55th Illinois Bituminous Paving Conference

In Conjunction With

North Central Asphalt User Producer Group

Mix Optimization for Quality and Consistency

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Some Definitions…

- ***Optimize***:
  To make something as good or as effective as possible

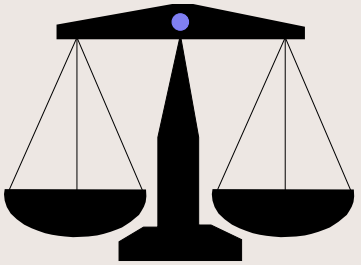
- ***Quality***:
  A high level of value or excellence

- ***Consistent***:
  Always acting or behaving in the same way

Merriam-Webster.Com

What's Your Definition of an ***Optimized*** Mix?

- Contract Requirements
- Economical
- Reproducible
- Compactable and Non-Segregating
- Workable and Controllable
- Achieve Full Pay



Meets or Exceeds ***All*** Contract Requirements

- Gradation
- VMA and Voids
- Binder Replacement
- Stripping Test
- Density
- Non-segregating
- Smooth
- Hamburg Wheel
- Future Cracking Test…?

Economical ≠ Cheapest

The most **economical** blend seeks the right **balance** between material costs and design characteristics that influence pay and customer satisfaction.

- As-Produced vs. Design material costs (produce a quality mix **at or below** design material cost)
- Bonus vs. Penalty dollars achieved (achieve **maximum** pay for each mix on each job)
- **User-Friendly** to all parties involved (plant, lab, laydown)

Reproducible

- Achieve **accurate** mix design results
  - Aggregate specific gravities
  - Consistent and Correct
    - Blending, mixing, handling, specimen preparation and specimen testing
  - Do the results make sense?
  - Verify blend gradation and AC content achieved
- Account for anticipated VMA loss
  - Know what was achieved in the design
  - Field data evaluation

Compactable, Non-Segregating

The ***Bailey Method*** relates to:

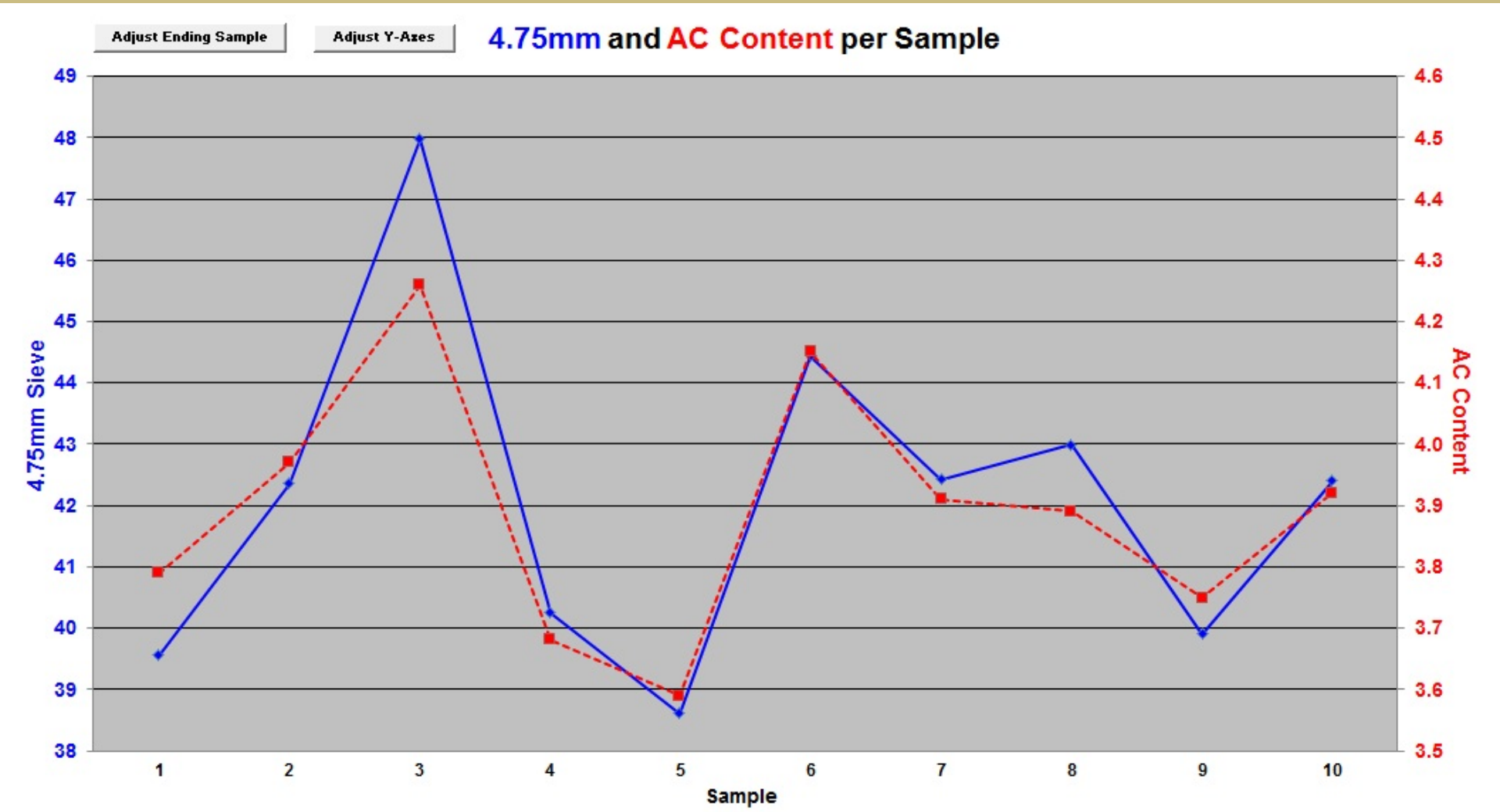
- Field Compactability, Segregation Susceptibility and Tenderness
  - **CA** volume relative to mix **type** and **lift thickness**
  - **CA** ratio
  - **FA_c** and **FA_f** ratios
- Do you have a systematical approach to mix evaluation (design and field)?

