Improve I-70 -
The Crystal Ball of Core Samples

IMPROVE I-70

Improve I-70 Pr

- Program Schedule and Proce
- Evaluate Existing Structure C
  - Subgrade and Base Evaluatio
  - Pavement Evaluation
  - Innovation in Pavements


ST0070 I-70 Phase 1
Pavement Core #1, Westbound, Mile 133.6
Legend
Pavement Core (PC)
E ABC Ln
E ABC Ln
PC1-WB-OS
PC1-WB-PL
PC1-WB-IS
133
Interstate 70 Dr SE

Subgrade Properties

Soil Classification- AASHTO or Unified Soil Classification

- Average Atterberg Limits (LL – 44, PL-17, and PI-27)
- Soil Gradation (80% minus #200)
- Average Moisture Content – 24%

General classification	Silt-clay materials (more than 35% of total sample passing No. 200)			
Group classification	*A-4*	*A-5*	*A-6*	*A-7* *A-7-5** *A-7-6†*
Sieve analysis (percent passing)				
No. 10				
No. 40				
No. 200	36 min.	36 min.	36 min.	36 min.
Characteristics of fraction passing No. 40				
Liquid limit	40 max.	41 min.	40 max.	41 min.
Plasticity index	10 max.	10 max.	11 min.	11 min.
Usual types of significant constituent materials	Silty soils		Clayey soils	
General subgrade rating	Fair to poor			

*For A-7-5, $PI \leq LL - 30$
†For A-7-6, $PI > LL - 30$

FINE-GRAINED SOILS
(50% or more of material is smaller than No. 200 sieve size.)

SILTS AND CLAYS Liquid limit less than 50%		ML	Inorganic silts and very fine sands, rock flour, silty of clayey fine sands or clayey silts with slight plasticity
		CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
		OL	Organic silts and organic silty clays of low plasticity
SILTS AND CLAYS Liquid limit 50% or greater		MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts
		CH	Inorganic clays of high plasticity, fat clays
		OH	Organic clays of medium to high plasticity, organic silts
HIGHLY ORGANIC SOILS		PT	Peat and other highly organic soils

