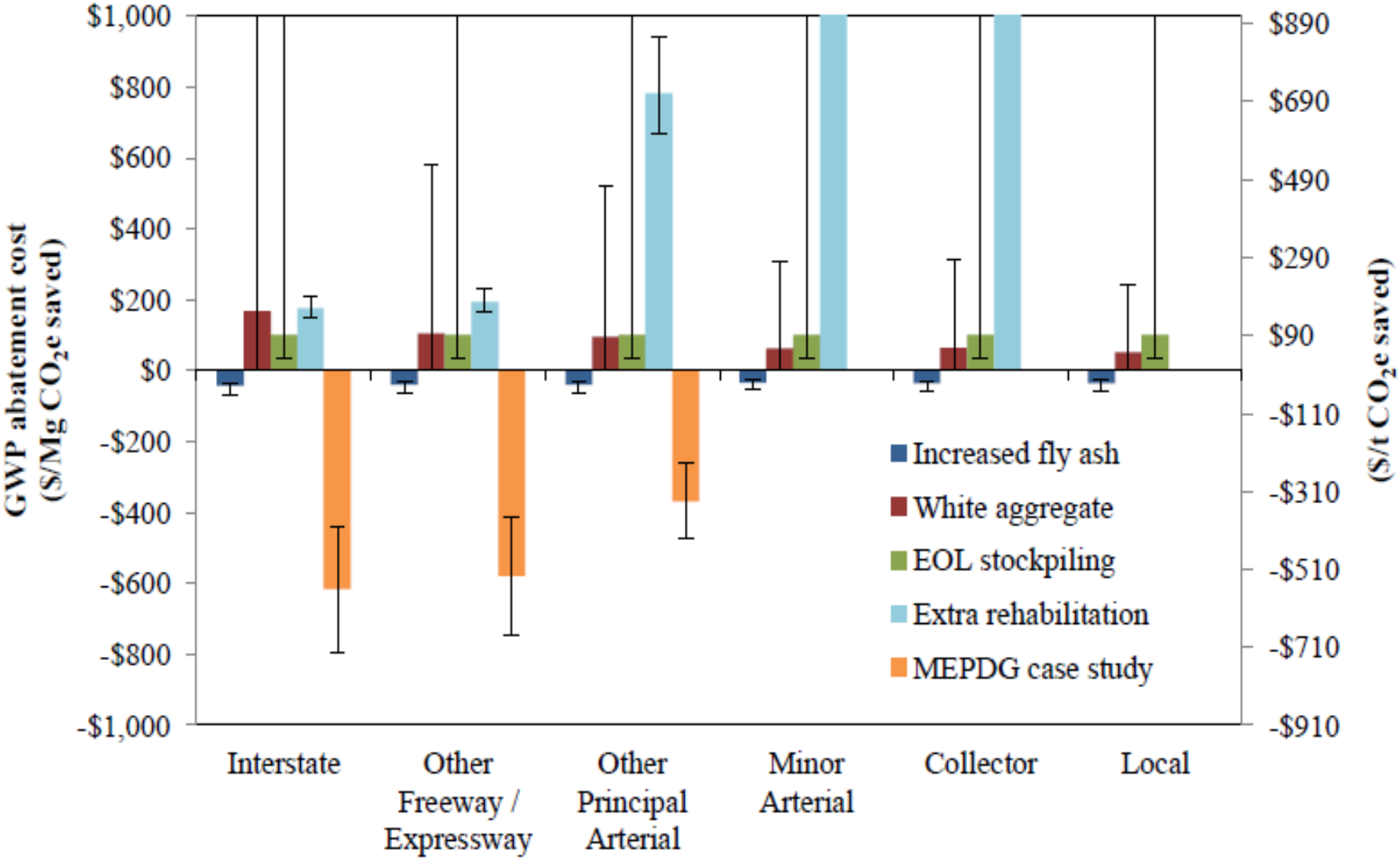
The Research Problem

- The current Pennsylvania design method for rigid pavements is outdated
  - AASHTO 93-based procedure (1960-s technology)
  - Not cost-effective: many empirical evidences of overdesign built into AASHTO 93
- Pennsylvania is considering a transition to AASHTO ME design, which requires the user:
  - to provide many inputs thus increasing possibilities of the design errors
  - to use AASHTOWare Pavement ME software with annual license fees

Why AASHTO ME Design?



