

New York Implementation of Performance-Engineered Mixtures





Department of
Transportation

New York Implementation of Performance-Engineered Mixtures

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<https://www.kimley-horn.com/recycled->



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Why Performance Engineered Mixes?



SuperPave System

- Our SuperPave system provides us with a solid product with limitations.
- We can improve on that system to account for those and continue to improve our pavements

SuperPave System

- **Why Switch?**

- **Encourage Innovation**
- **Improve Mixture Performance**
- **Become More Flexible**



<https://www.amycoleconnect.com/blog/flexibility-in-the-workplace-is-not-an-f-word>



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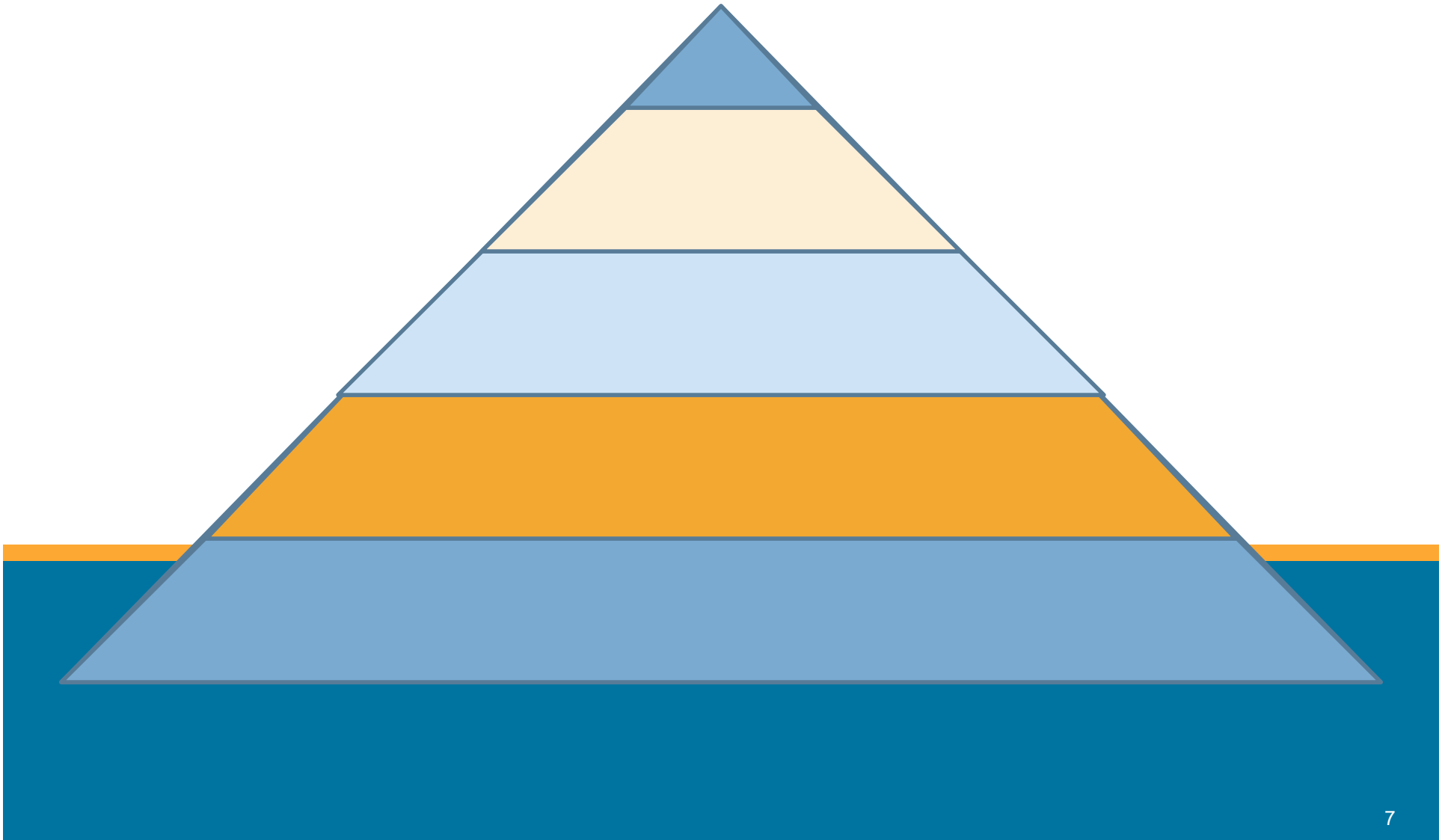
A pyramid diagram with four horizontal layers. From top to bottom, the layers are: a small blue triangle, a yellow trapezoid, a light blue trapezoid containing the text "Encouraging Innovation", and a large blue trapezoid. The pyramid is set against a white background with a blue base. The text "Encouraging Innovation" is centered in the light blue layer.

Encouraging
Innovation



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Transportation

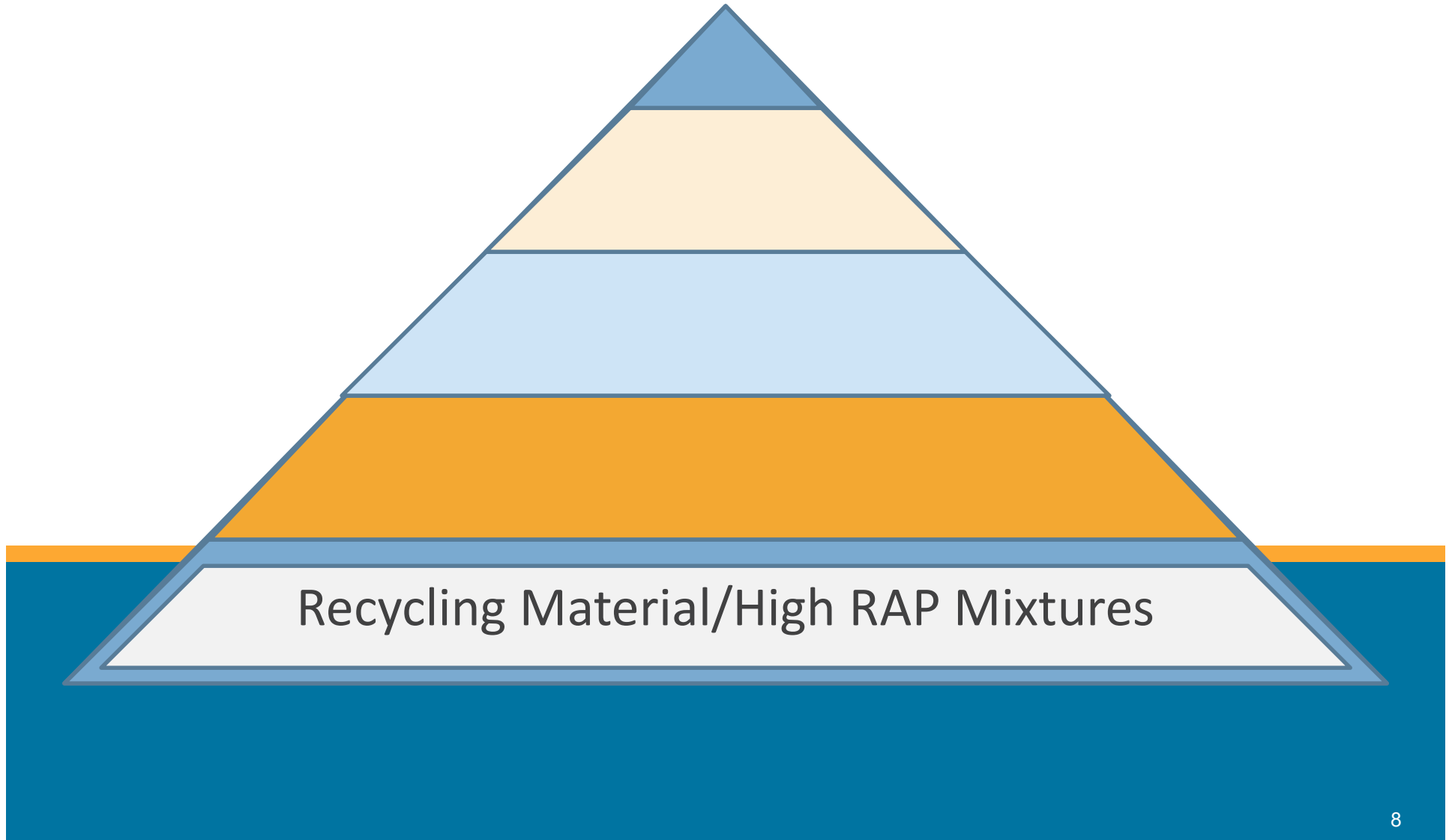
Encouraging Innovation





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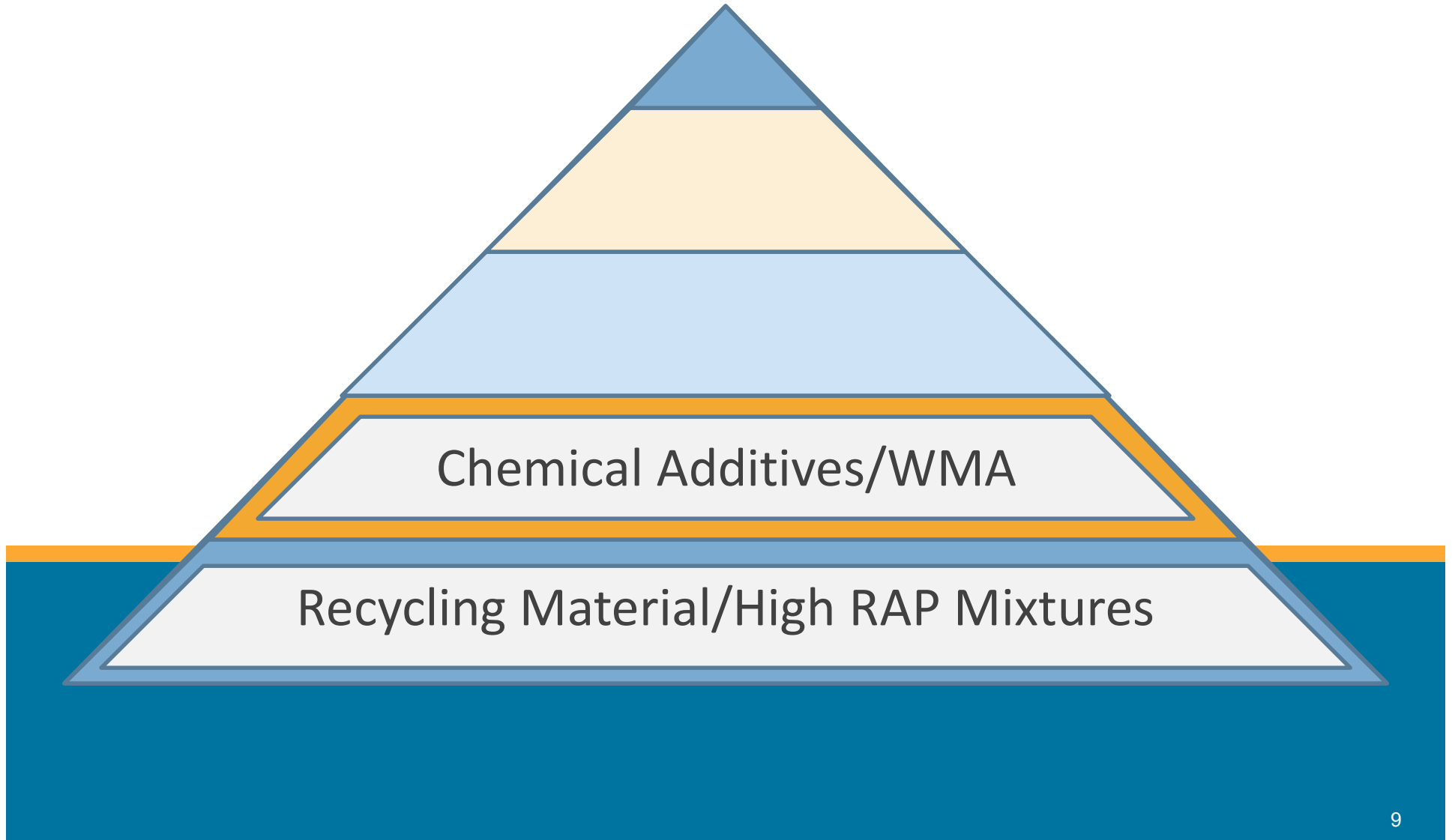
Encouraging Innovation