Soil Strength Parameters

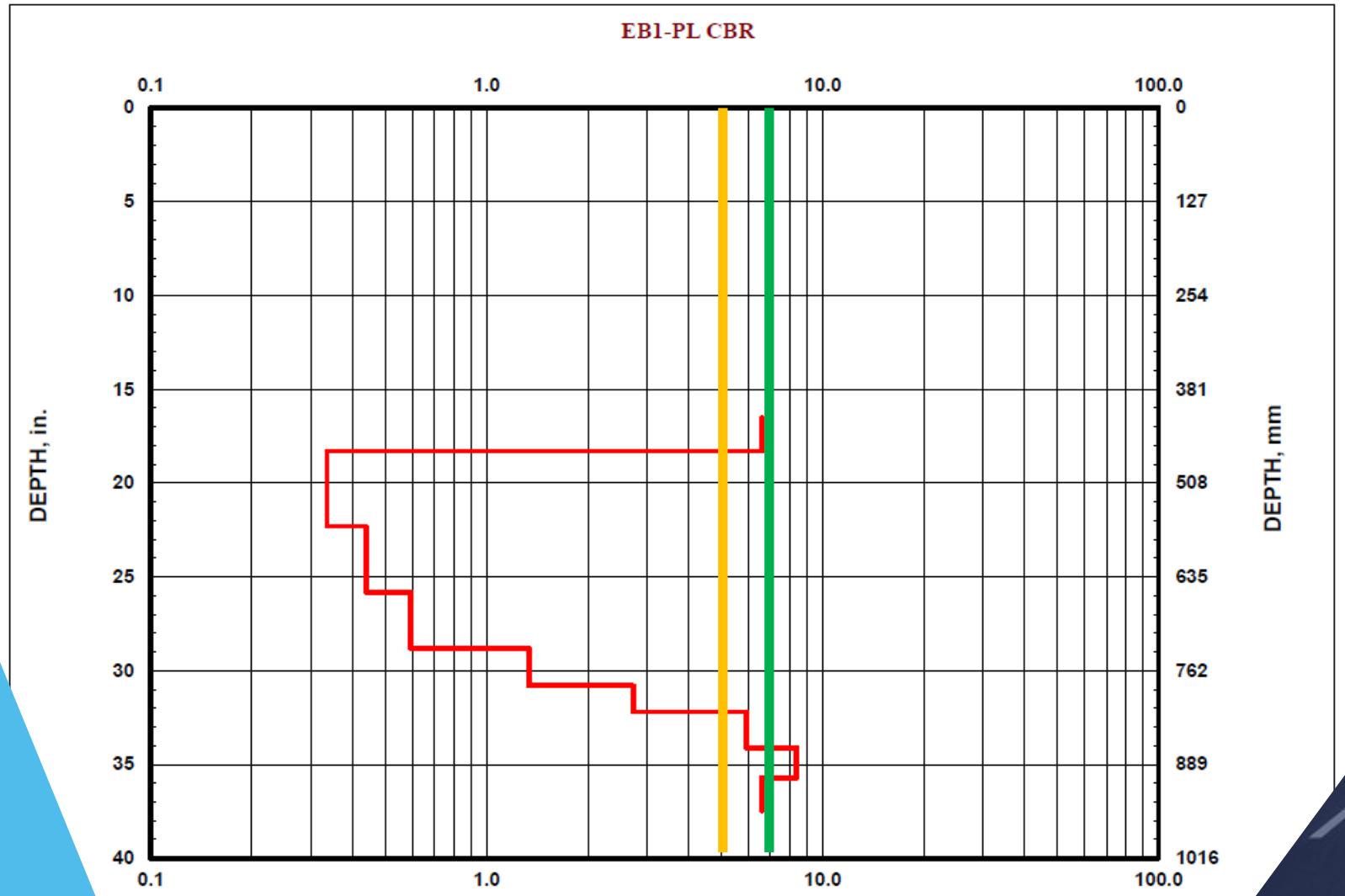
- Resilient Modulus (M_R)
  - Falling Weight Deflectometer (FWD)
  - California Bearing Ratio (CBR)
  - Dynamic Cone Penetrometer (DCP)

Table 1: Typical CBR and Modulus of Elasticity Values for Various Materials

Material (USC given where appropriate)	CBR	R-Value	Elastic or Resilient Modulus (psi)
Diamond	–	–	170,000,000
Steel	–	–	30,000,000
Aluminum	–	–	10,000,000
Wood	–	–	1 – 2,000,000
Crushed Stone (GW, GP, GM)	20 – 100	30 – 50	20,000 – 40,000
Sandy Soils (SW, SP, SM, SC)	5 – 40	7 – 40	7,000 – 30,000
Silty Soils (ML, MH)	3 – 15	5 – 25	5,000 – 20,000
Clay Soils (CL, CH)	3 – 10	5 – 20	5,000 – 15,000
Organic Soils (OH, OL, PT)	1 – 5	< 7	< 5,000

Dynamic Cone Penetrometer (DCP)

Based on DCP data and preliminary pavement design depths of approximatly19 to 26 inches, construction of new pavements will require a modified subgrade as per Sec. 205.

