

New Jersey Intelligent Compaction Pilot Project: Results and Lessons Learned

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Overview

- Why is compaction so important?
- Project Overview and Key Facts
- NJ-IC Specification
- Results and Lessons Learned
- Questions

Why are we talking about compaction?

- Achieving the target compaction of an asphalt pavement may be the single most important factor to the longevity of the pavement
- Studies have cited that a 1% deviation from the target design air voids results in a 10% reduction in service life (20 year design = 18 year max life, 50 years = 45 years)
- Under-compaction typically results in increased permeability, rutting, and raveling
- Over-compaction results in bleeding, shoving, and cracking all while wasting time and resources

Project Overview

- The Rt. 130 Main Street to Route 1 Resurfacing Project spanned 3 townships (Cranbury, South Brunswick and North Brunswick)
- Project bounds were between Mile Posts 72.8 and 83.5 both North and South bound lanes received attention
- Pavements utilized were a Binder Rich Intermediate Course (BRIC) topped with a 12.5mm Stone Matrix Asphalt (SMA)
- A Material Transfer Vehicle (MTV) was utilized during paving operations
- Both Intelligent Compaction and Thermal Profile Scanning were utilized on the project

Thermal Profile Scanner (TPS)

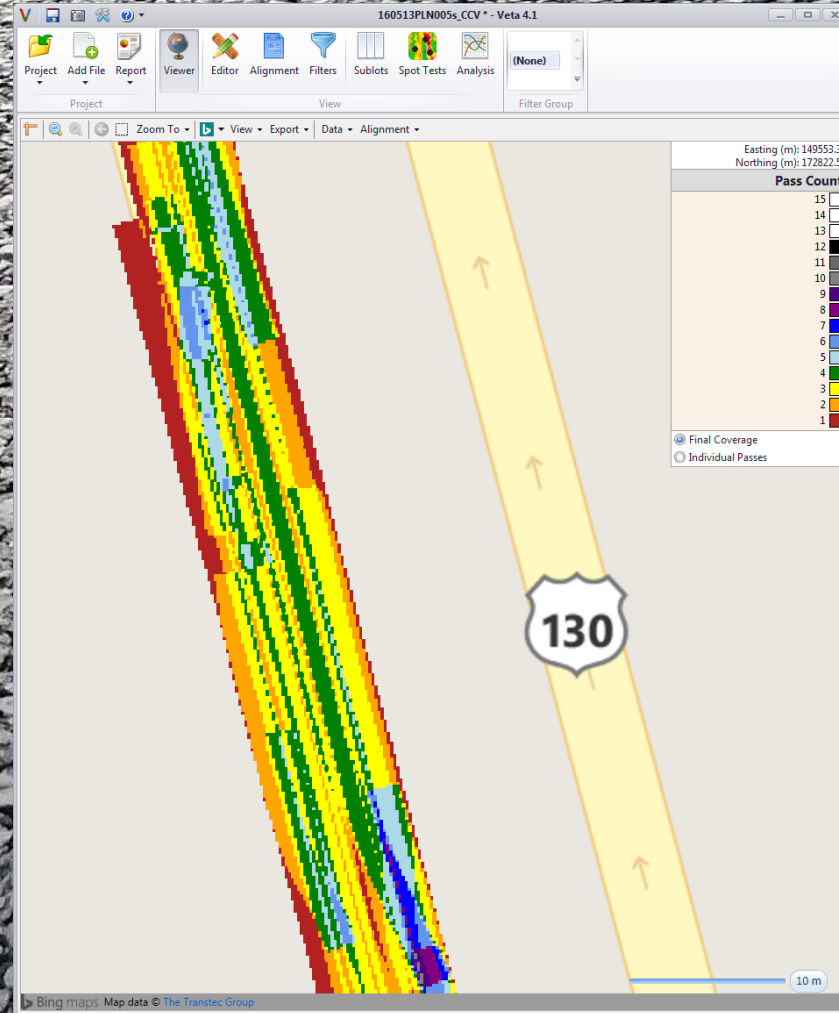
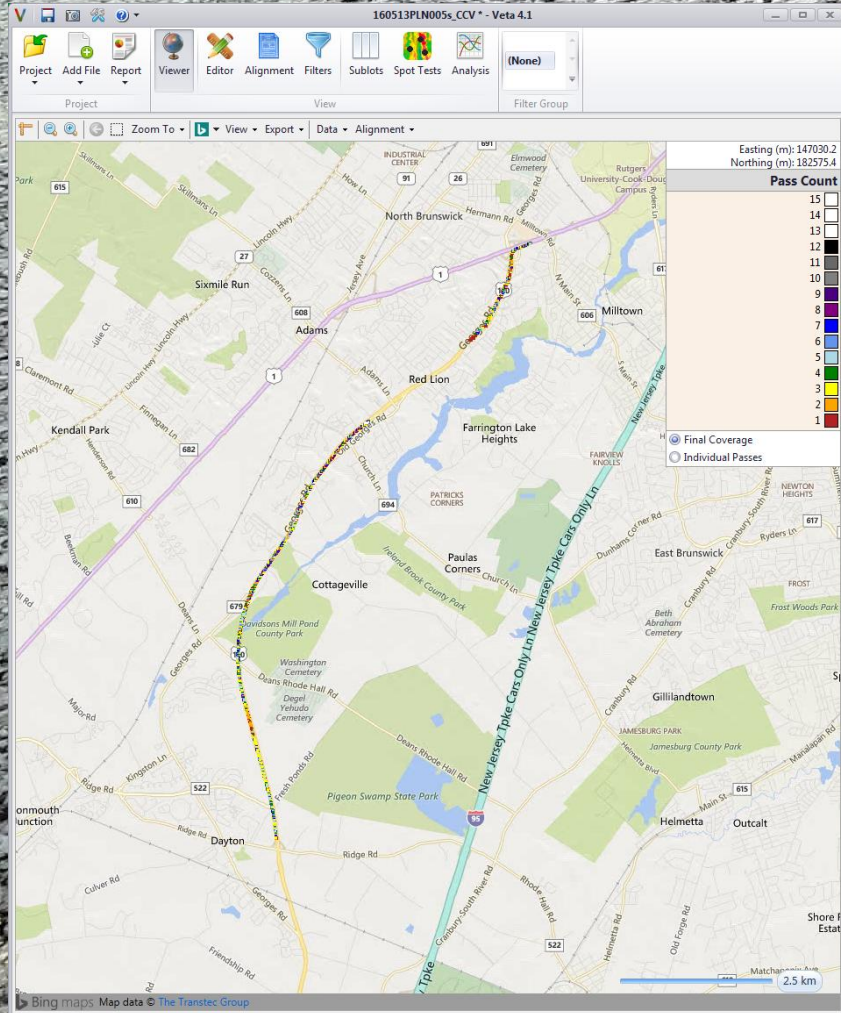