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Transportation

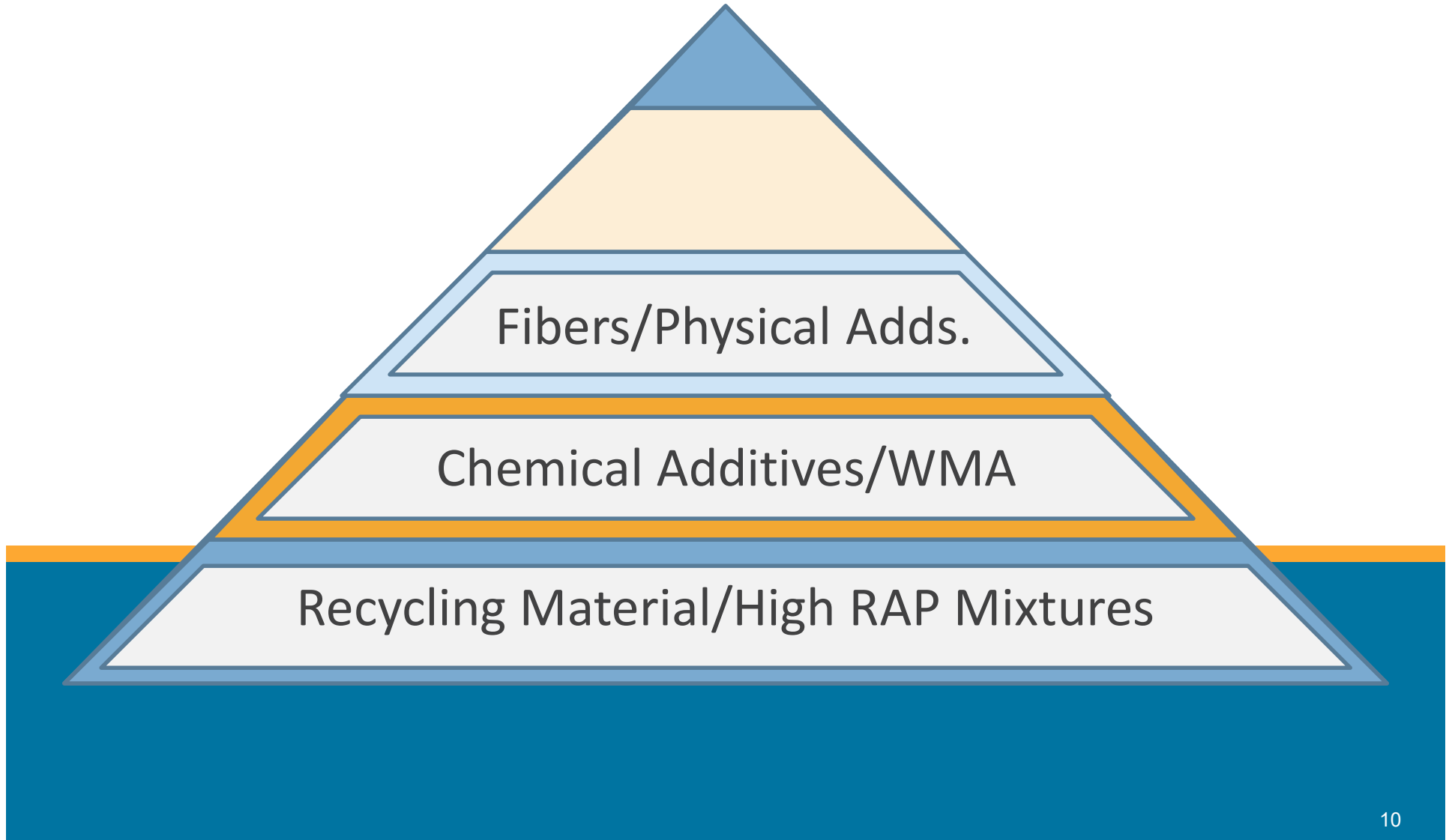
Encouraging Innovation





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Transportation

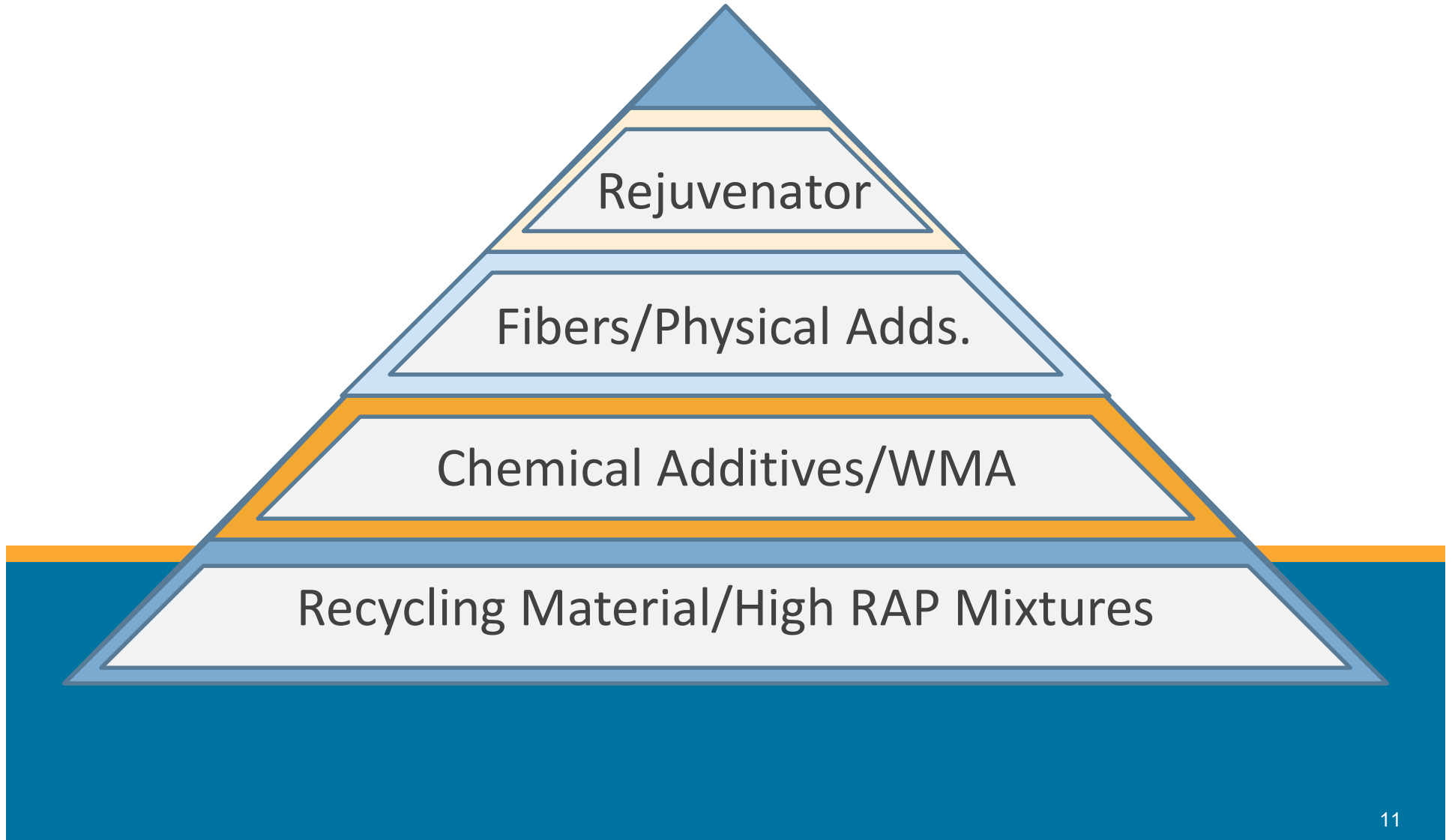
Encouraging Innovation





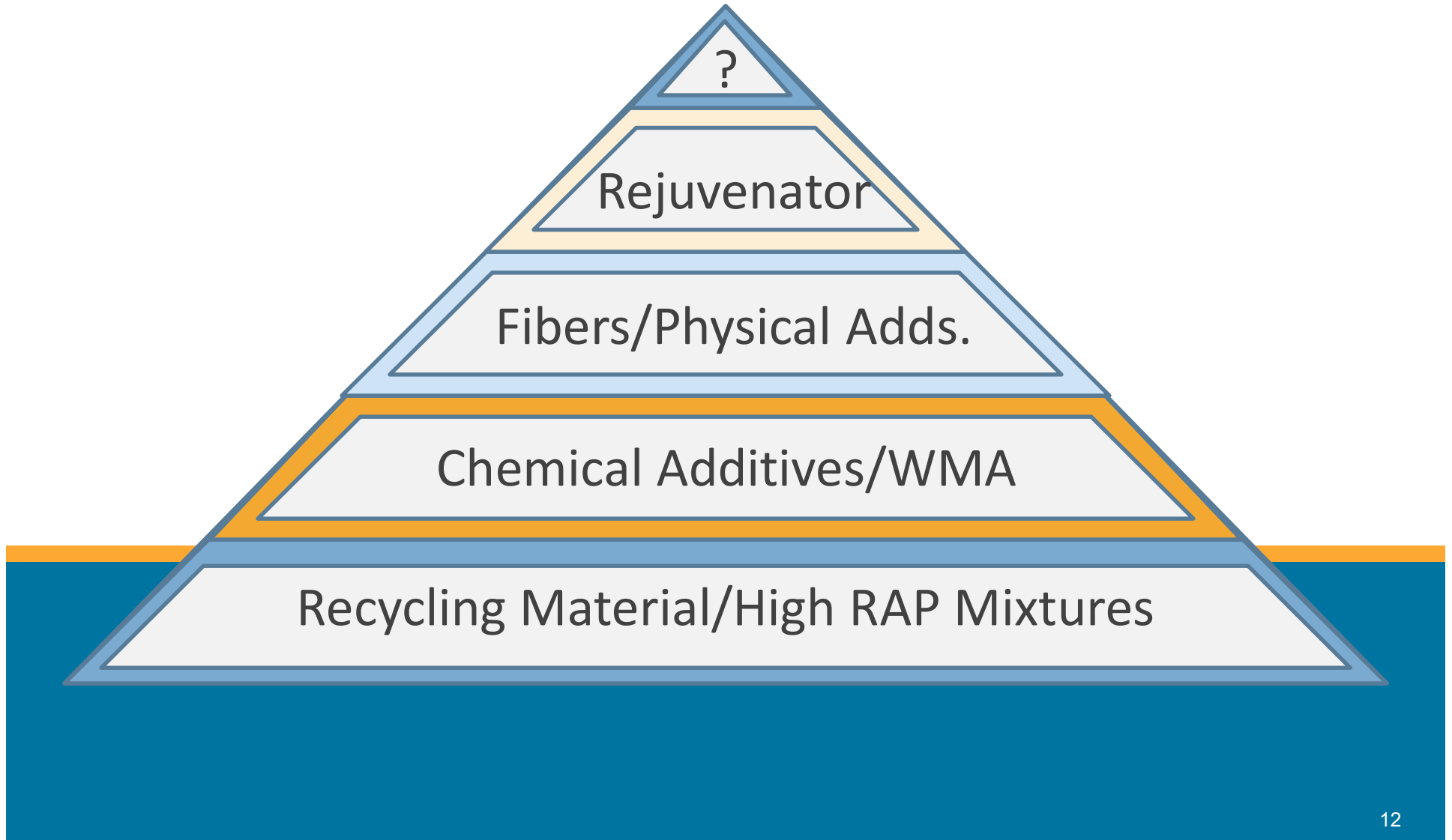
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Transportation