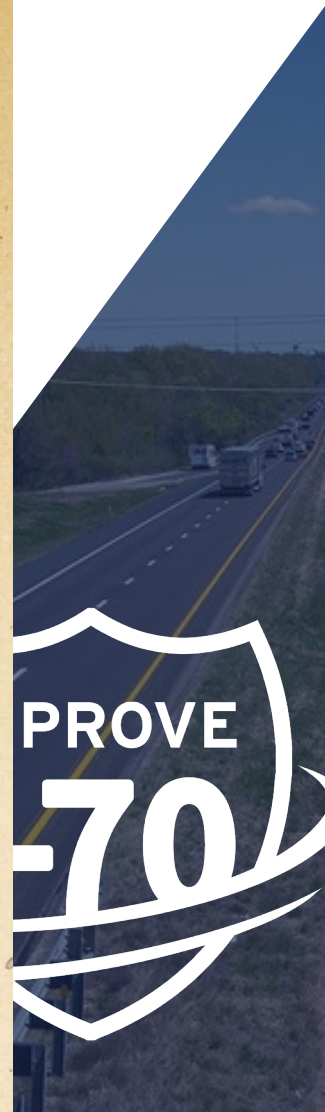


Aggregate Base

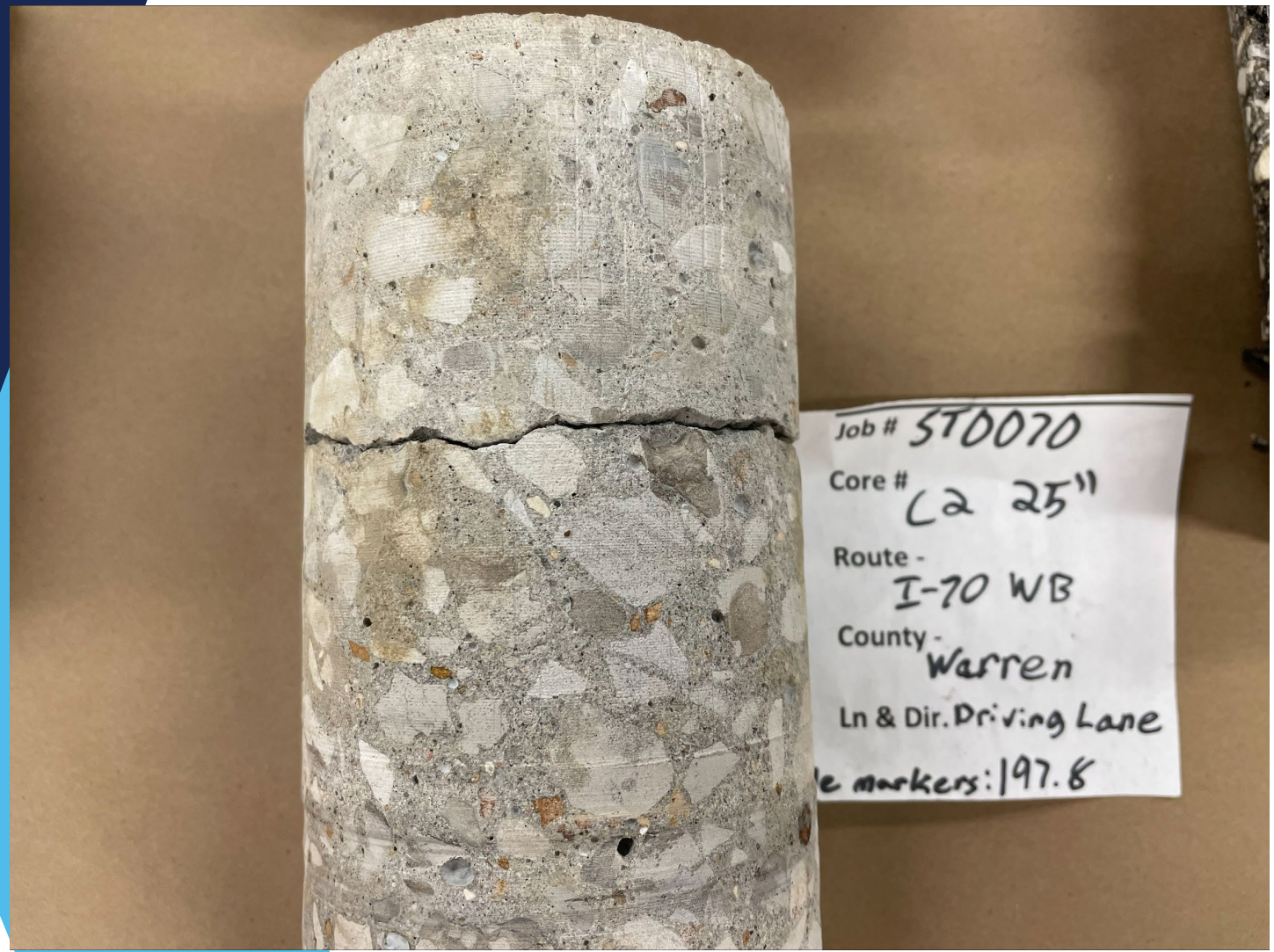
- Very Contaminated w/ Subgrade
  - Thickness Difficult to Determine
  - Strength Difficult to Determine
  - > 15 % Minus # 200 Sieve