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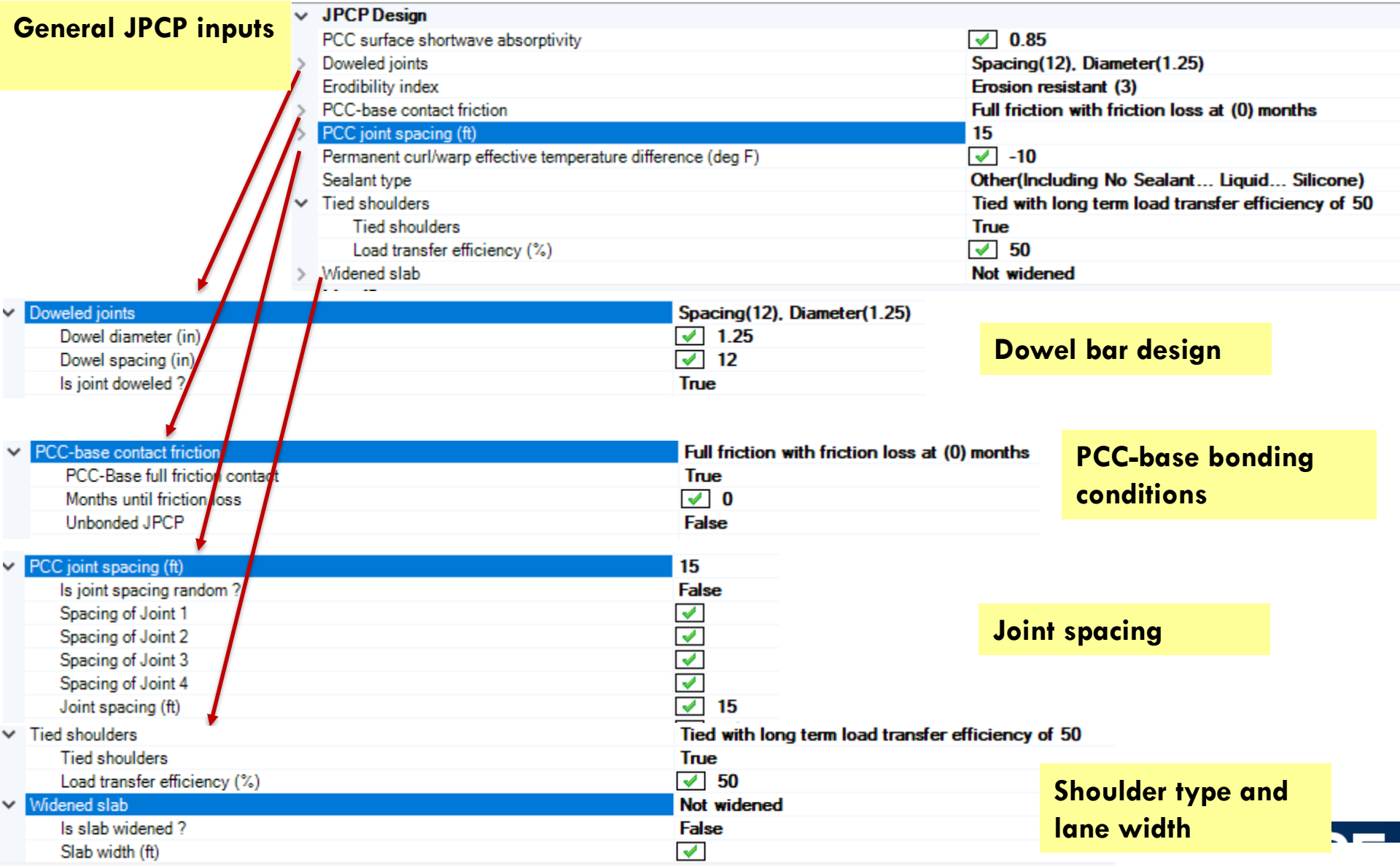
Pavement ME JPCP Design Inputs

General JPCP inputs



Dowel bar design

PCC-base bonding conditions

Joint spacing

Shoulder type and lane width

Research objectives

- Provide effective, localized design tool to Pennsylvania pavement engineers compatible with the AASHTOWare Pavement ME program similar to MnPAVE Rigid, the tool used by MnDOT
- Accelerate implementation of the AASHTO Mechanistic-Empirical Pavement Design Guide (MEPDG)
- Reduce potential of design errors from the improper use of the AASHTOWare Pavement ME software
- Reduce or eliminate license fees required to perform MEPDG design using the AASHTOWare Pavement ME software