Encouraging Innovation



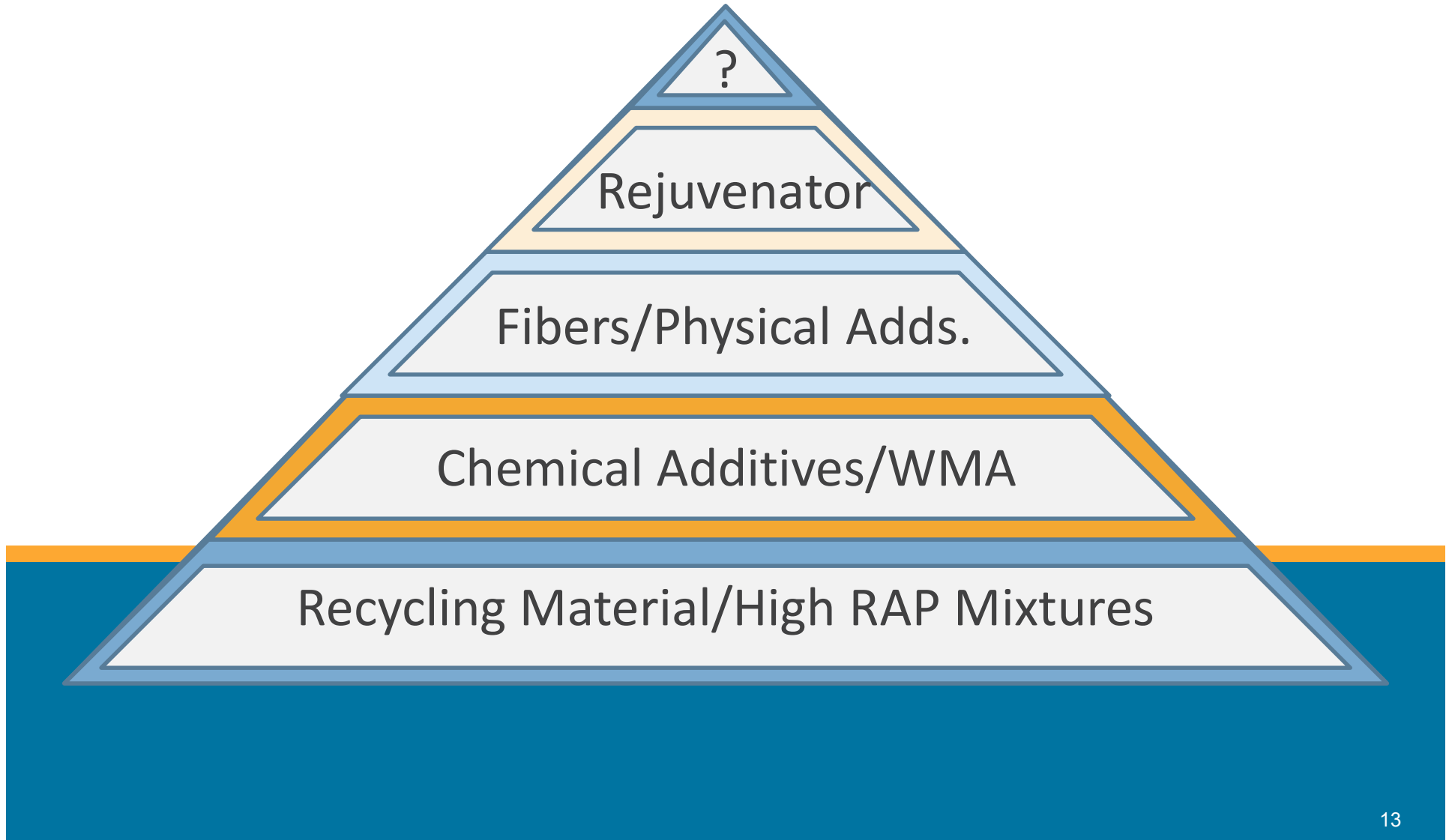


Encouraging Innovation





Encouraging Innovation





**Department of
Transportation**

Improving Mixture Performance



Evaluation of
Asphalt Mixtures in
New York State



Evaluation of Asphalt
Mixtures in New York
State



Establishing Proper
Balance for
Mixtures

Improving Mixture Performance

Evaluation of Asphalt Mixtures
in New York State

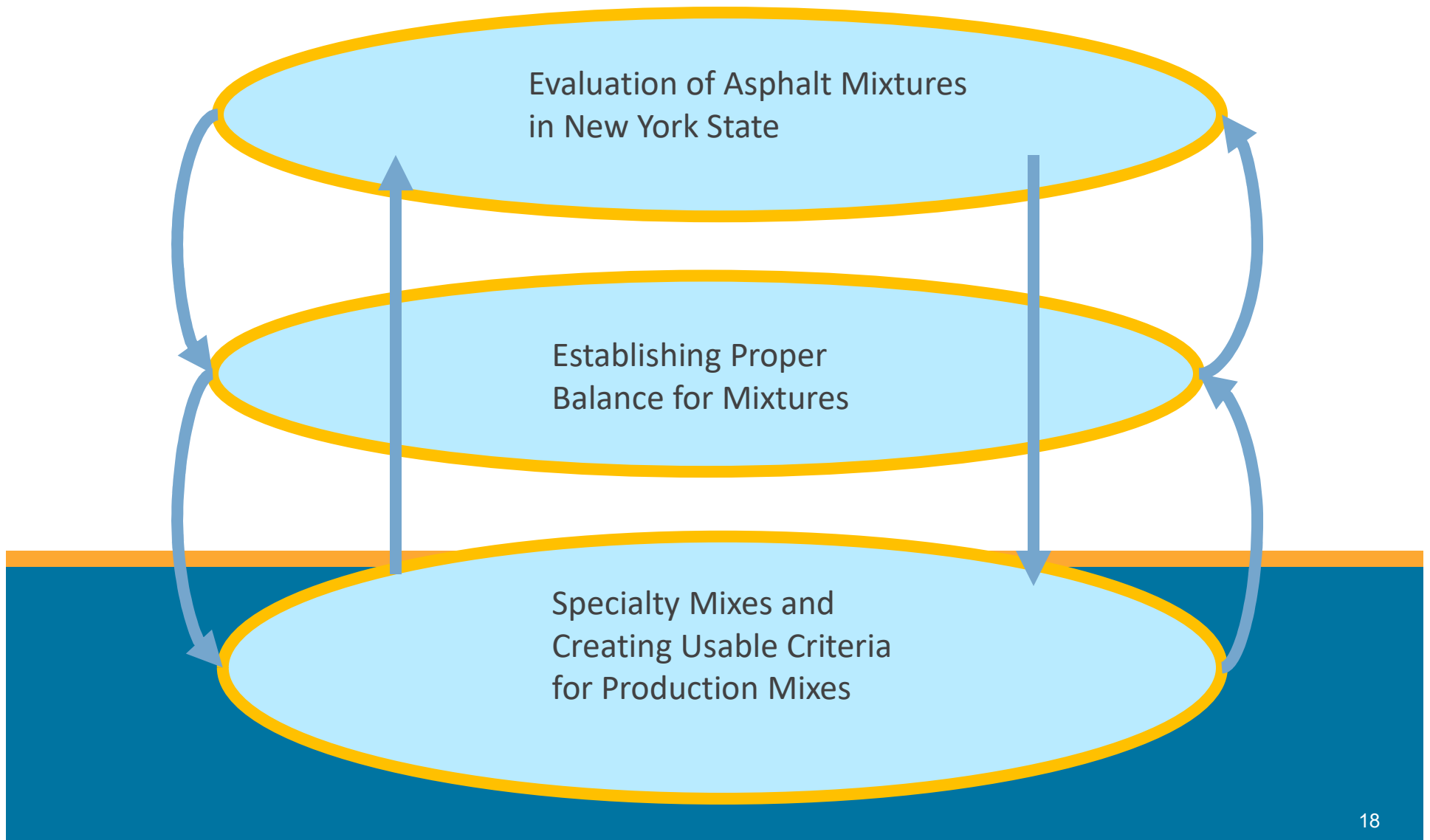


Establishing Proper
Balance for Mixtures



Specialty Mixtures and
Creating Usable Criteria
for Production Mixes

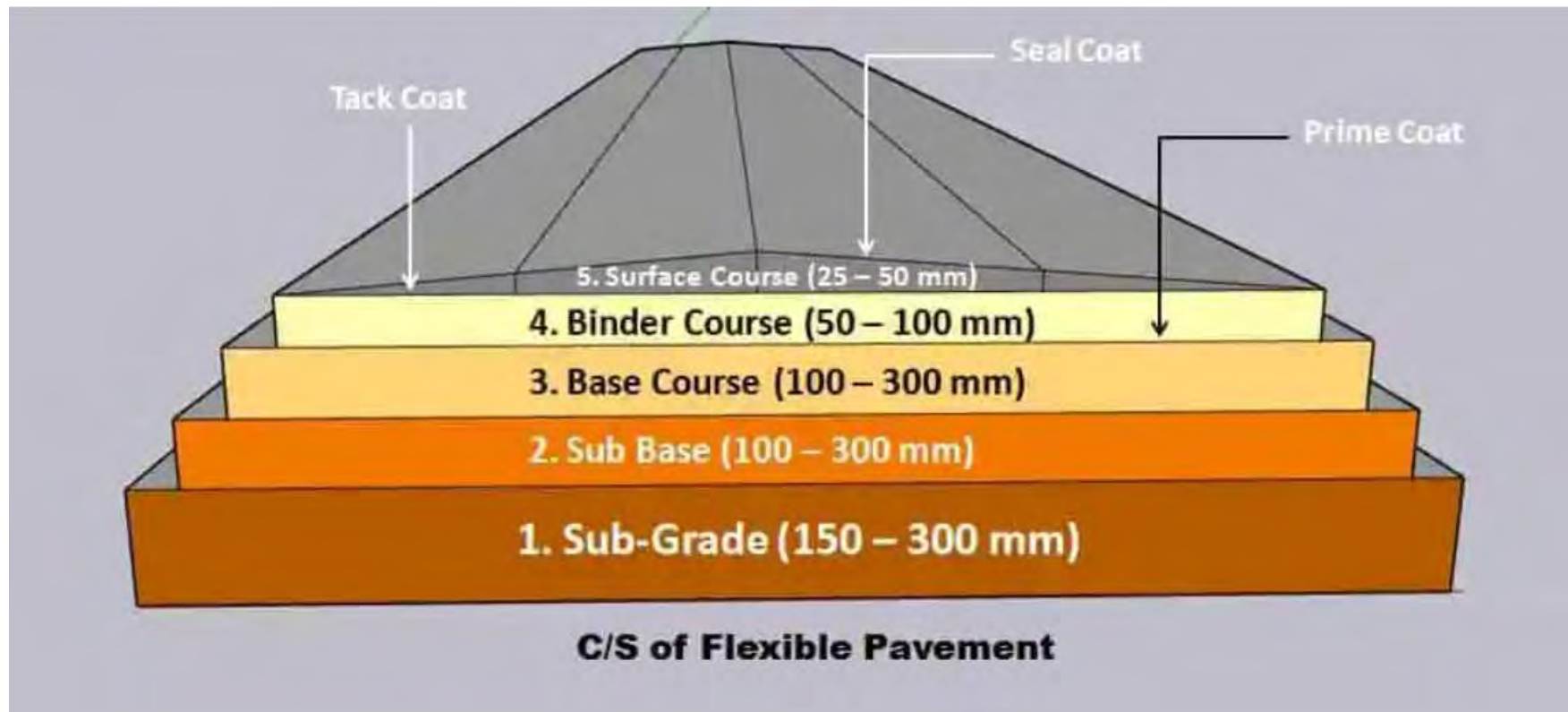