NOT DRAINABLE

Pavement



Pavement

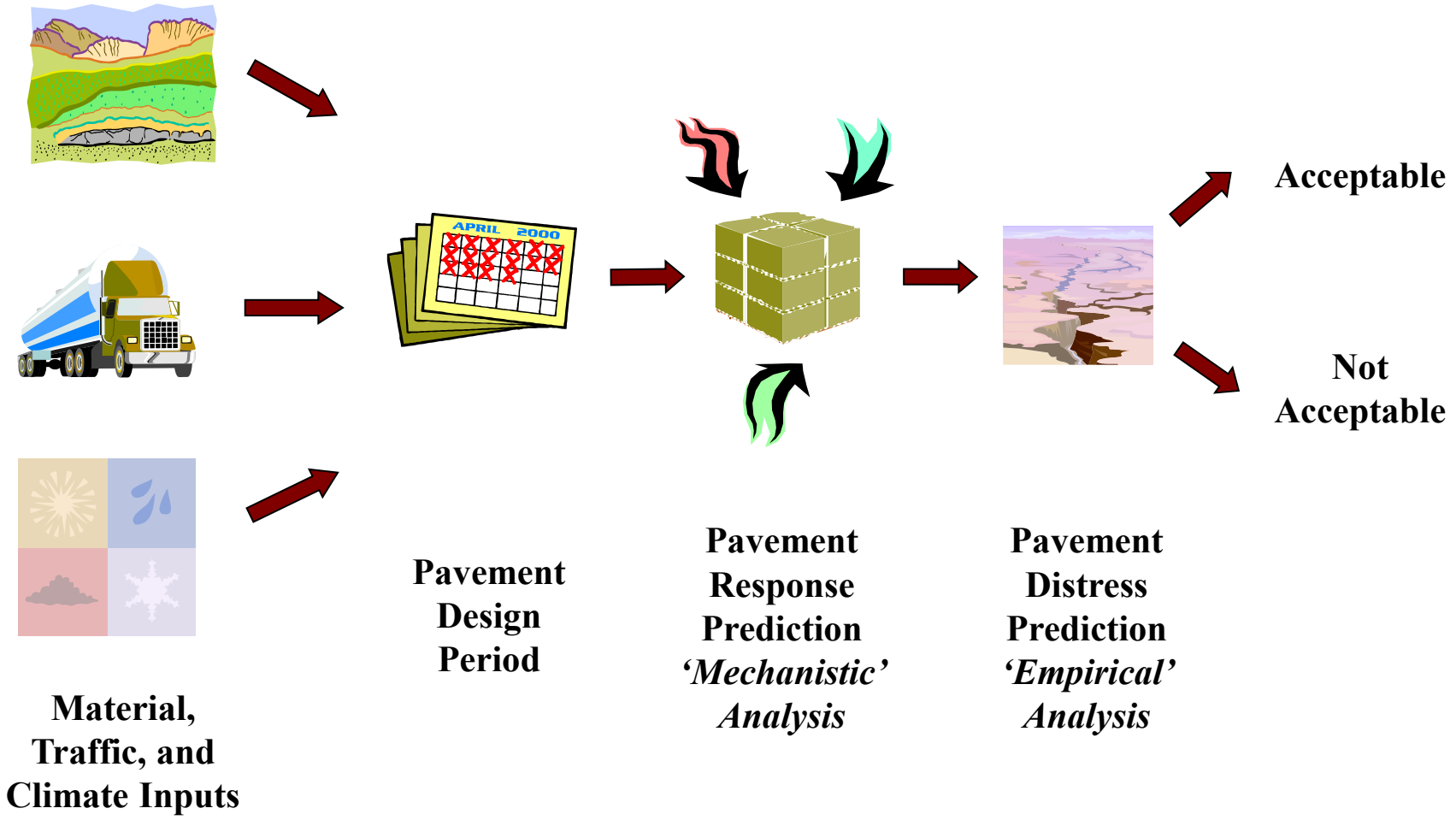

Job # 570070
Core # C2 25"
Route - I-70 WB
County - Warren
Ln & Dir. Driving Lane
e markers: 197.8


mile markers: 197.8

Pavement Type Selection

- Pavement Mechanistic/Empirical (ME) Design
  - Asphalt Overlay Options
  - Major Rehabilitation
  - New Reconstruction
- Service Life Goals
- Life Cycle Costs