Formally known as Infrared Bar (IR-Bar)

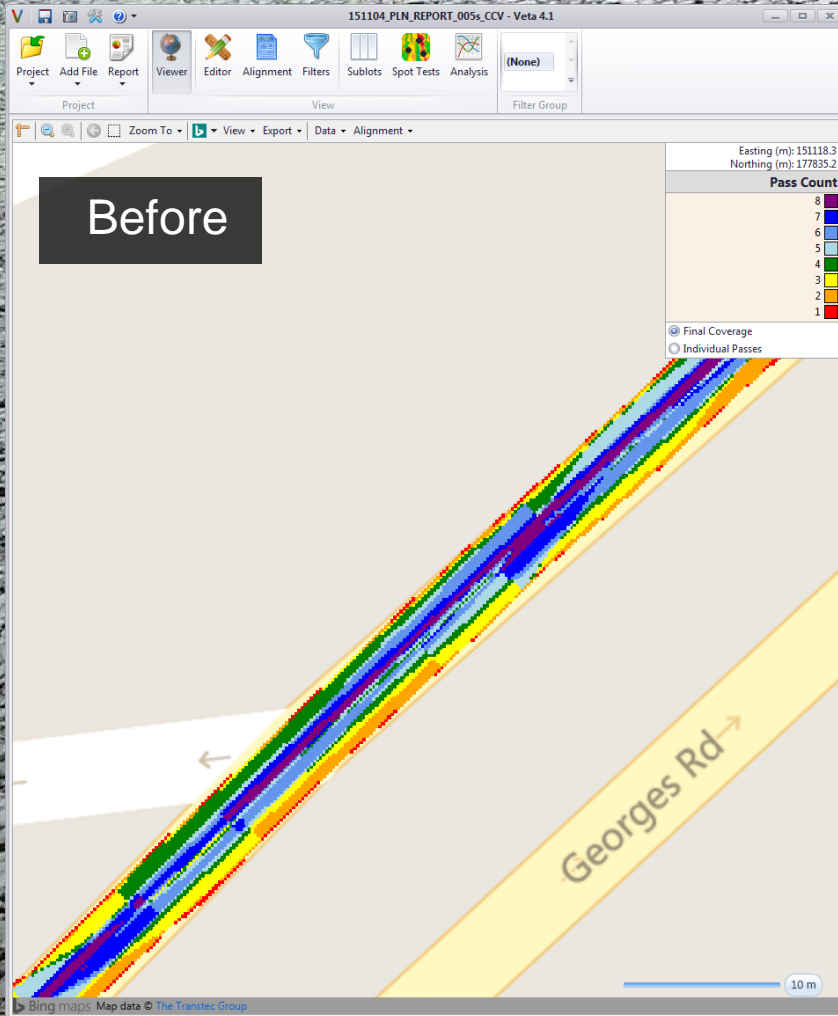


Replaced by a single scanning device