Improving Mixture Performance



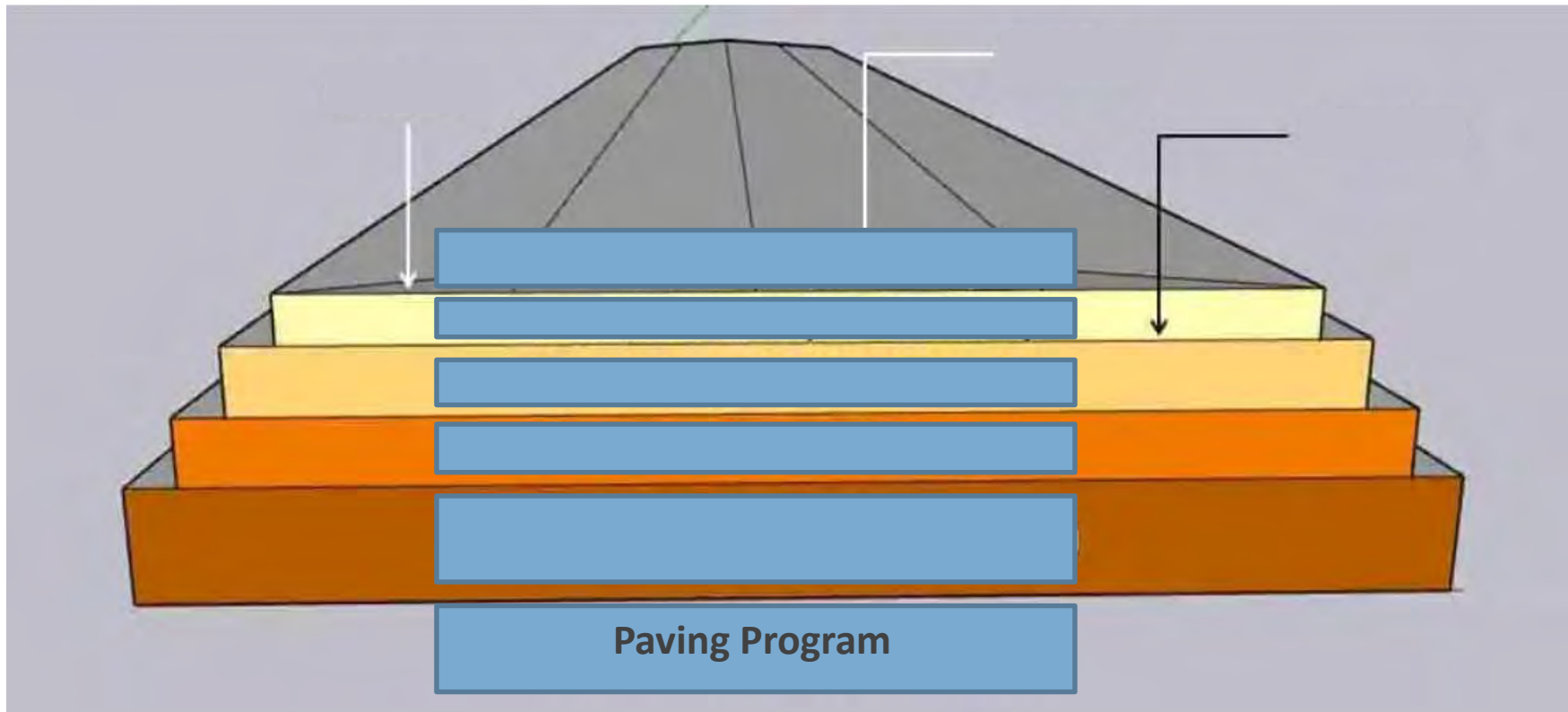


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Transportation**

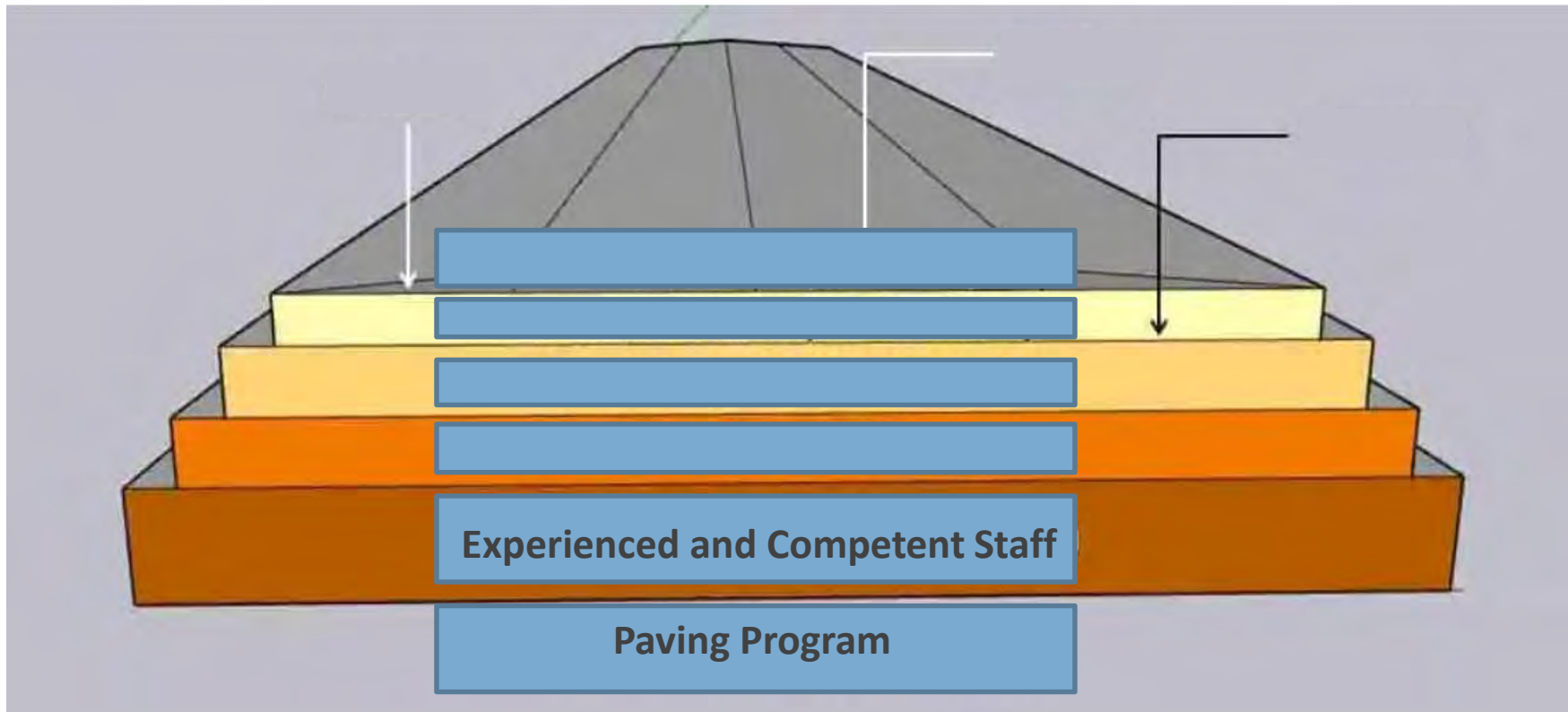
Developing a Flexible and Robust System



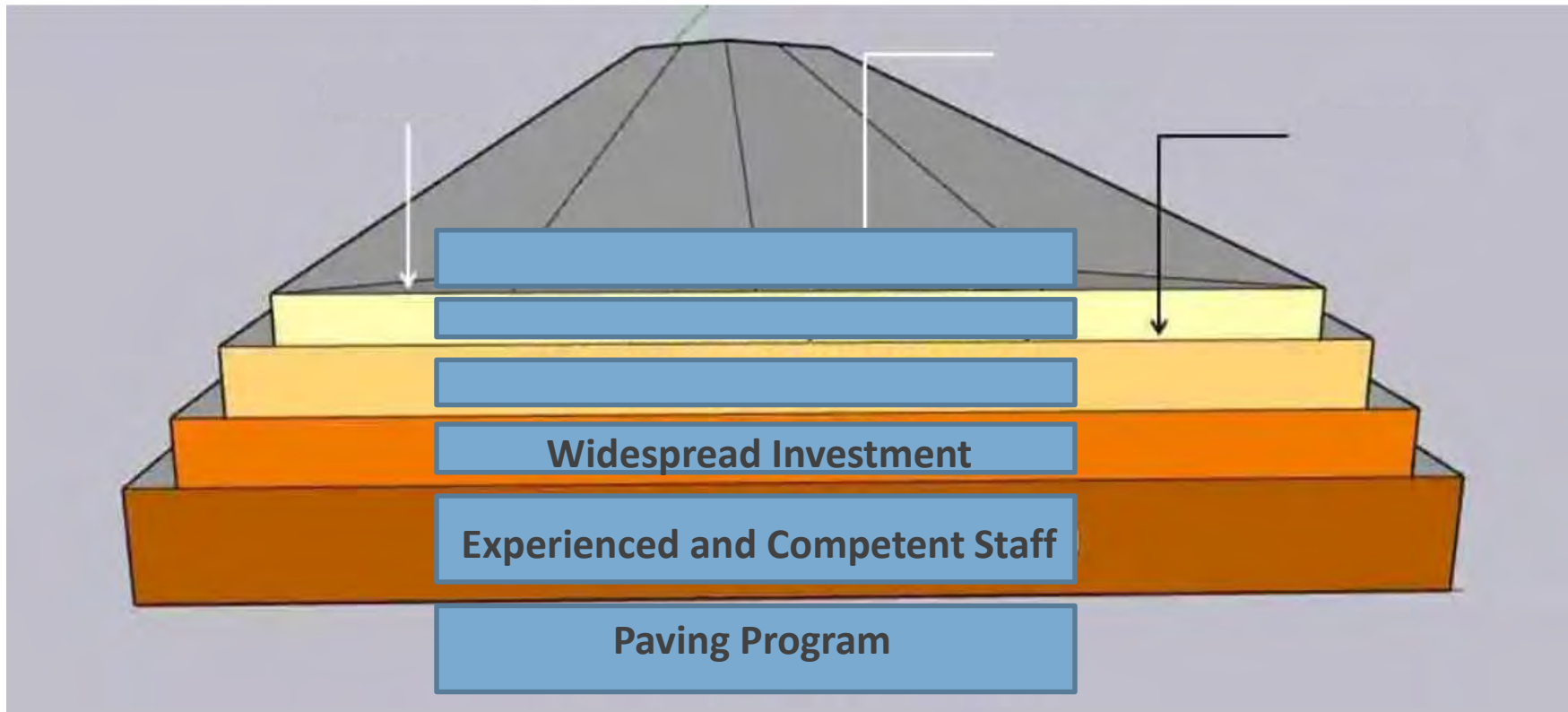
Source: <https://civiconcepts.com/blog/what-is-pavement-types-of-pavement-road-construction-layers>



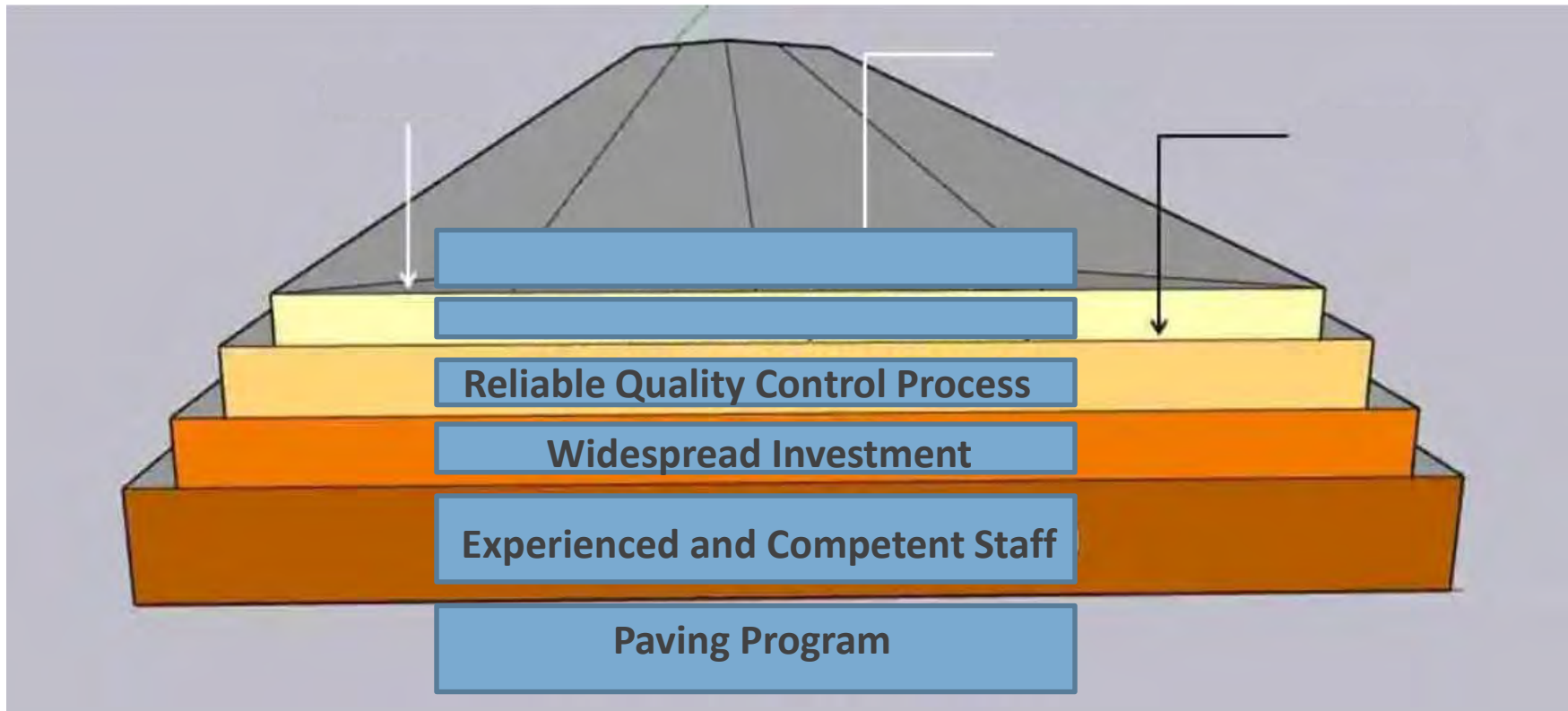
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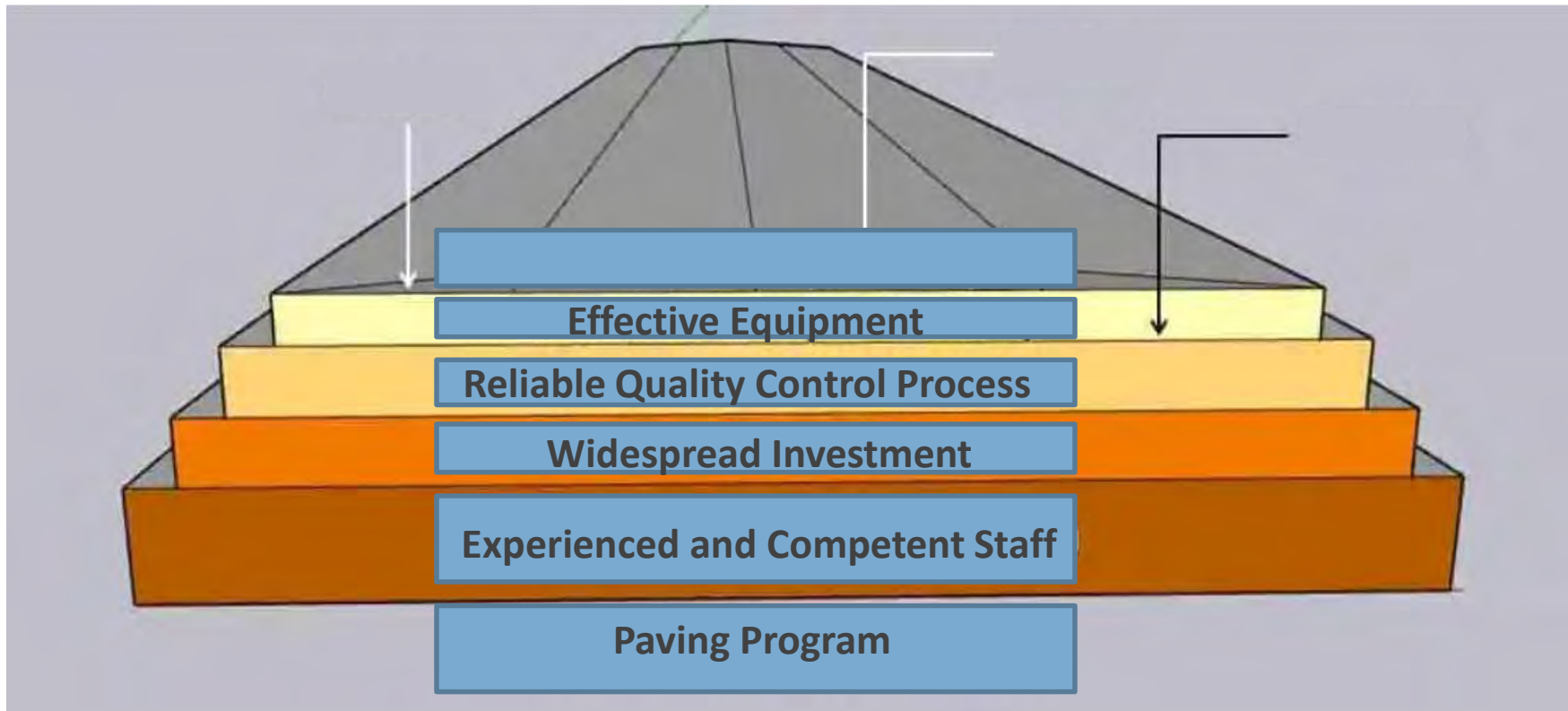
Source: <https://civiconcepts.com/blog/what-is-pavement-types-of-pavement-road-construction-layers>