Pavement ME Design Process



Output – Predicted Pavement Distress @ 45-yr Design Life

PCCP Distress

2.0 % Slab Cracking

0.15" Faulting

HMA Distress

10% Fatigue Cracking

0.25" AC Layer Rutting

0.5" Total Rutting

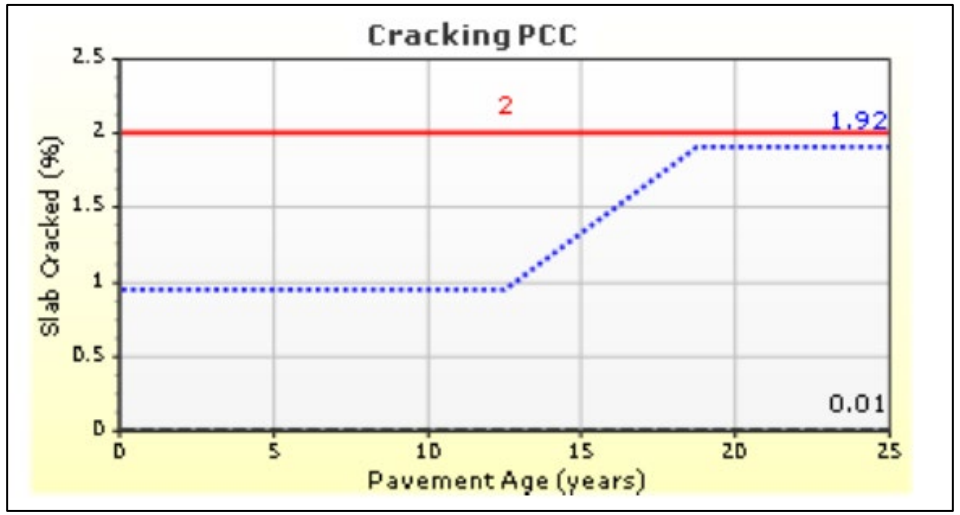
HMA vs. Concrete – Reconstruction

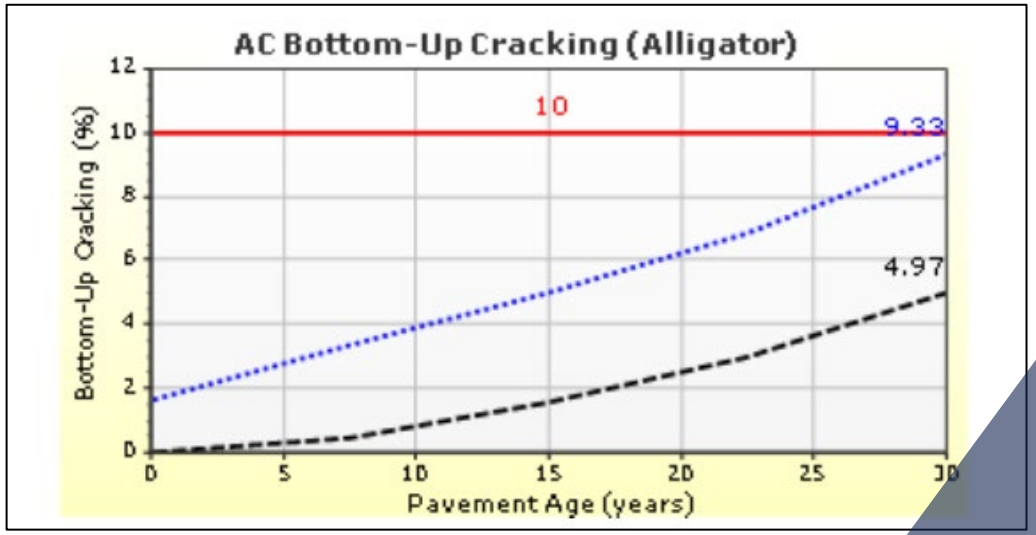
I-70 ~20,000 trucks per day

11.5” PCCP
OR
15” HMA

12” Rock Base

Modified Subgrade;
CBR > 7

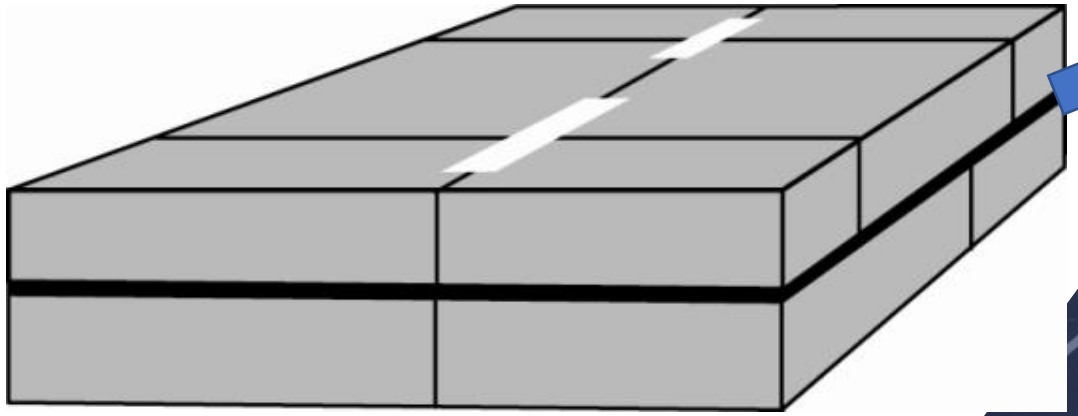




IMPROVE I-70

Major Rehabilitation

- ME Design or Unbonded Overlay Program
  - Milling all the asphalt to original concrete
  - Place geotextile fabric
  - Place new concrete pavement
    - Joint Design Options



Short Term Solutions

- Coldmill or Overlay with Asphalt
  - Evaluating Existing Conditions
  - Estimating Structural Integrity of Existing Asphalt

I-70 Pavement Engineering Concerns

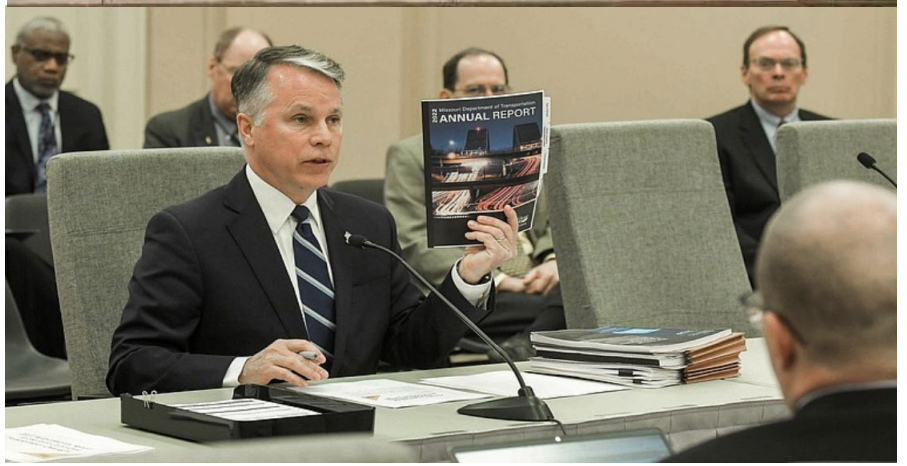
- Poor Subgrade Stability
  - Affects to Rubblization efforts
  - Causes early distresses

- Incorporating Positive Drainage
  - Poor drainage causing early distress
  - Promoting positive drainage

Legislative Recap

Missouri governor signs off on I-70 expansion, state budget

As part of a $2.8 billion plan, I-70 will be expanded to three lanes across Missouri — from suburban St. Louis to suburban Kansas City.



General Revenue for I-70

IMPROVE I-70

Program Goals

- Provide a third lane of travel to eastbound and westbound Interstate 70 from Blue Springs to Wentzville.
- Improve the interstate while modernizing the existing pavement and bridges
- Increase the efficiency of freight movements along Interstate 70.
- Minimize construction impacts through communication and construction staging with a focus on work zone safety.
- Utilize innovation to position Interstate 70 as a leading corridor to transform the future of transportation.
- Provide expanded employment opportunities to a diverse workforce.