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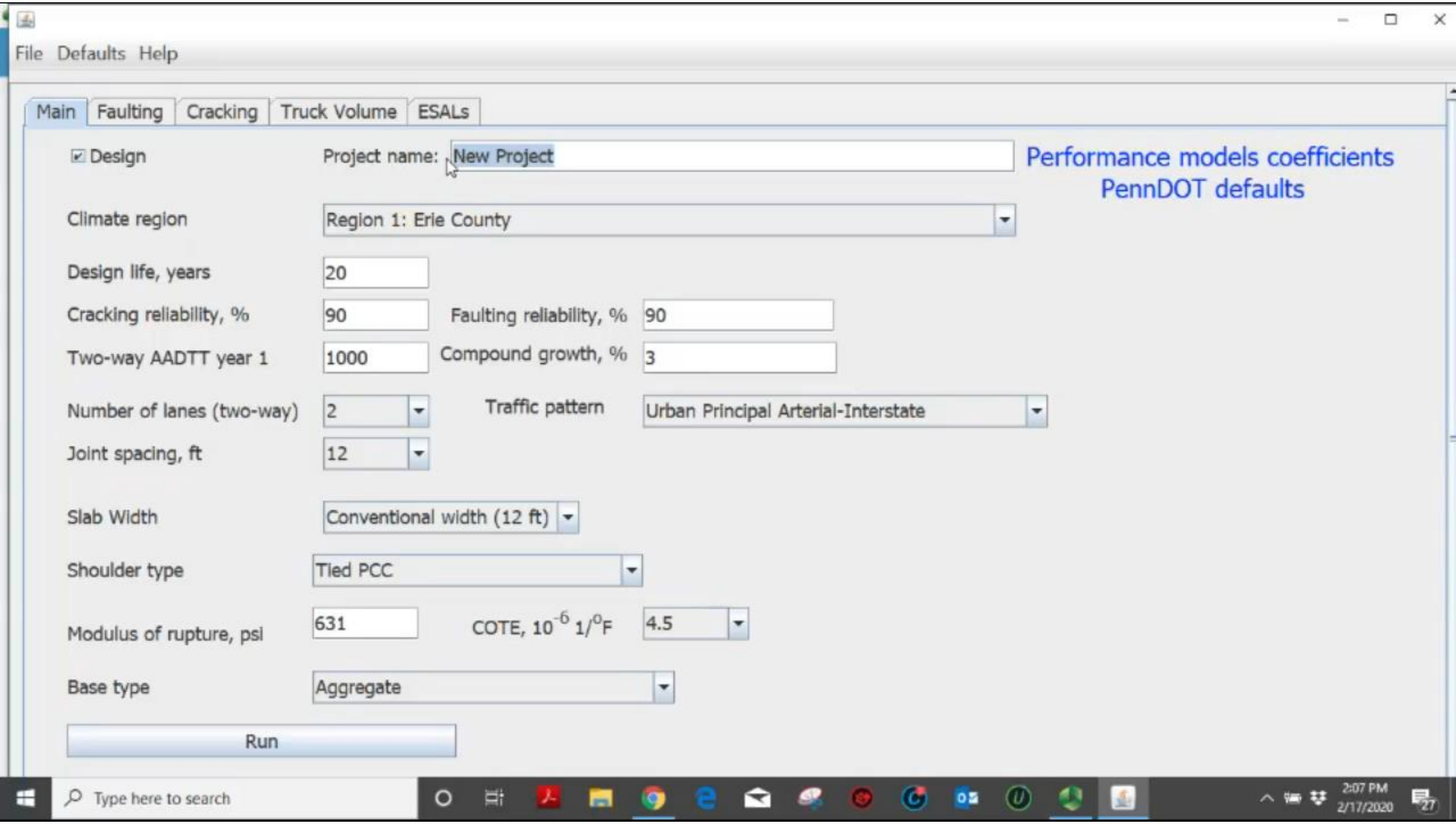
Project Approach/Deliverables