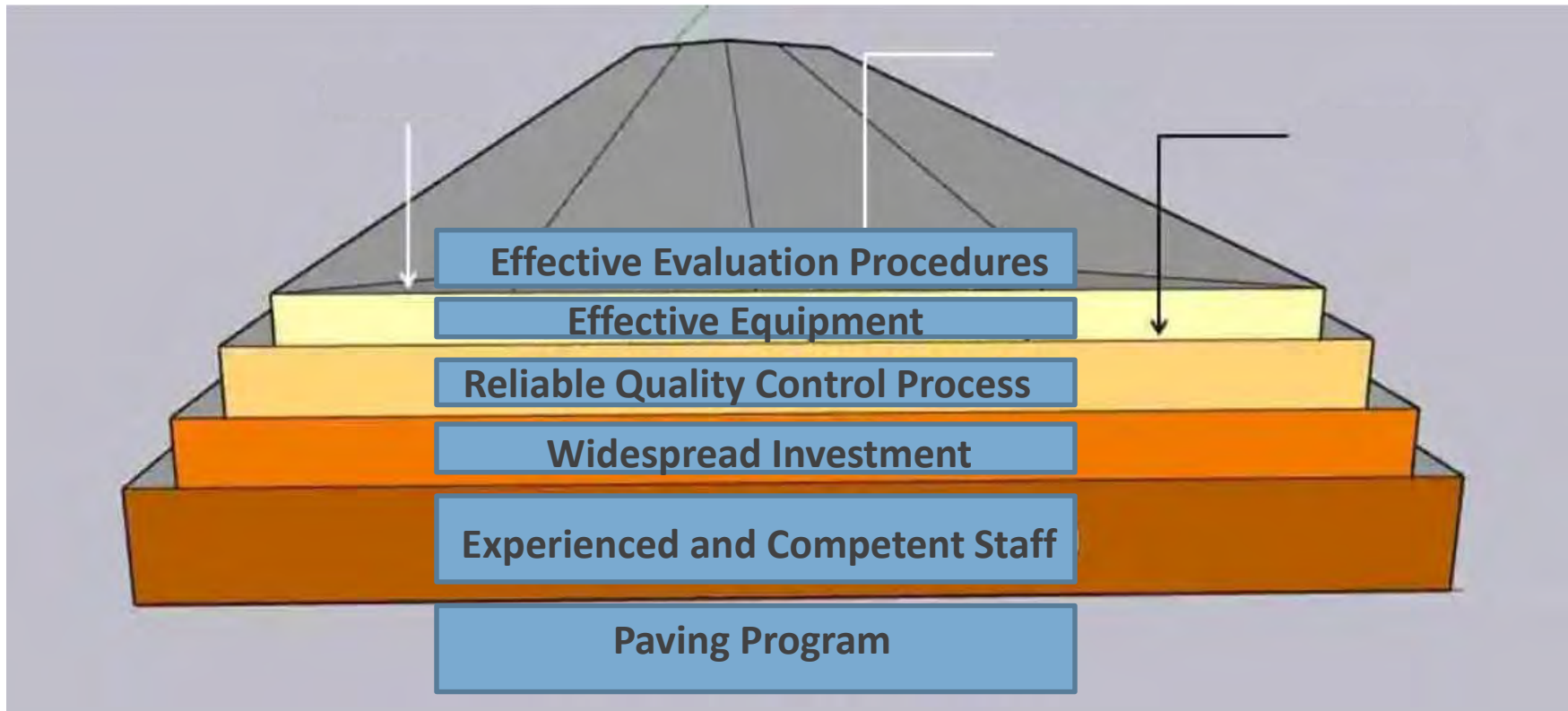
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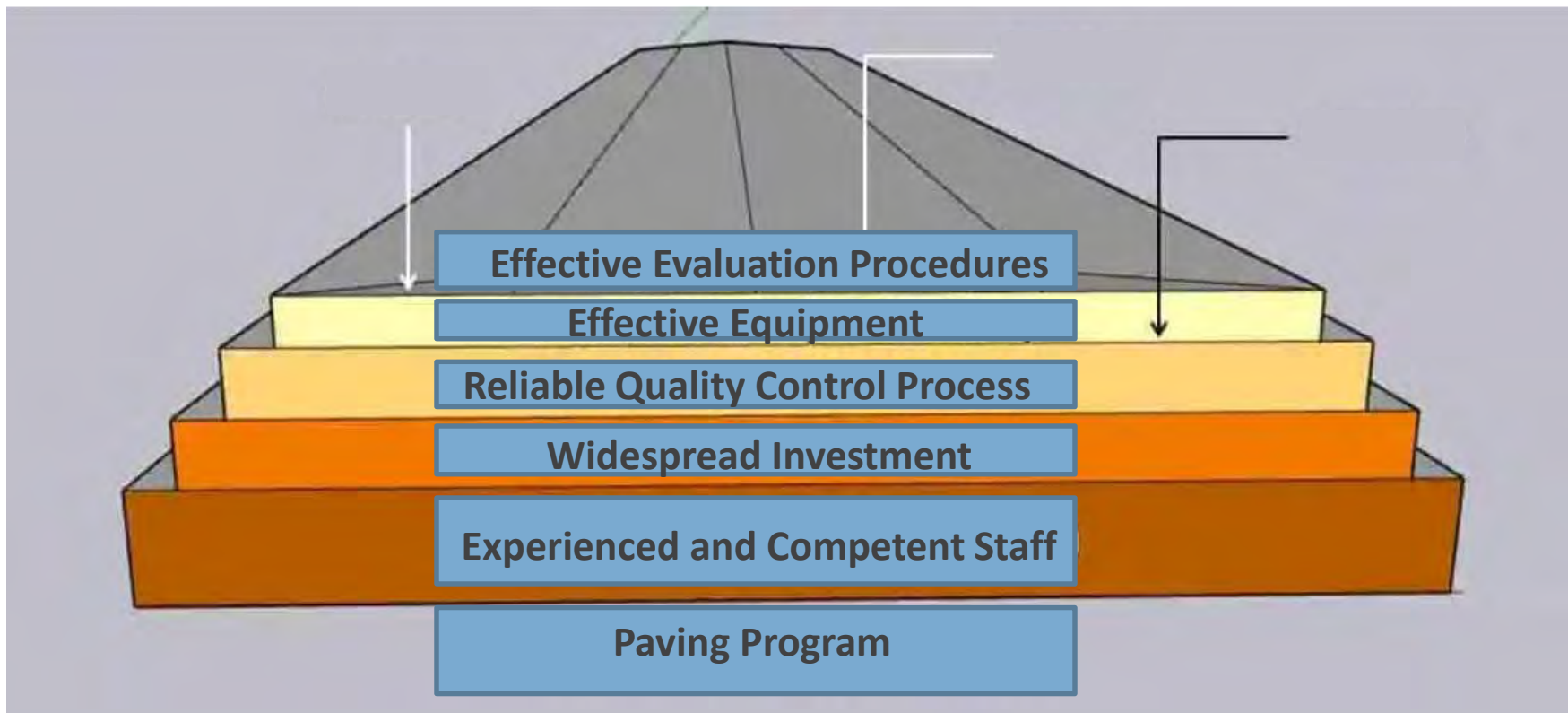
Source: <https://civiconcepts.com/blog/what-is-pavement-types-of-pavement-road-construction-layers>



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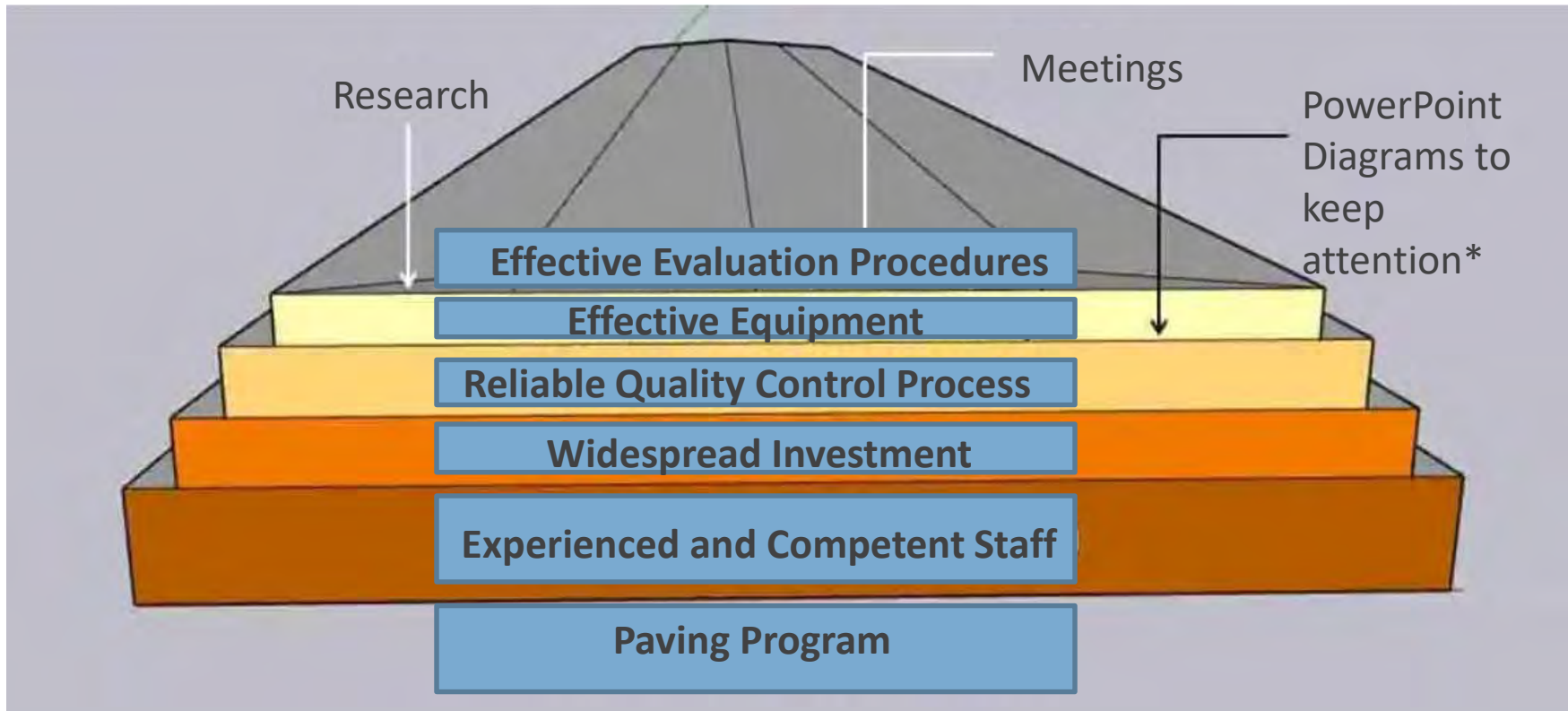


Source: <https://civiconcepts.com/blog/what-is-pavement-types-of-pavement-road-construction-layers>



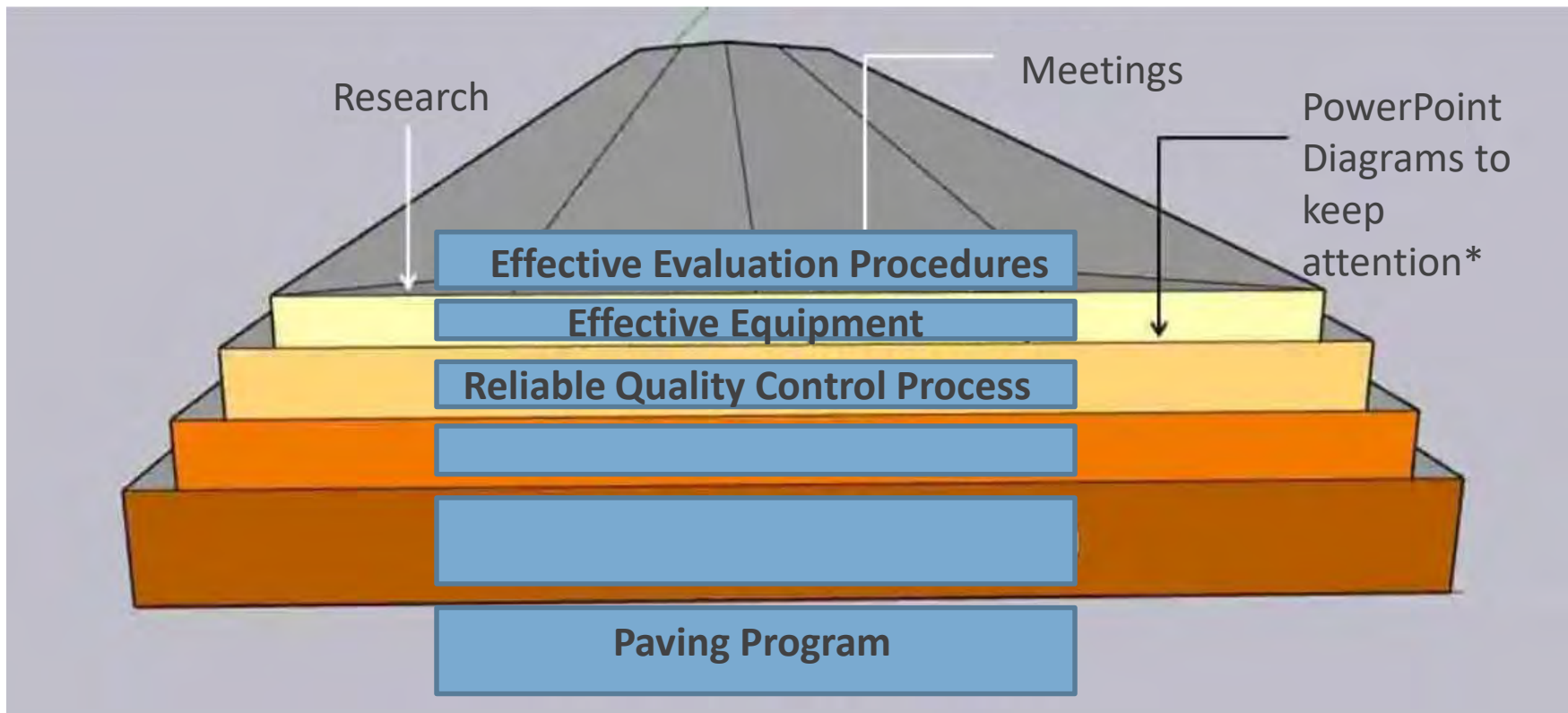
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Developing a Flexible and Robust System