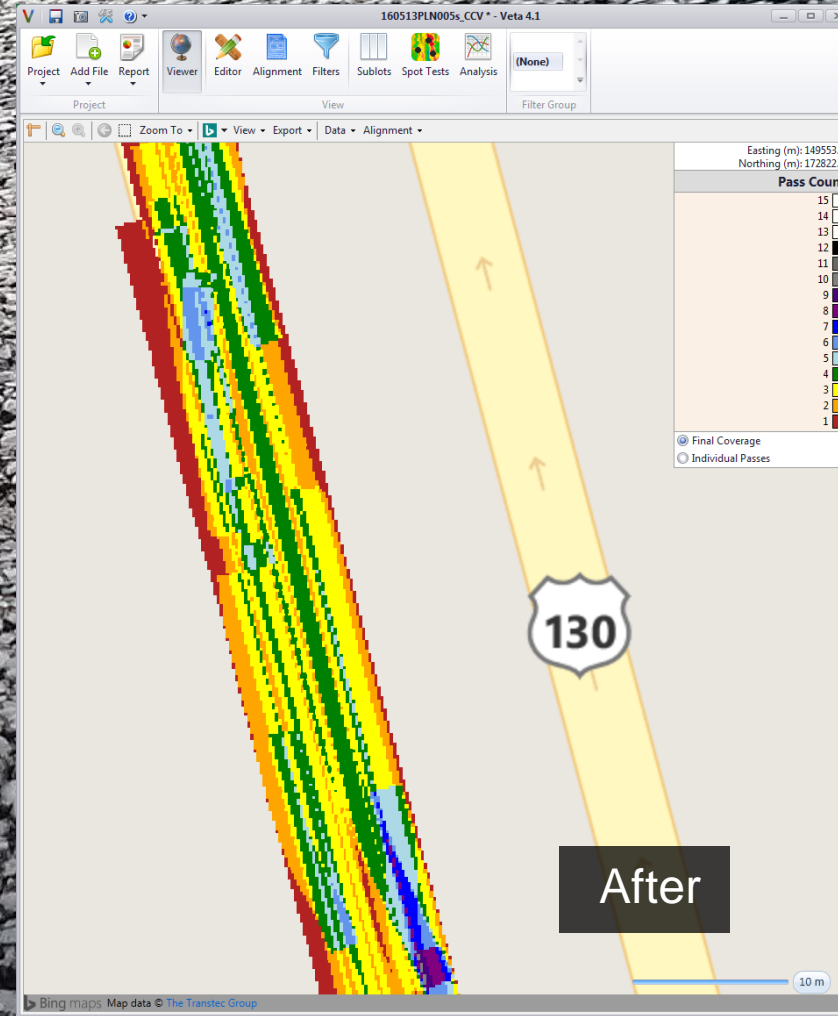
Results



Results

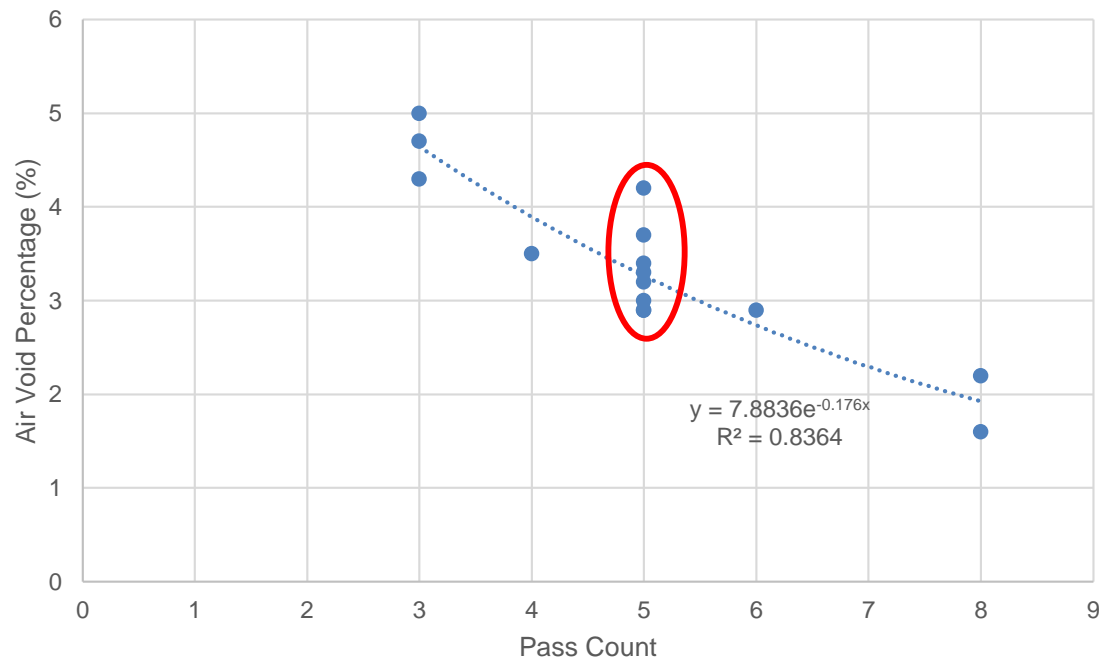


VS.