Laboratory Mixture Analysis

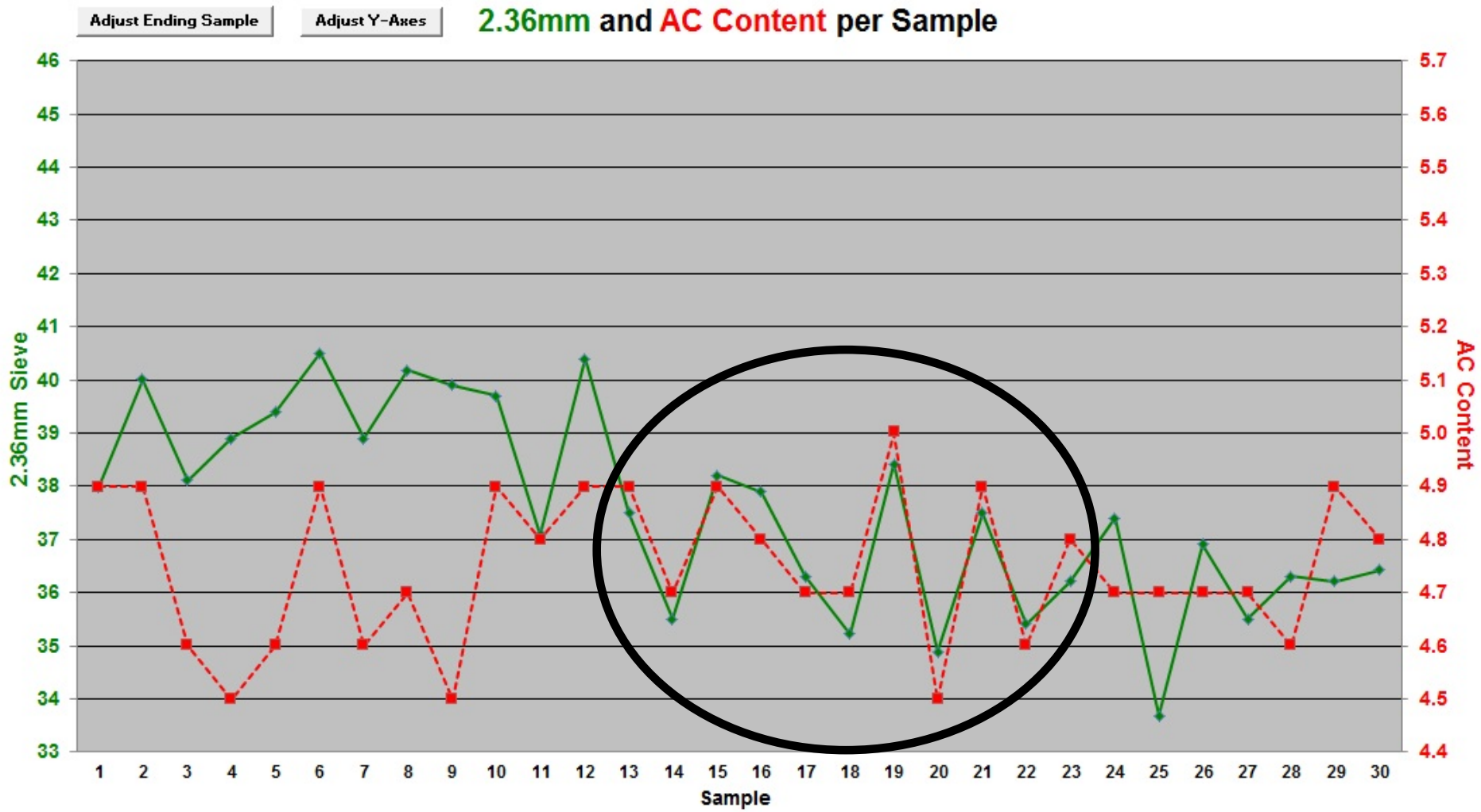
Laboratory Mixture Analysis


ATTRACTION - EXIT 41

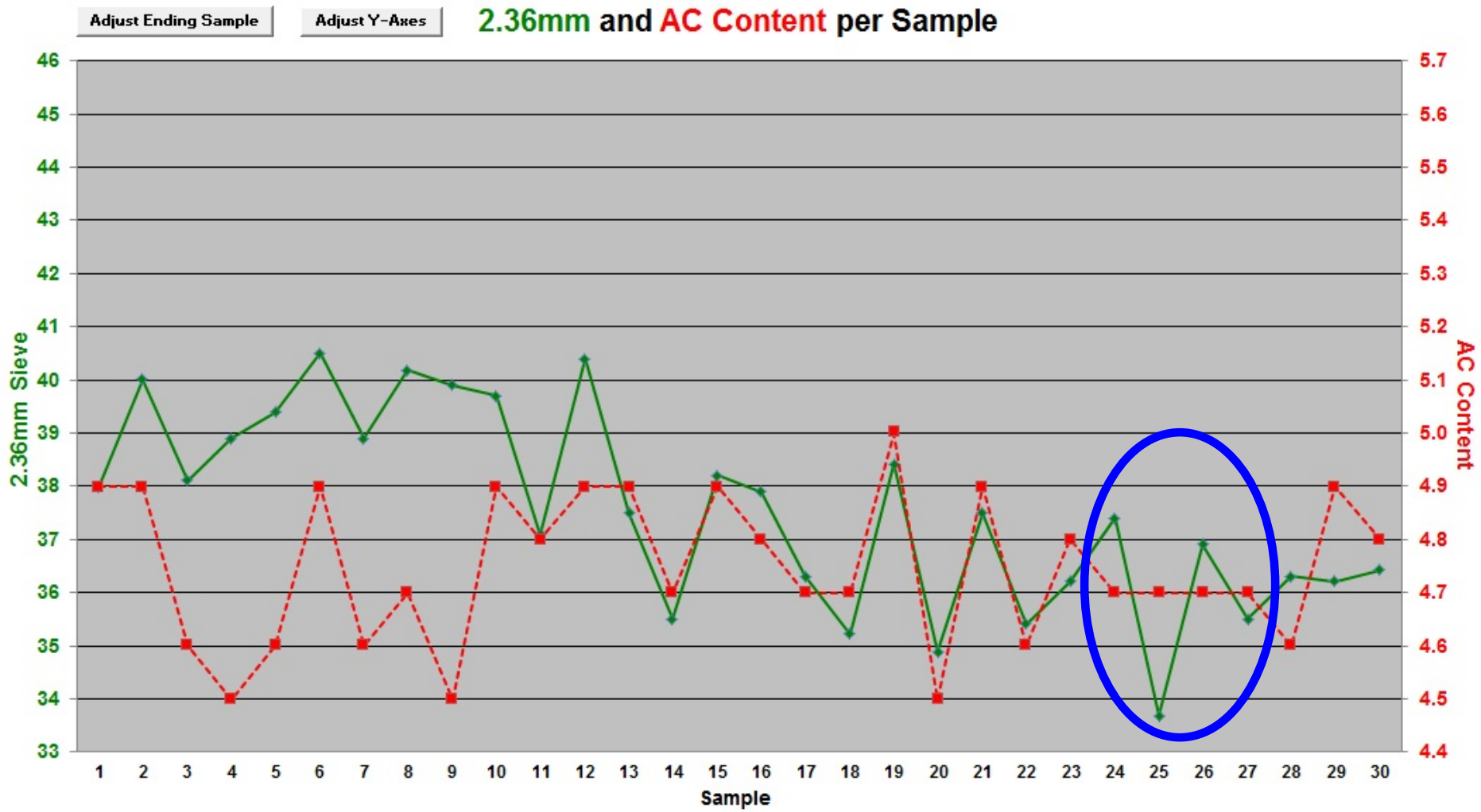
Segregated Mix



Segregated Mix



Non-Segregated Mix



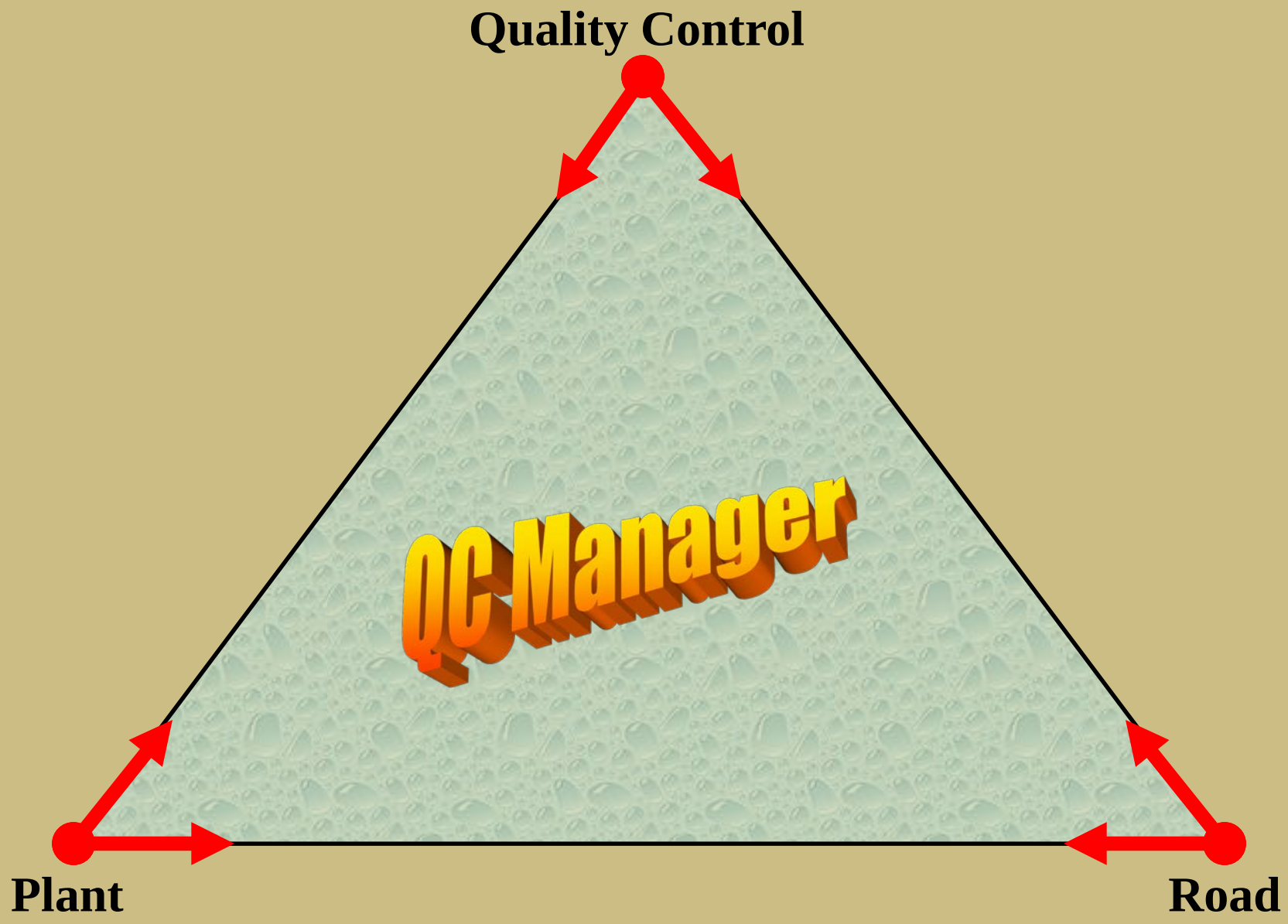
Workable and Controllable

- Volumetric **adjustability** during production
  - Key to meeting volumetrics, while maintaining cost effectiveness
  - Achieving a blend and corresponding volumetrics that provides a **workable** mix
- Sensitivity to field gradation **changes** as it relates to mix **control**
  - What method do you have for analyzing mix results to provide an indication of sensitivity to change relative to volumetrics, density, and performance tests?