- ❑ Task 1. Literature and Software Review and Sensitivity Analysis
- ❑ Task 2: Perform Pavement ME Factorial and Develop Simplified Design Tool, PittRigid-ME
- ❑ Task 3: Conduct PittRigid-ME Verification
- ❑ Task 4: Final Report


File Defaults Help
Main Faulting Cracking Truck Volume ESALs
Design
Project name: New Project
Performance models coefficients
PennDOT defaults
Climate region
Region 1: Erie County
Design life, years
20
Cracking reliability, %
90
Faulting reliability, %
90
Two-way AADTT year 1
1000
Compound growth, %
3
Number of lanes (two-way)
2
Traffic pattern
Urban Principal Arterial-Interstate
Joint spacing, ft
12
Slab Width
Conventional width (12 ft)
Shoulder type
Tied PCC
Modulus of rupture, psi
631
COTE, 10-6 1/°F
4.5
Base type
Aggregate
Run
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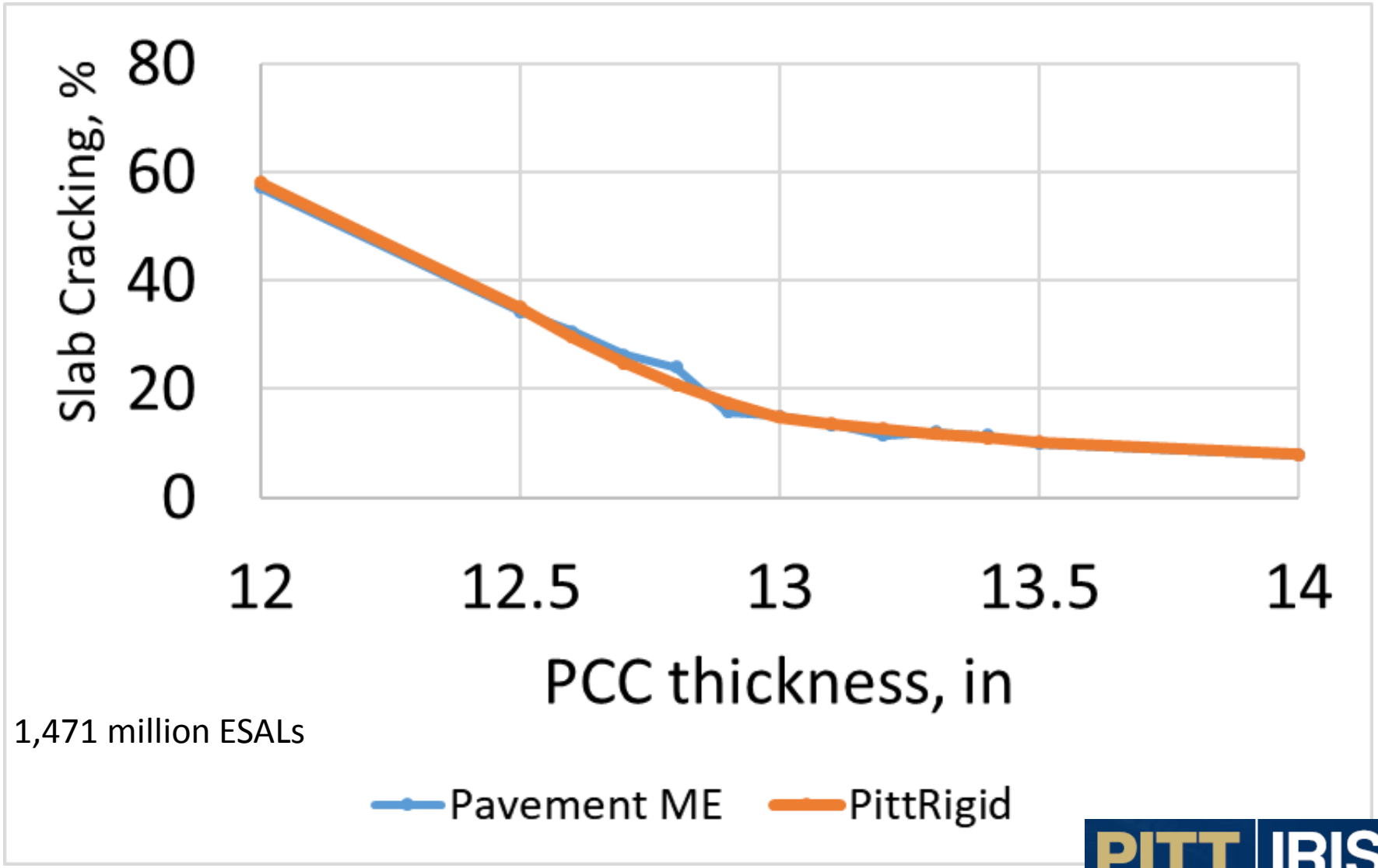
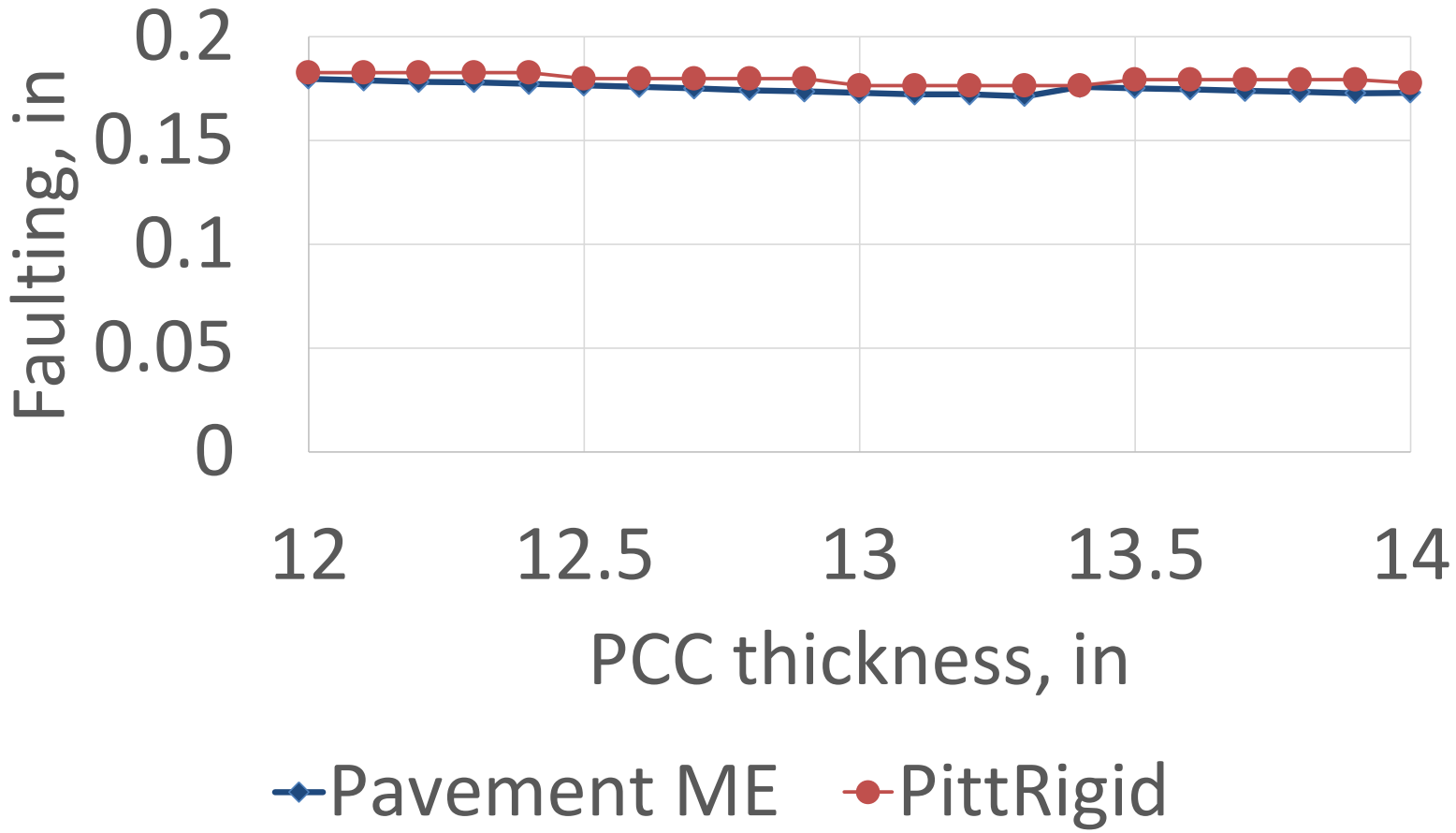
Comparison of Cracking Predictions