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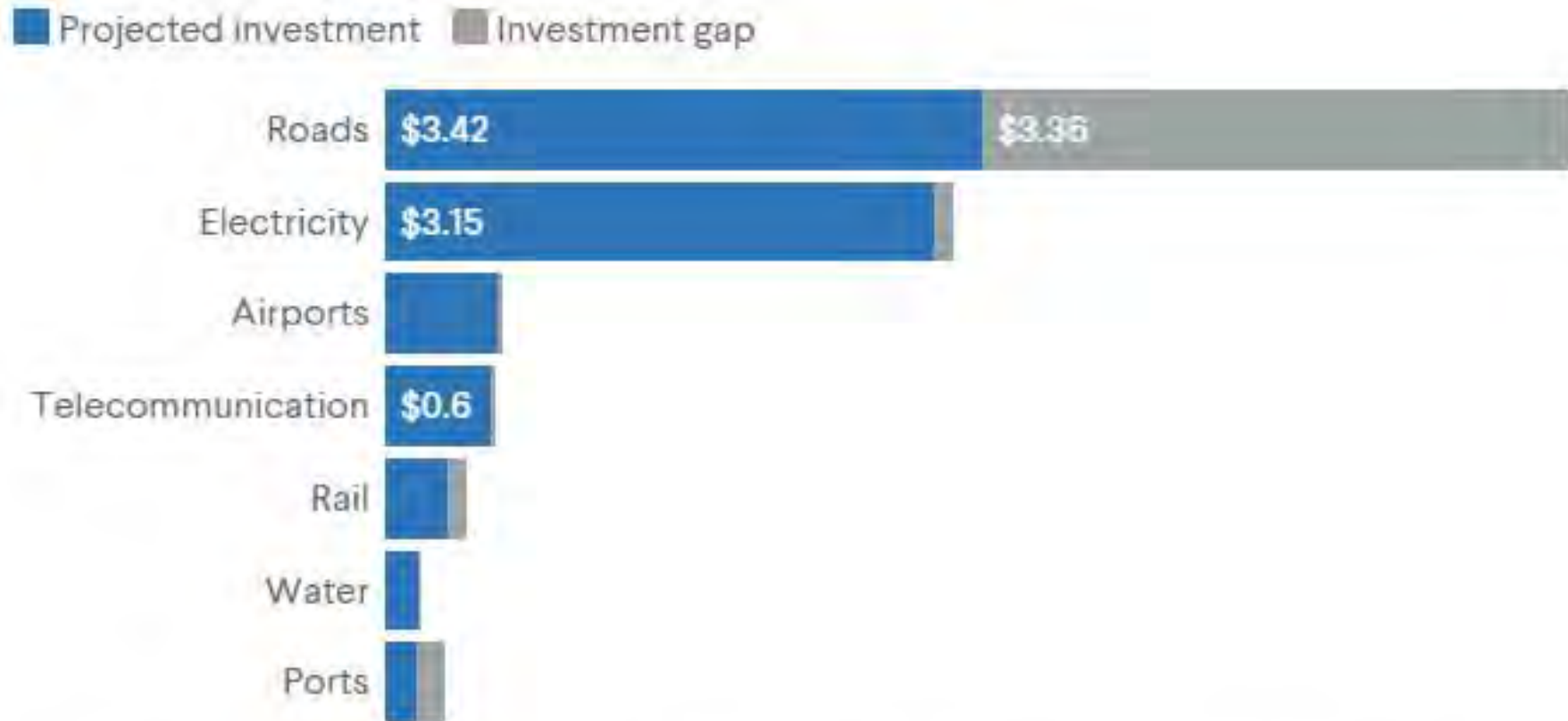
Developing a Flexible and Robust System



Source: <https://civiconcepts.com/blog/what-is-pavement-types-of-pavement-road-construction-layers>

U.S. Infrastructure Investment Gaps by 2040

Projected public and private infrastructure spending by sector, 2016–2040 (trillions of 2015 dollars)



Notes: Investment gap is the difference between projected investment and the investment required to match the best-performing peer countries, accounting for differences in country characteristics. Projected investment assumes the United States continues to invest at current levels and accounts for economic and population growth.

Performance Testing



<https://www.globalgilson.com/s/emi-circular-bend-test-fixture>

Semi-Circular Bending Test

Simple

Cheap



<https://www.hmalabsupply.com/products/ideal-rt-jig>

IDEAL Rutting Test



<https://www.globalgilson.com/in/direct-tensile-loading-fixtures>

High-Temperature IDT Test

Feasible



https://www.researchgate.net/figure/IDEAL-cracking-test-IDEAL-CT_fig1_343785079

IDEAL Cracking Test



Implementation



Slide 32

HMP(5

Ended on this section. I think this should detail all of our efforts to this point. This should incorporate all of our specialty mixture testing. Still need to take pictures to replace the rounds of pucks. I detail a bit of how many different things we have going right now. Figuring we do a zoom into each year and touch briefly on each effort that we worked on. Quick takeaways from each effort. Regrets and positives

Heim, Michael P (DOT), 10/4/2021

- Widespread Production Mixture Evaluation
 - Production Mixes
 - Many Regions
 - Non-Standardization of methods



Major Takeaways:

1. Ruggedness Testing
2. Designed and Targeted Testing
3. Closely Adhering to Specifications



Implementation

**Widespread Production
Including Many Regions
Non-Standard Methods**





- Widespread Production Mixture Evaluation
 - Production Mixes
 - Many Regions
 - ~~Non~~ Standardization of methods
- Ruggedness Testing – Testing Matrix
- New Equipment



Gilson Press

2018 Testing

	0 % RAP				10 % RAP			
5.5%	IDT 1	IDT 2	IDT 3	IDT 4	IDT 1	IDT 2	IDT 3	IDT 4
	SCB1	SCB2	SCB3	SCB4	SCB1	SCB2	SCB3	SCB4
6.0%	IDT 1	IDT 2	IDT 3	IDT 4	IDT 1	IDT 2	IDT 3	IDT 4
	SCB1	SCB2	SCB3	SCB4	SCB1	SCB2	SCB3	SCB4
6.5%	IDT 1	IDT 2	IDT 3	IDT 4	IDT 1	IDT 2	IDT 3	IDT 4
	SCB1	SCB2	SCB3	SCB4	SCB1	SCB2	SCB3	SCB4
7.0%	IDT 1	IDT 2	IDT 3	IDT 4	IDT 1	IDT 2	IDT 3	IDT 4
	SCB1	SCB2	SCB3	SCB4	SCB1	SCB2	SCB3	SCB4
	20% RAP				30% RAP			
5.5%	IDT 1	IDT 2	IDT 3	IDT 4	IDT 1	IDT 2	IDT 3	IDT 4
	SCB1	SCB2	SCB3	SCB4	SCB1	SCB2	SCB3	SCB4
6.0%	IDT 1	IDT 2	IDT 3	IDT 4	IDT 1	IDT 2	IDT 3	IDT 4
	SCB1	SCB2	SCB3	SCB4	SCB1	SCB2	SCB3	SCB4
6.5%	IDT 1	IDT 2	IDT 3	IDT 4	IDT 1	IDT 2	IDT 3	IDT 4
	SCB1	SCB2	SCB3	SCB4	SCB1	SCB2	SCB3	SCB4

Ruggedness Testing Matrix

Major Takeaways:

1. Targeted Production Testing
2. Difference between Lab and Production
3. Correlate to Accepted Performance Testing



Implementation

**Widespread Production
Including Many Regions
Non-Standard Methods**



**Testing Matrix
Standardized
New Equipment Investment**



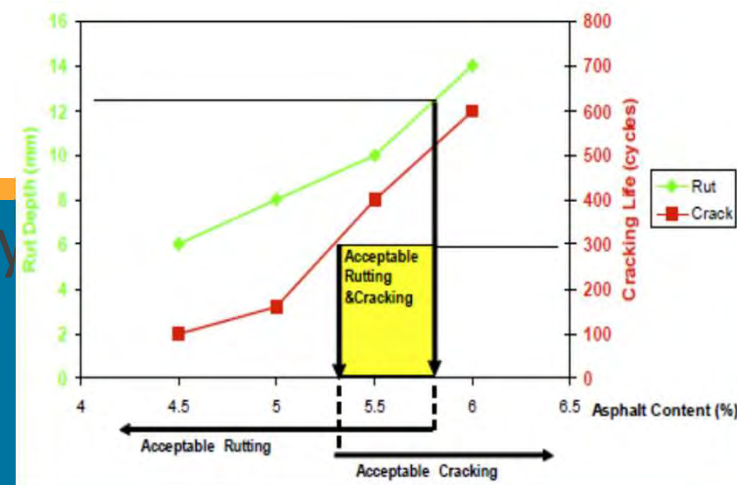
- **Production Special Note**
- **Rutgers Research Project**



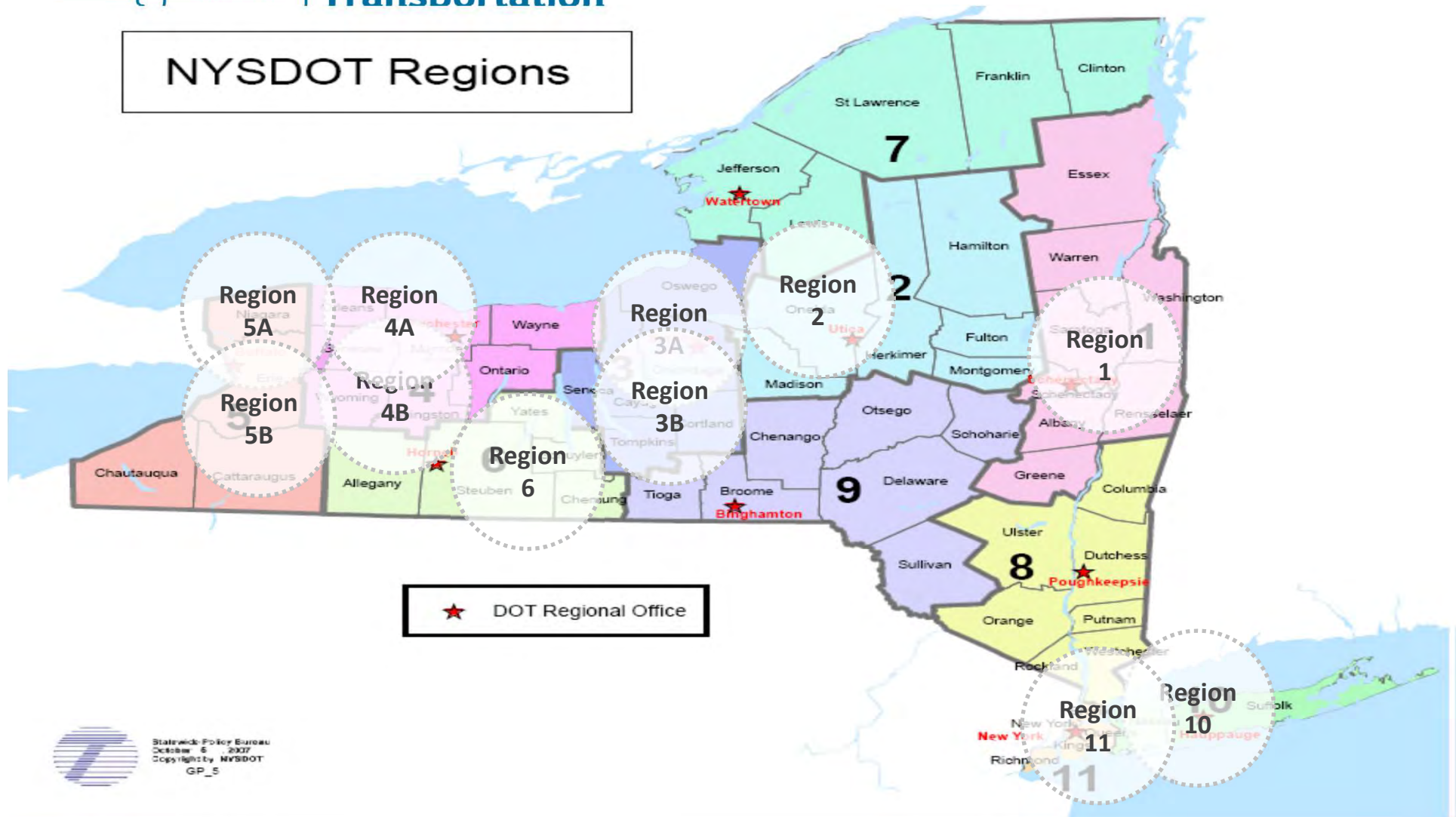
- **Production Special Note**
 - Two Mixes (Different Regions and Producers)
 - IDEAL Cracking Test, Semi-Circular Bending
 - High-Temp IDT, APA or Hamburg Test
 - Comparison Testing
- Rutgers Research Project

- Production Special Note
- **Rutgers Research Project**
 - 11 Mixes (Covering eight Regions)
 - APA, Hamburg, High-Temp IDT
 - Overlay Tester, SCB, IDEAL-CT
 - NY Balanced Mix

- More Mixture Diversity
- Statewide Criteria



NYSDOT Regions



Statewide Policy Bureau
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Implementation

**Widespread Production
Including Many Regions
Non-Standard Methods**

**Rutgers BMD
Production Note**



**Testing Matrix
Standardized
New Equipment Investment**

- **Performance Note 1.1**
 - Major Components:
 - Enhanced Mixture Approval
 - Modified Quality Control Process



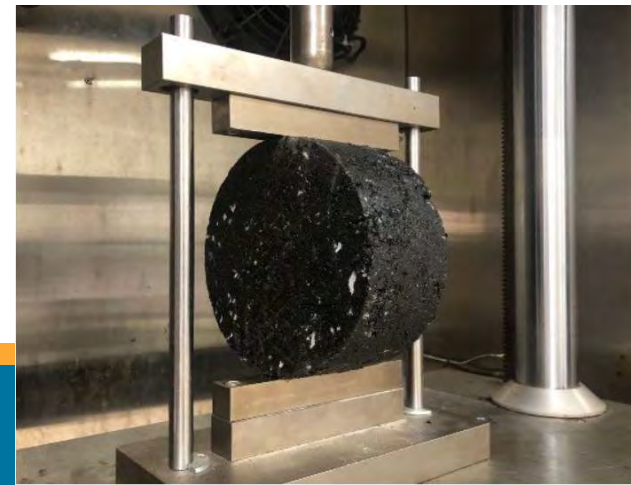
<https://www.globalgilson.com/indirect-tensile-loading-fixtures>