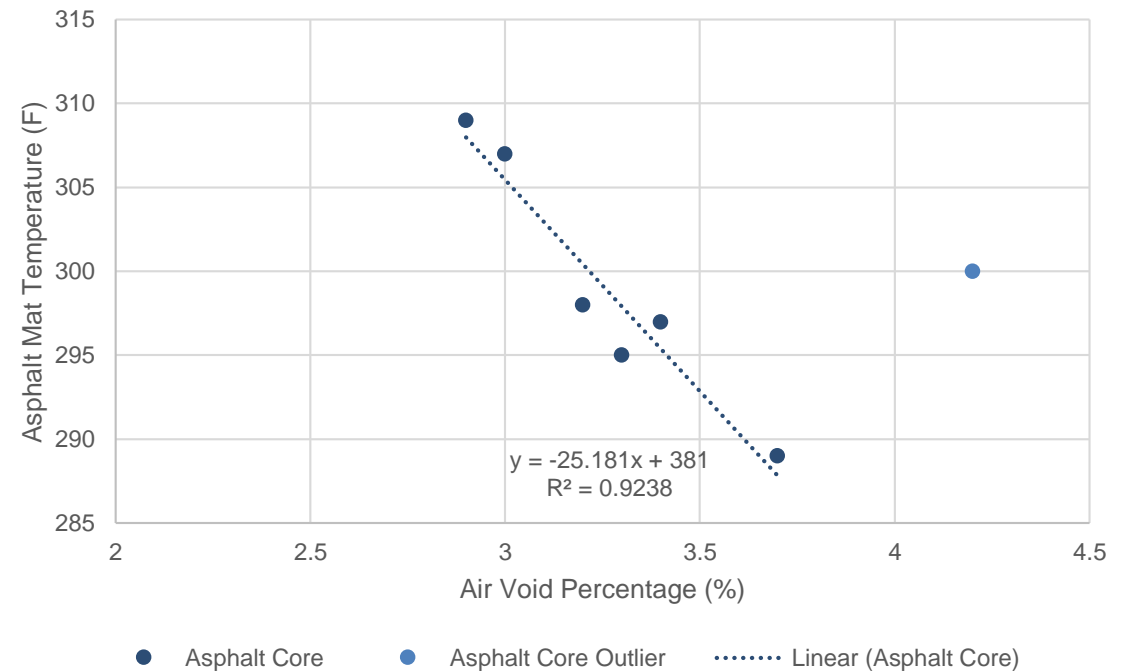


Results

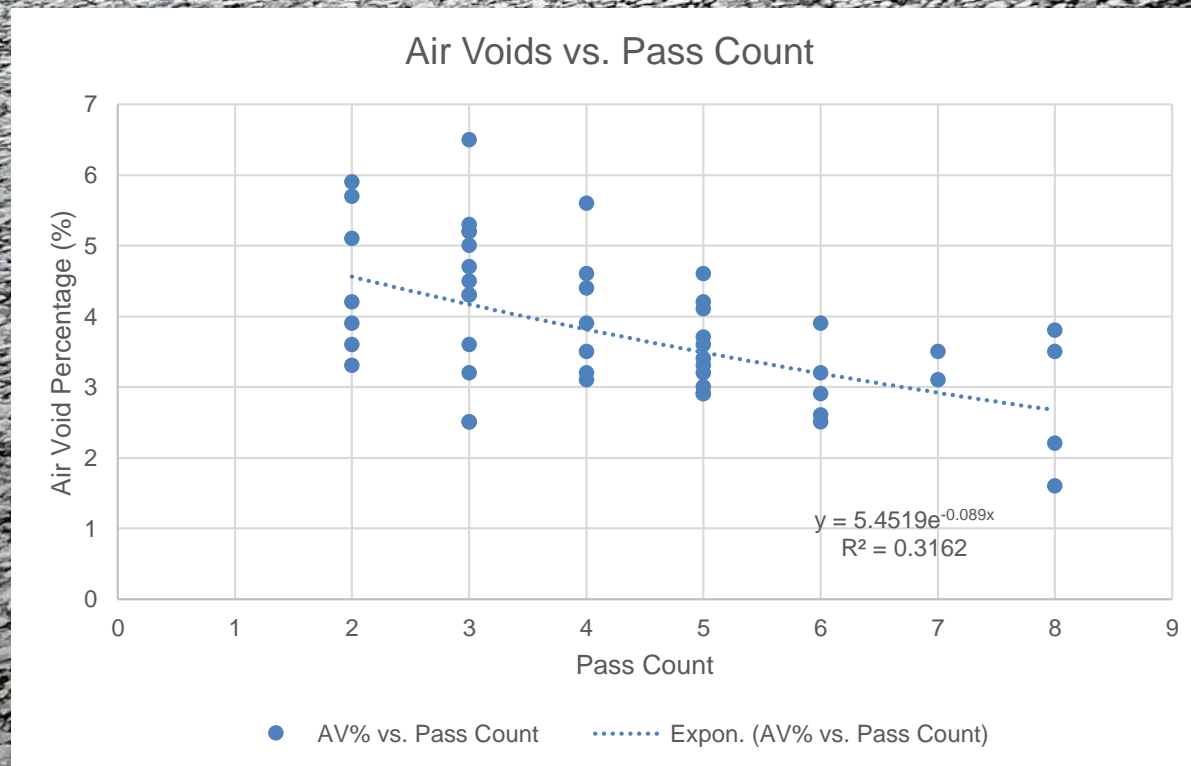
Air Voids vs. Pass Count



Asphalt Mat Temperature vs. Air Voids



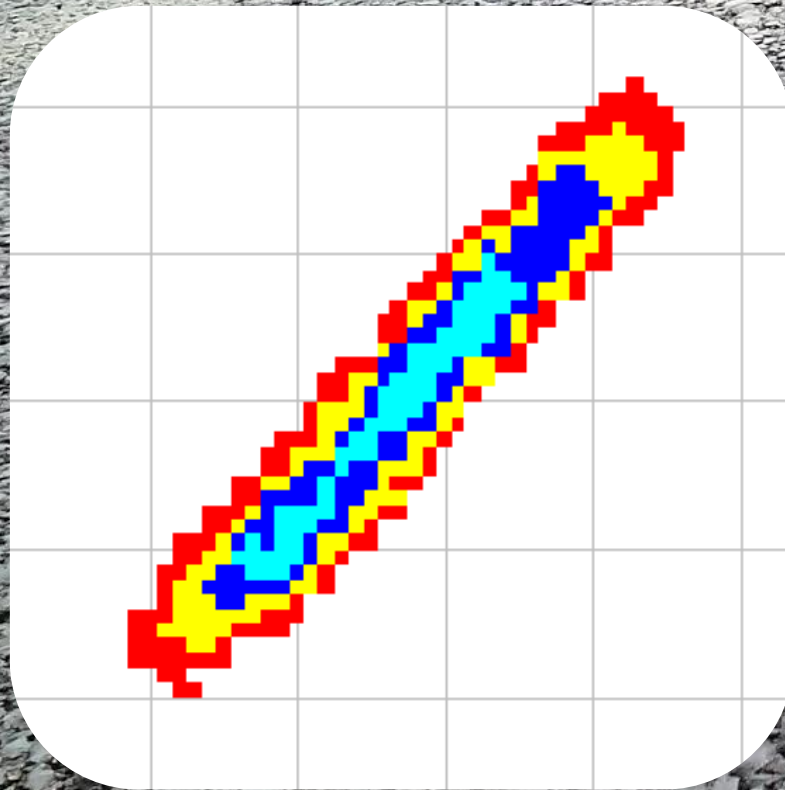
Results



Lessons Learned

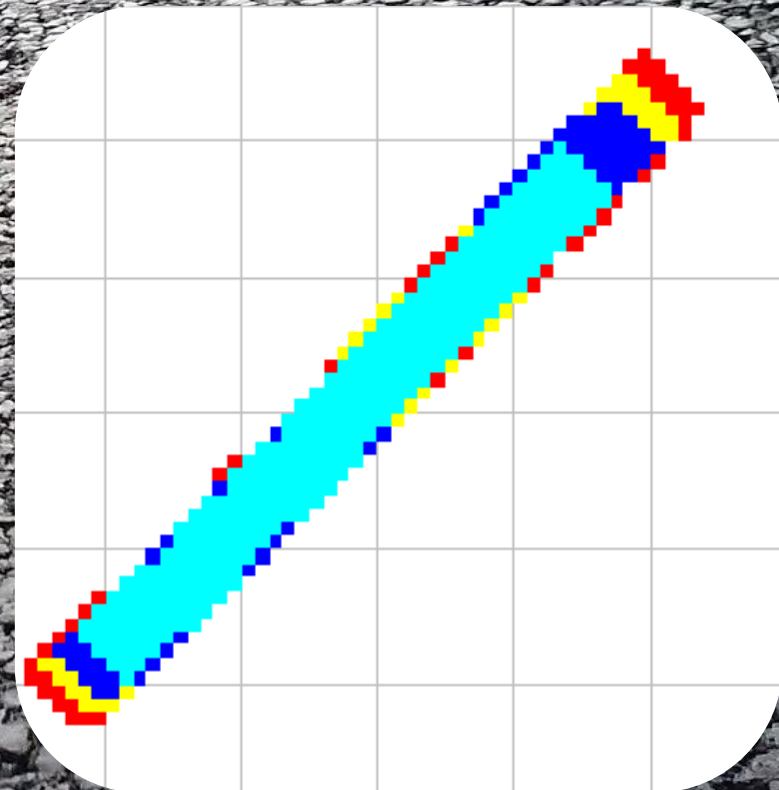
- Contractors can produce better quality pavements with adequate and more consistent rolling patterns without under or over rolling
- Consistency in rolling patterns
- Increases in efficiency over the project mean pass count dropped from 4 to 3 passes
- Contractors can monitor material performance in real time, with 100% coverage, making problem areas easier to identify
- Agencies are provided with geospatial records that can be re-purposed for future projects