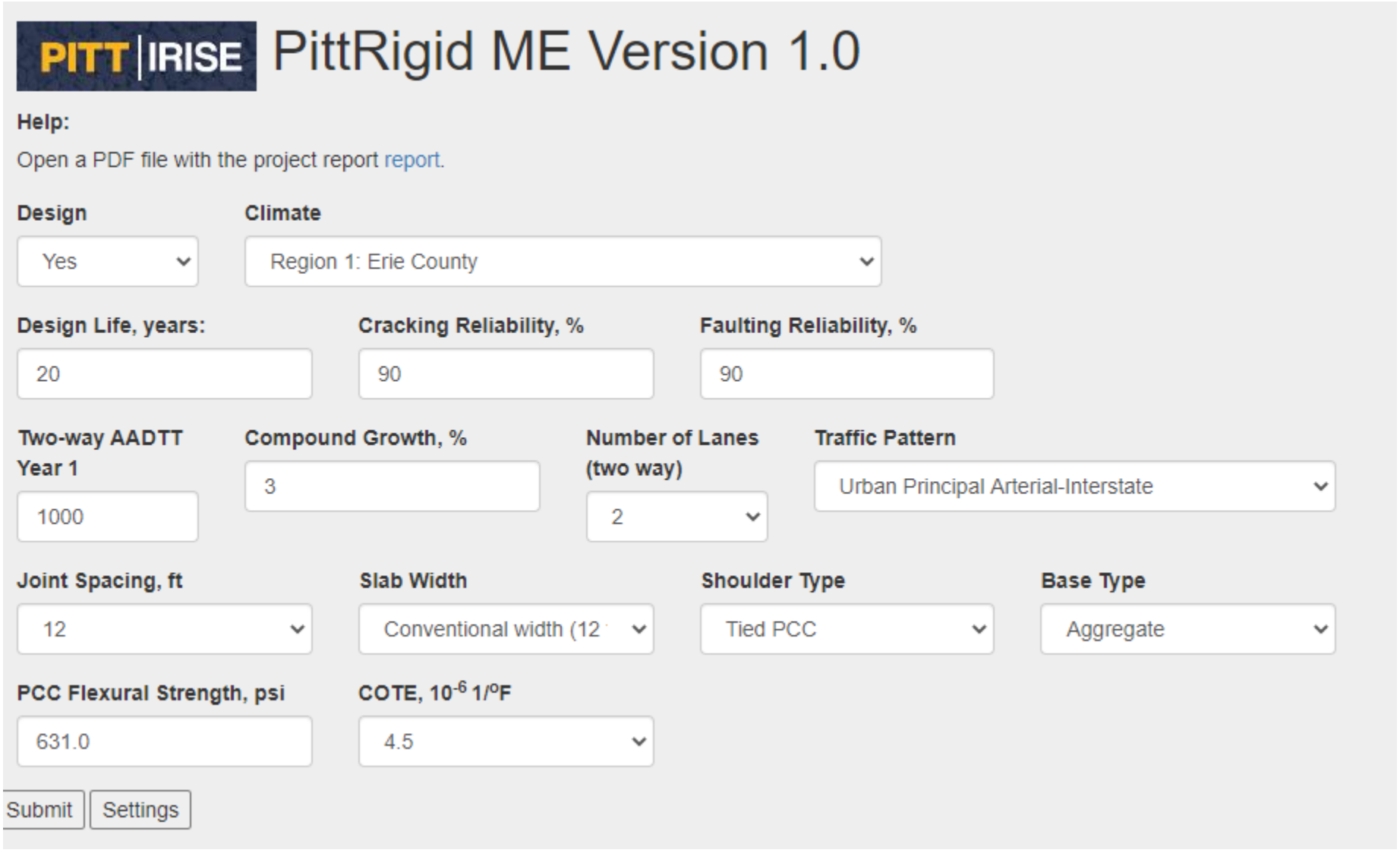
Comparison of Faulting Predictions



260 million ESALs

Web-Based Version

https://pittrigid.azurewebsites.net/



Application of Research Results

- Design of new concrete pavements
- Implementation of the AASHTO ME design procedure for concrete pavements in Pennsylvania without software license fees
- Simplification of design and reduction of design errors
- Pavement type selection
- Improvement/local calibration of AASHTO ME for Pennsylvania conditions