High-Temp IDT Test



<https://www.globalgilson.com/s-emi-circular-bend-test-fixture>

Semi-Circular Bending Test



Semi-Circular Bending Test

https://www.researchgate.net/figure/ID-EAL-cracking-test-IDEAL-CT_fig1_343785079

Enhanced Mixture Approval

Mixture Verification

- Producer Made Samples
 - Producer-Tested Samples
 - Regional Lab – Tested Samples
- Regional Lab Made Samples
 - Regional Lab Tested Samples

Test Methods	Criteria	Design Value
AASHTO TP124-18 Flexibility Index Test	Flexibility Index	6
ASTM D6931-17 Indirect Tensile Strength Test	IDT Strength	30 psi
ASTM D8225-19 Determination of CT Index	CT Index	100

Modified Quality Control Process

Plant Test Property	Test Method	Contractor Testing Frequency ¹	Department Testing Frequency ²
Aggregate Gradation	AASHTO T27	One per Sublot	One per Day (enough material for two tests)
Aggregate Moisture	AASHTO T255	One per Lot	Monitor and Verify
Mix Temperature	-	Two per Sublot	-
Air Voids	MM 5.16, AASHTO T269	One per 3 Lots	One per 3 Days
Indirect Tensile Strength	ASTM D6931-17	One per 3 Lots	One per 3 Days
Semi-Circular Bending	AASHTO TP124-18	One per 3 Lots	One per 3 Days
Determination of CT Index	ASTM D8225-19	One per 3 Lots	One per 3 Days

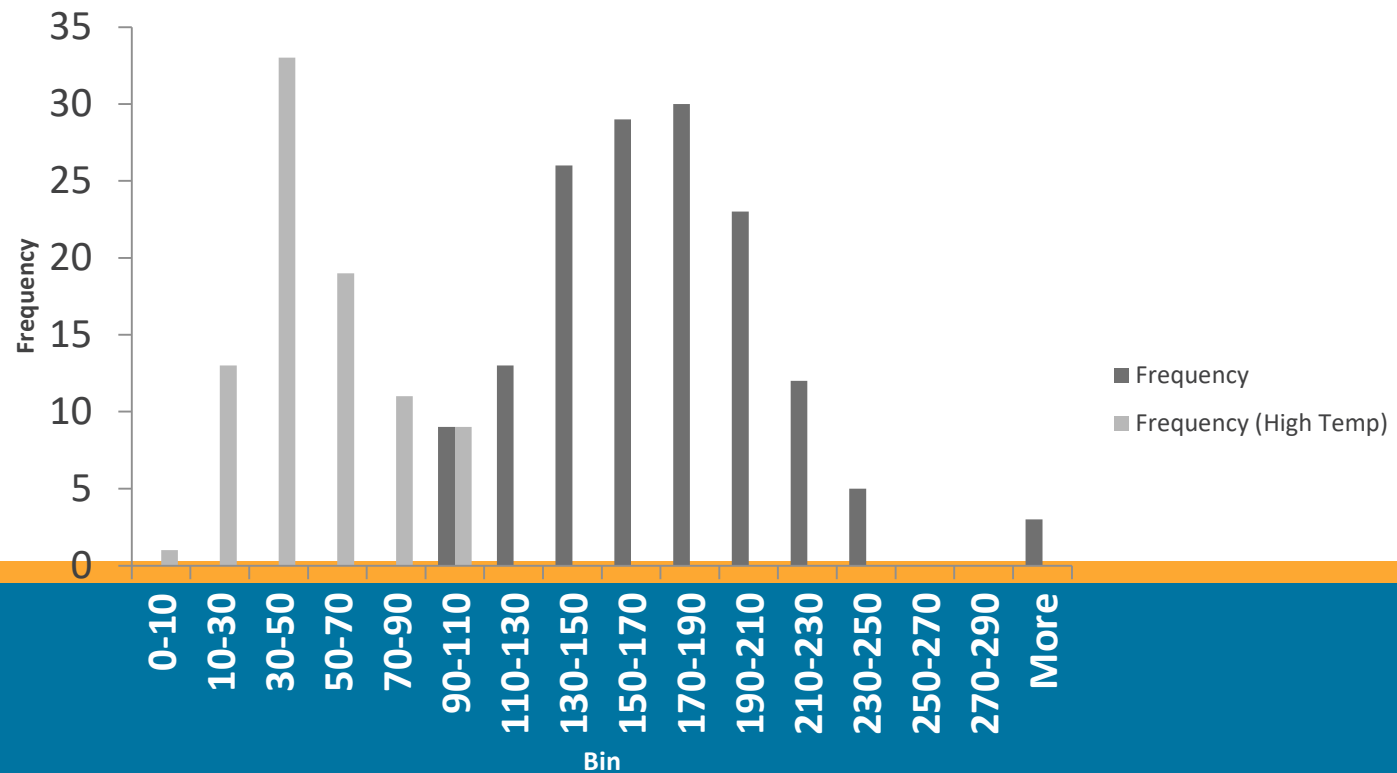
All Data Recorded on Control Charts*



- **Performance Note 1.1**
 - Major Components:
 - Enhanced Mixture Approval
 - Performance Component
 - Modified Quality Control Process
 - Simplified/Flexible
 - Reduced Plant Presence
 - Control Charts

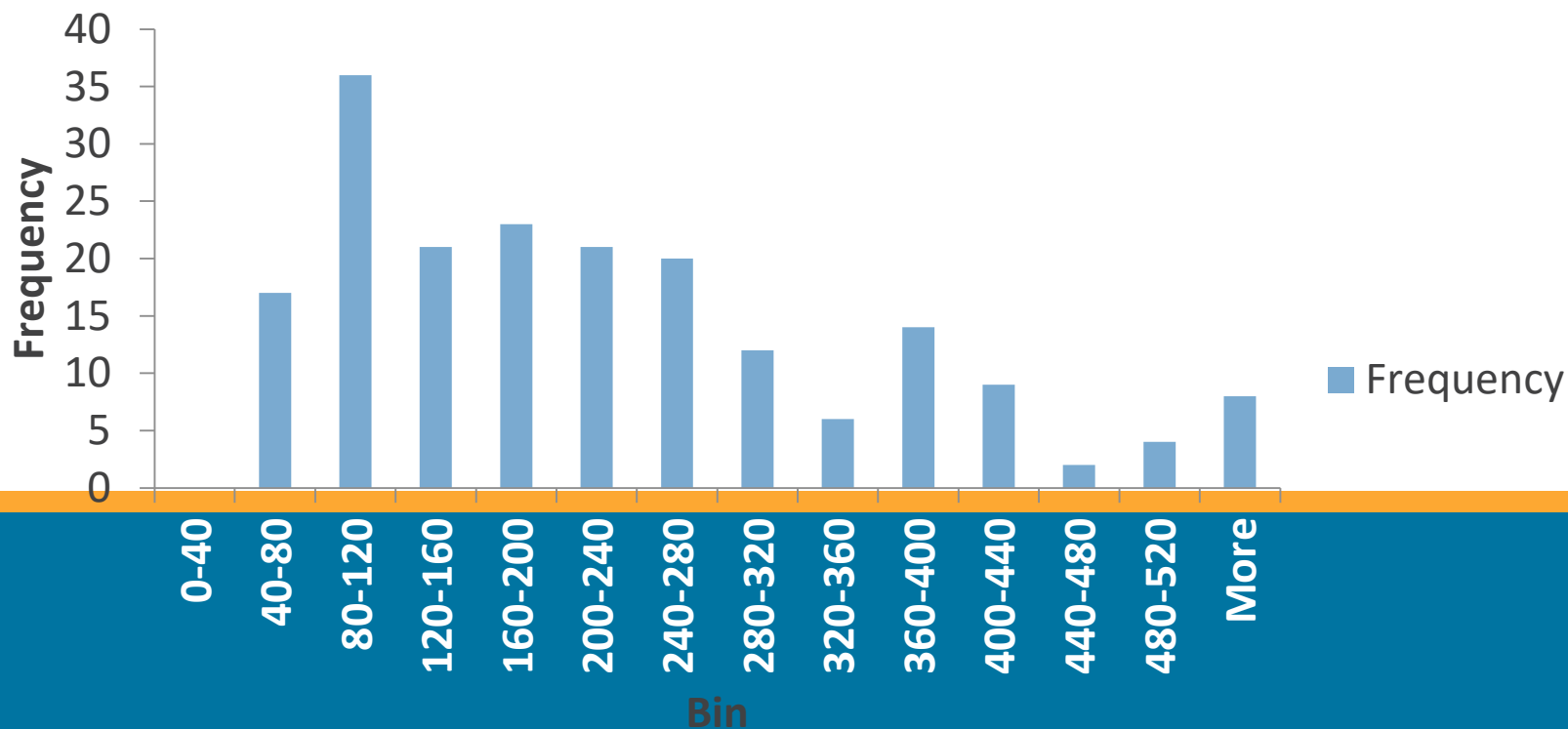
- Performance Note 1.1

IDT Strength Histogram



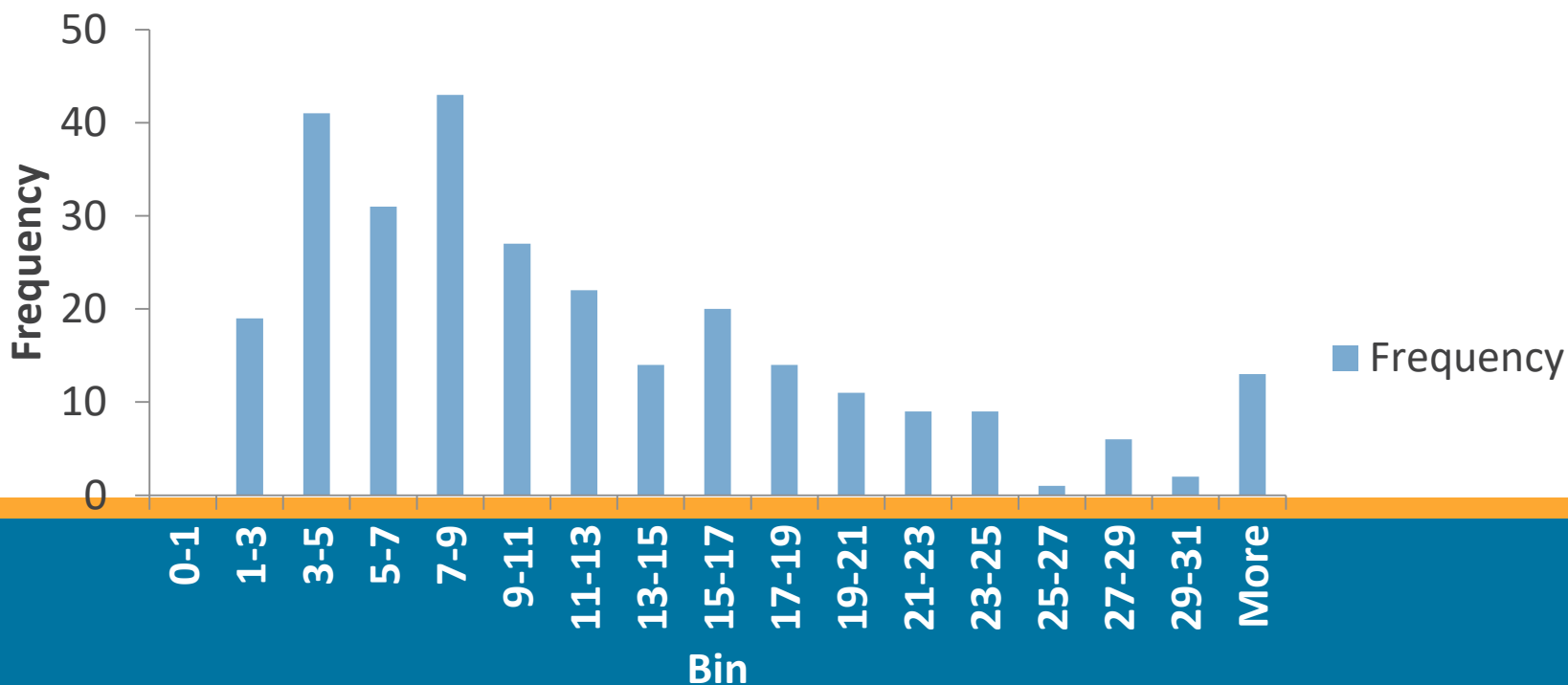
- Performance Note 1.1

Ideal CT Index Histogram



- Performance Note 1.1

SCB Histogram



- **Performance Note 1.1**
 - Major Components:
 - Enhanced Mixture Approval
 - Performance Component
 - Modified Quality Control Process
 - Simplified/Flexible
 - Reduced Plant Presence
 - Control Charts

Major Takeaways:

1. Improving and Evolving Criteria
2. Consistency in sample fabrication
3. Solidifying Aging Protocols

NYS Mixture Performance – Production Note

- Gradation is the controlling Test Property for this project
- Gradation Limits
 - Production
 - Action
 - Evaluation