IMPROVE I-70

MAY 2023

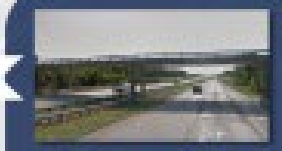
Needed Capacity Improvements
Blue Springs to Wentzville

- **Awarded** - $271 million
- **STIP Funded** - $236 million
- **General Revenue** - $2.8 billion

Additional Capacity Improvements
Kansas City and St. Louis

- **Awarded** - $709 million
- **STIP Funded** - $274 million

Kansas City
- $257 million
  Buck O'Neil Bridge
- $145 million
  Paseo to I-435
- $6 million
  Blue Ridge Boulevard



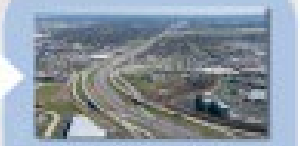
Kansas City Suburban
Blue Springs to Odessa
19 miles
- $0
- $6 million
- $233 million

Western Rural
Odessa to Midway
83 miles
- $240 million
  Rocheport Bridge
- $0
- $1.1 billion

Columbia
Midway to Route Z
13 miles
- $0
- $185 million
- $410 million

Eastern Rural
Route Z to Warrenton
60 miles
- $31 million
- $13 million
- $796 million

St. Louis Suburban
Warrenton to Wentzville
20 miles
- $0
- $32 million
- $216 million

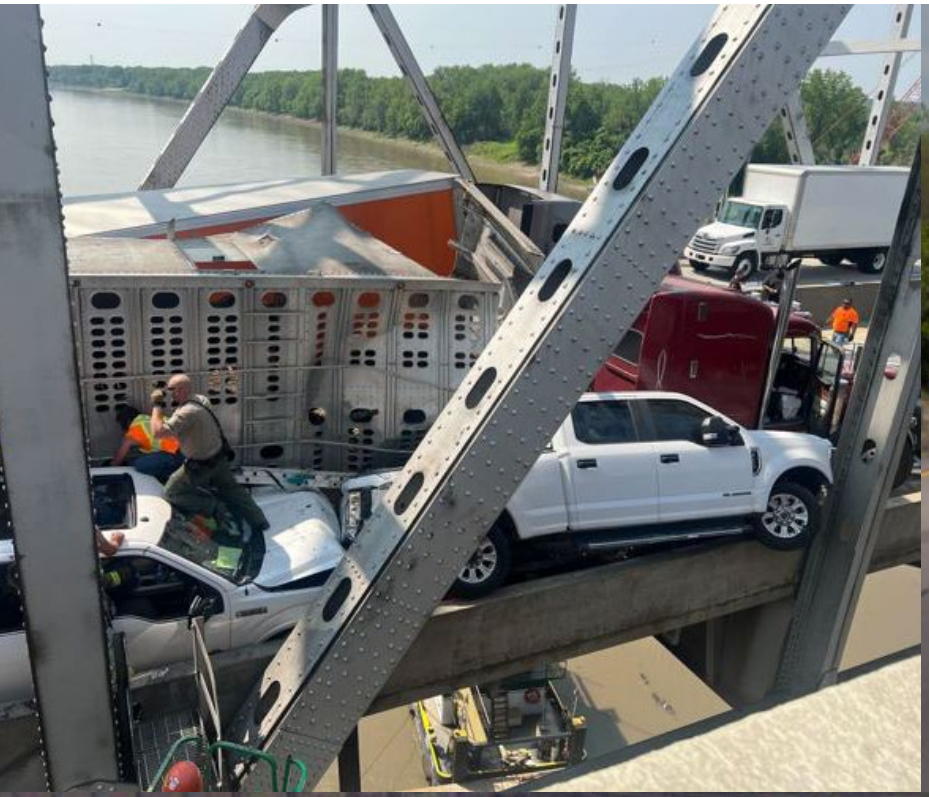


St. Louis
- $278 million
  I-270
- $112 million
  Chain of Rocks
- $62 million
  Cave Springs to Fairgrounds
- $77 million
  I-70/I-64
- $46 million
  I-70/U.S. 67

- *Environmental near completion*
- ***1.1 million jobs** depend on I-70*
- *Workforce development opportunities*
- *I-70 carries **100 million tons of freight***