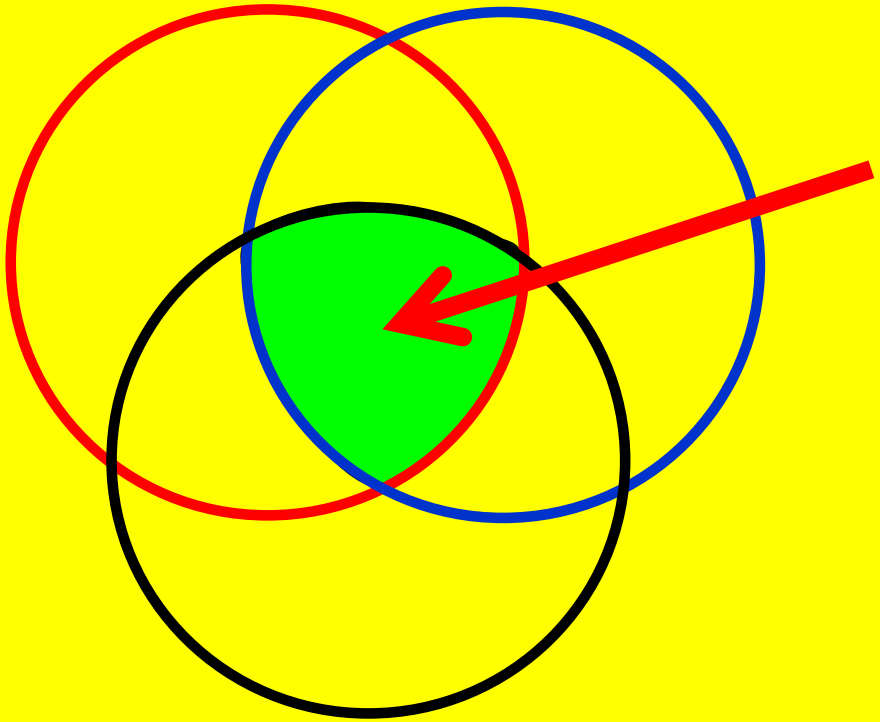
Other Issues to Consider…

- Design should take into account job specific characteristics, such as:
  - Silo time
  - Haul time
  - **Lift thickness**
  - Handwork
  - Underlying base
- **Communication** is vital!

In The Past…



Moving Forward As A TEAM!



QC Manager

Quality Control

Plant

Laydown

Everyone Plays a Role in QC!

Train them, Enable them, Support them, and Hold them Accountable

Things That Handcuff Us…

- Low Bid System
  - We have to compete!
  - Not enough pie!
- Challenging Decisions…
  - Multiple mixes
  - Production/Placement rate
  - Stockpile area
  - Commitment
- Locally Available Materials
- Lift Thickness

THE HERITAGE GROUP


POWERSCREEN

Mix **Type** vs. Lift Thickness

HMA Lift Thickness vs. NMAS and Mix Type			
Nominal Maximum Aggregate Size	**NCAT** **Coarse**-Graded **4 x NMAS**	**NCAT** **Fine**-Graded **3 x NMAS**	**IDOT** Specification **3 x NMAS**
9.5mm **(3/8”)**	**1-1/2”**	**1-1/8”**	**1-1/4”**
12.5mm **(1/2”)**	**2”**	**1-1/2”**	**1-1/2”**
19.0mm **(3/4”)**	**3”**	**2-1/4”**	**2-1/4”**
25.0mm **(1”)**	**4”**	**3”**	**3”**

Info from Fine-Graded Literature Review Performed by Murphy Pavement Technology

Mix *Optimization*

Where do you start?….

- Trial and ***Error***?
  - Experience
  - Specification Bands
- Which blend is **best**?
- How will it work at the plant and in the field?
- How will it perform?
- Today, it requires a more ***systematical*** approach to design and control a mix to achieve success!


Thank You