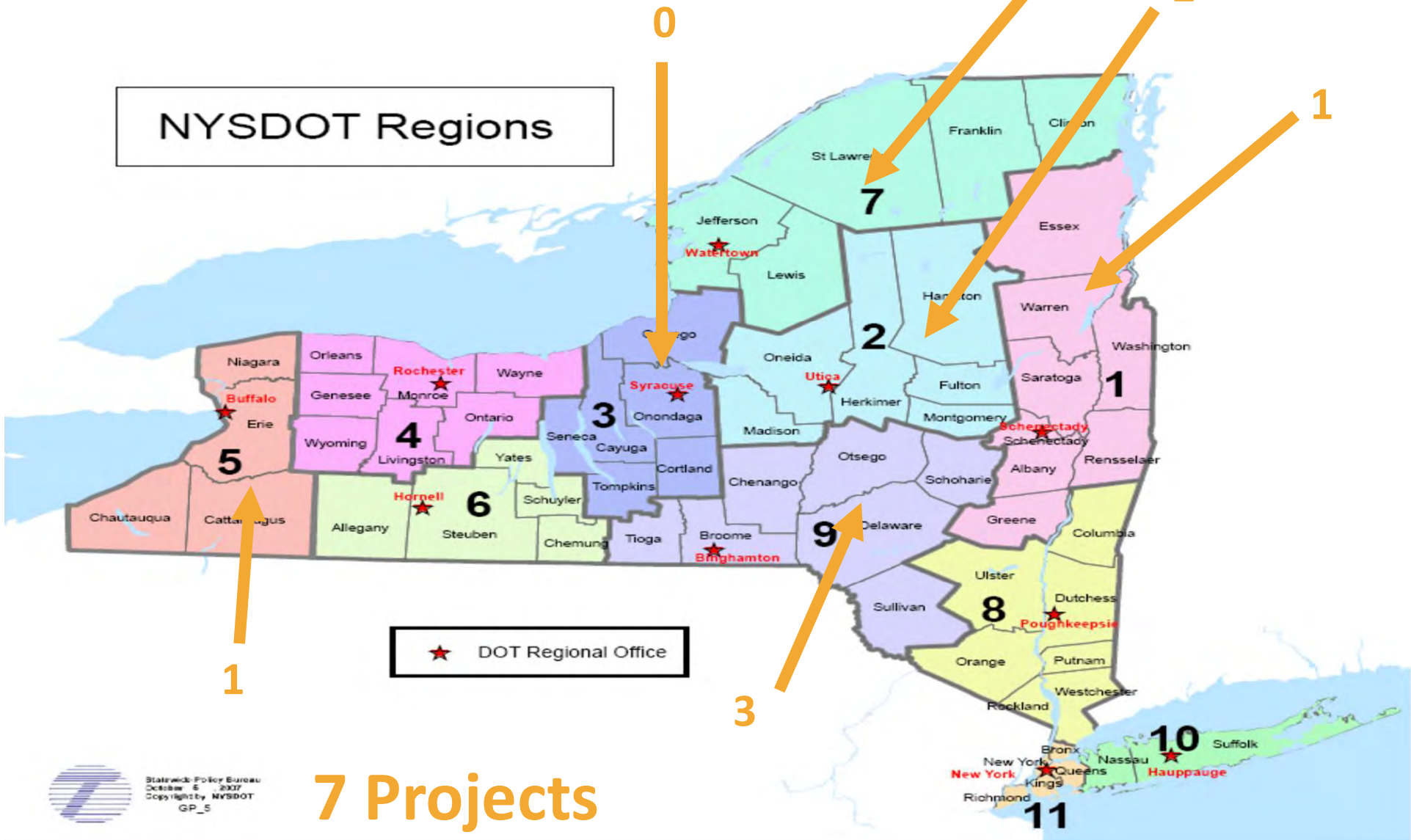
Limits (Test Value – JMF Value)	Sieve Sizes		
	#50 and Larger (300 µm and Larger)	#100 (150 µm)	#200 (75 µm)
Production	0.0 – 5.0	0.0 – 4.0	0.0 – 2.0
Action	5.0 – 8.0	4.0 – 6.0	2.0 – 4.0
Evaluation	>8.0	>6.0	>4.0



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2020

NYSDOT Regions



7 Projects



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Implementation

**Widespread Production
Including Many Regions
Non-Standard Methods**

**Rutgers BMD
Production Note**



**Testing Matrix
Standardized
New Equipment Investment**

**Increased Usage
Mixture Design Component**



- **Performance Note 1.2**
 - Major Components:
 - No major changes
 - Expanded roll-out
 - Tweaks with process

Major Takeaways:

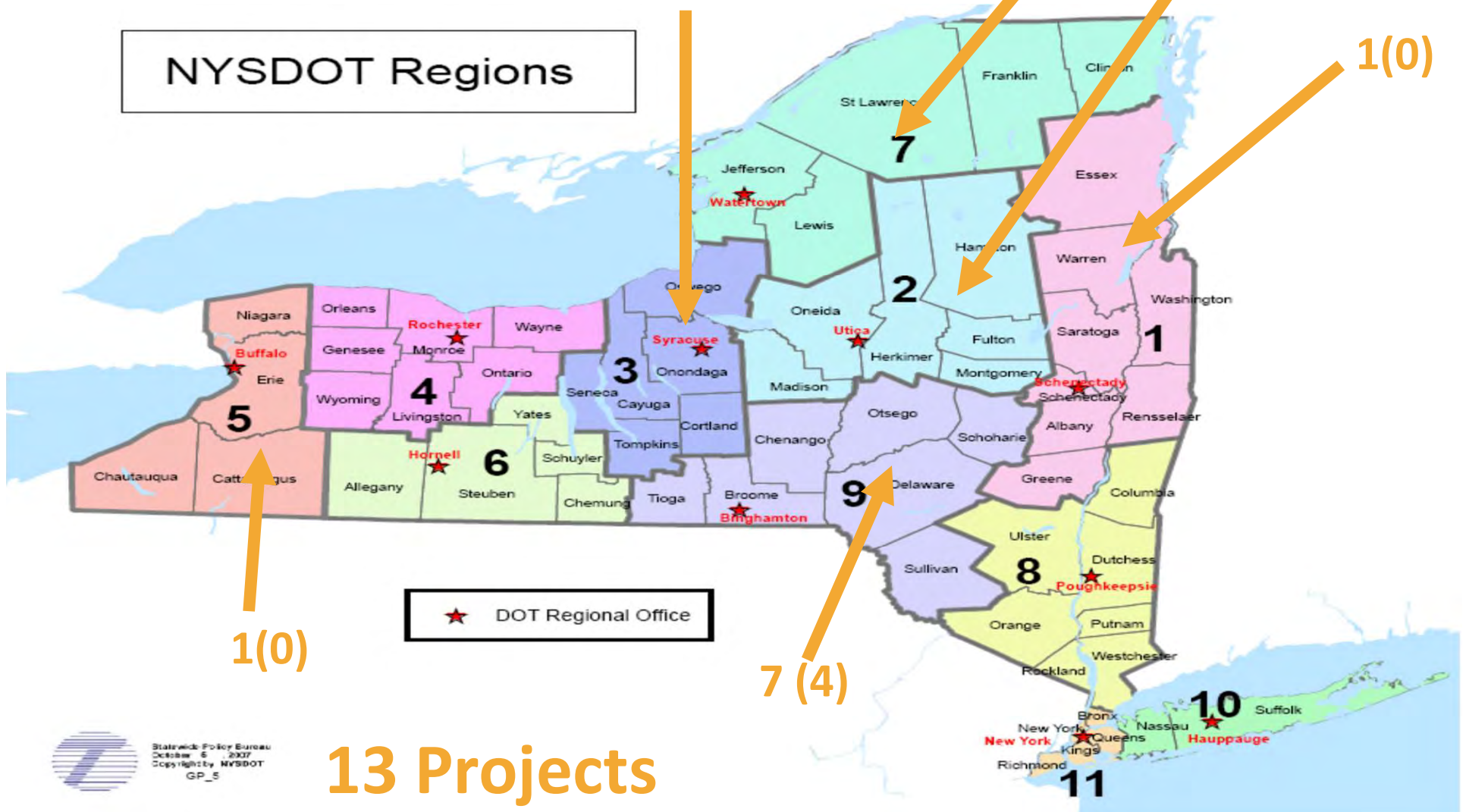
1. Need Experience, both years and projects
2. Good collaboration with involved parties



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2021

NYS DOT Regions



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- **Performance Note 1.2**
 - Major Components:
 - No major changes
 - Expanded roll-out
 - Tweaks with process

Major Takeaways:

1. Need Experience, both years and projects
2. Good collaboration with involved parties



Implementation

VERSION 1.0

FIRST REAL PROJECTS

EQUIPMENT/PROCEDURE

OPERATIONAL

RUTGERS

FIRST CONTRACTOR DATA

Pre-2020

2021

2022

2023

2024

VERSION 1.1

EXPANSION & CLARITY

MORE COMPLETE

SHOWN COMMITMENT TO
INDUSTRY

Enhanced Mixture Approval

Mixture Verification

- Producer Made Samples
 - Producer-Tested Samples
 - Regional Lab – Tested Samples
- Regional Lab Made Samples
 - Regional Lab Tested Samples
 - **Producer Lab-Tested Samples**

Test Methods	Criteria	Design Value	COV
AASHTO TP124-18 Flexibility Index Test	Flexibility Index	8	≤40
ASTM D6931-17 Indirect Tensile Strength Test	IDT Strength	30 psi	≤40
ASTM D8225-19 Determination of CT Index	CT Index	135	≤40

Major Changes:

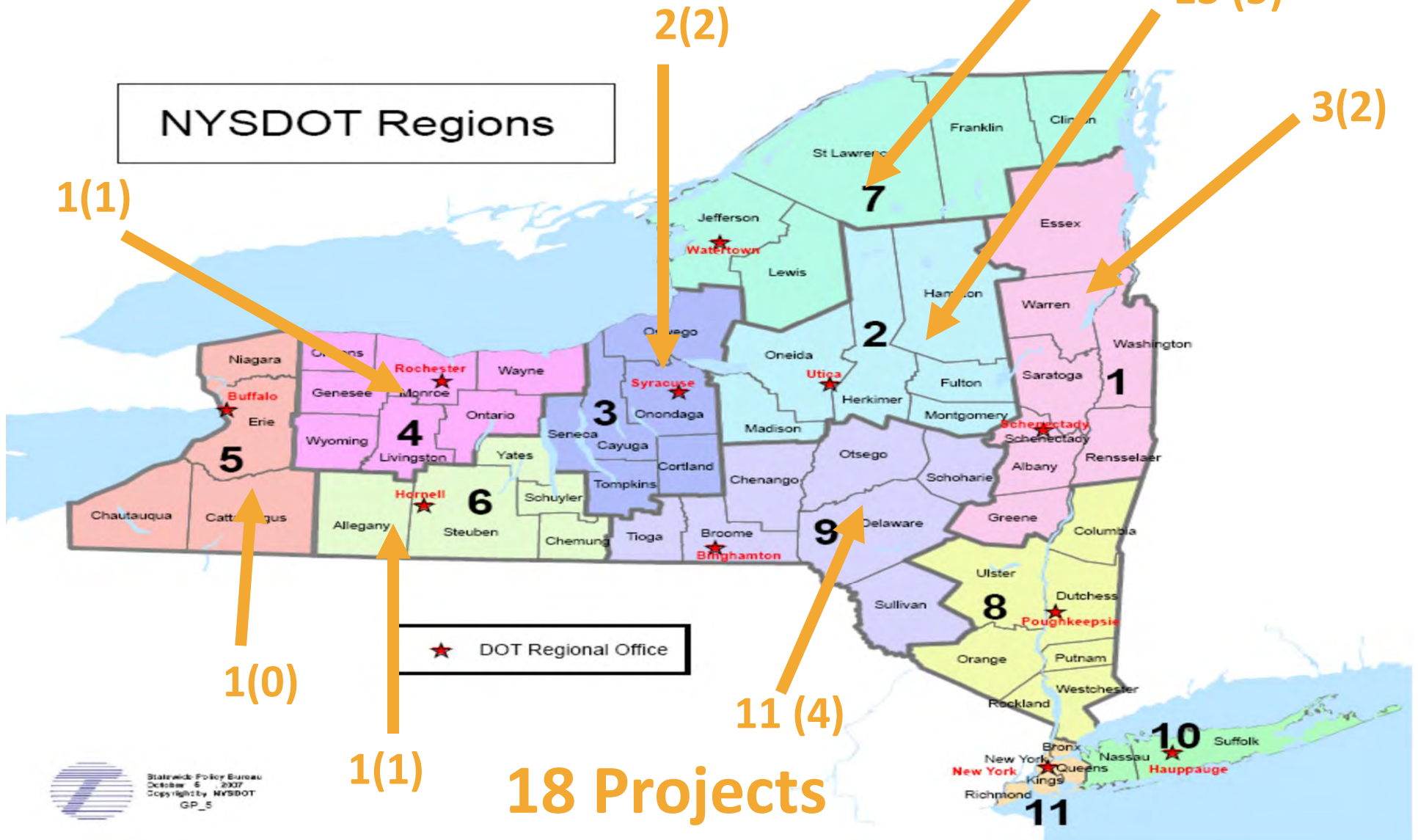
1. Consistent Aging Producer to Region
2. More rigorous criteria



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2022

NYS DOT Regions



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Implementation

VERSION 1.0
FIRST REAL PROJECTS
EQUIPMENT/PROCEDURE
OPERATIONAL
RUTGERS
FIRST CONTRACTOR DATA

VERSION 2.0
HAVE THE FULL YEAR TO
EVALUATE 2 SEASONS
SIGNIFICANT CHANGE (IF
ANY) HAPPENS NOW
EXPANSION STATEWIDE

**REVISIONS TO ASPHALT
QC/QA PROGRAM**
**REVISIONS TO ASPHALT
MIXTURE APPROVAL**



VERSION 1.1
EXPANSION & CLARITY
MORE COMPLETE
SHOWN COMMITMENT TO
INDUSTRY

**REFINEMENT BASED ON
2.0 REVISION**
**PREPARATION OF
DOCUMENTS TO
STANDARDIZE**
DECIDE SCOPE OF USAGE



Department of
Transportation

Comments or Questions?

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