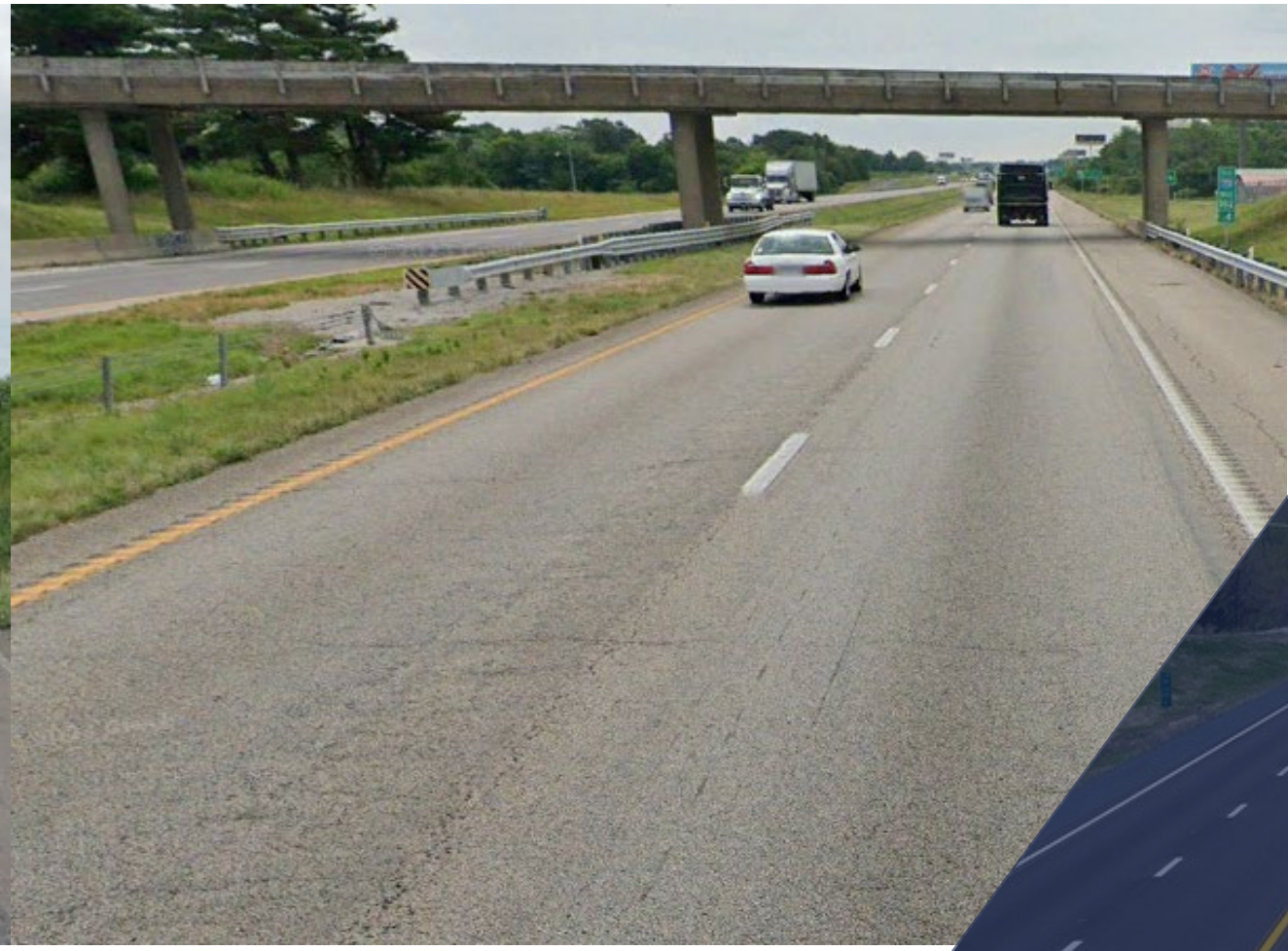
modot.org/improveI70

I-70 Challenge - Safety



I-70 Challenge - Mobility

I-70 Challenge - Pavement



I-70 Challenge - Maintenance of Traffic (MOT)