Components - GPS



Poor GPS Accuracy

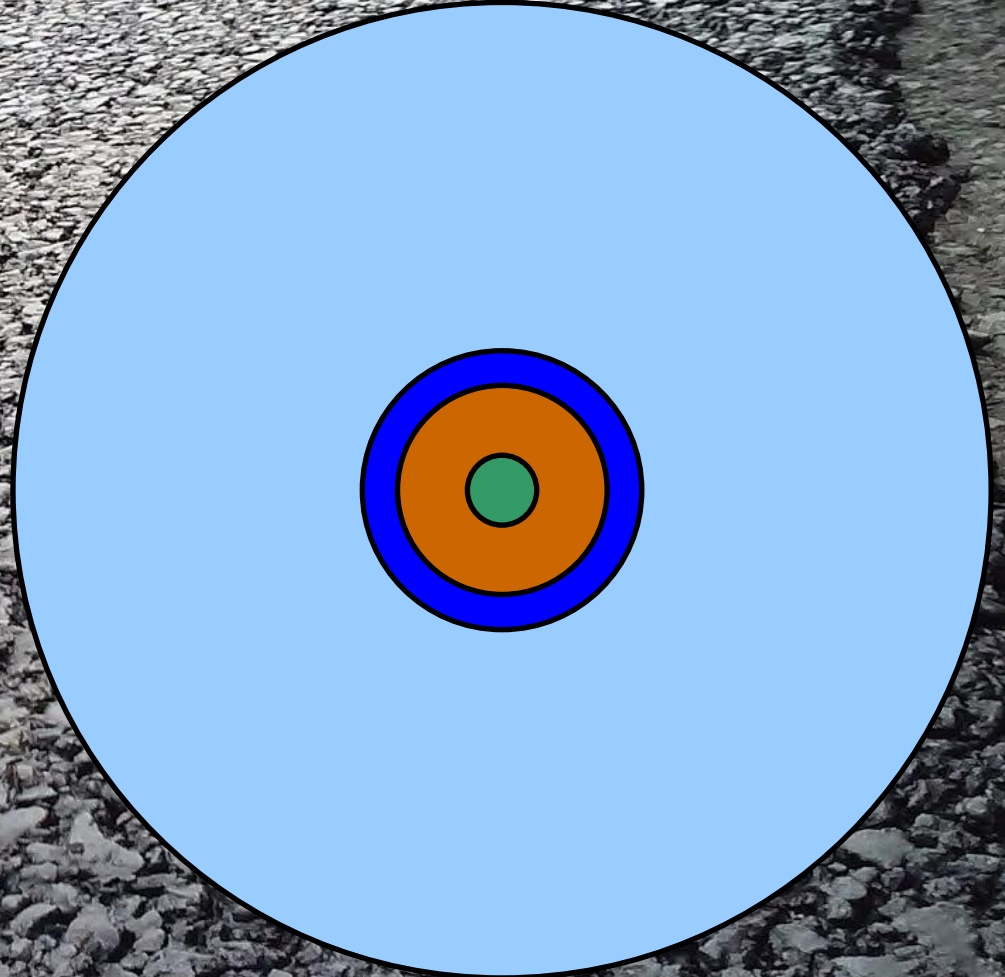
Pass
Count



Good GPS Accuracy

Components - GPS

- Autonomous 10 -15m
- DGPS: 0.5 - 5m
- Float : 1 m
- Fixed : 1-3 cm



NJDOT IC Specification

- The specification was to be integrated into current paving and compaction specifications
- The Specification could not favor any one manufacturer
- The ability to track pass count was the main priority and a pass count only specification was also produced
 - Full implementation was chosen in the end to allow for future improvements
- RTK GPS precision was specified with accuracy to 3cm
- IC was specified for use on at least 2 rollers to allow for the breakdown and intermediate rollers to switch positions during lane changes

NJDOT IC Specification

- Two sections were added to the current equipment specifications – Sections 1003.9 Intelligent Compaction Equipped HMA Compactor and 1003.10 Global Positioning System Equipment for Intelligent Compaction
- 1003.9 specified the use of:
 - Drum mounted accelerometers,
 - High precision GPS,
 - A documentation and color display system,
 - USB or cloud storage with a minimum of two data uploads per night
 - Compatibility with VETA Software
- 1003.10 specified the use of:
 - GPS system (including GPS receivers on IC rollers and hand-held GPS receivers (Rovers))
 - The system must connect to a base station or network-RTK capable of Fixed-GPS precision (at a minimum of 3 cm accuracy)

NJDOT IC Specification

- Three sections were added to the current construction specifications – Sections 401.02.02 Equipment, 401.03 Construction, and 401.04 Measurement and Payment
- 401.03 specified:
 - Current Compaction specifications will still be followed
 - A minimum coverage of 80% of the individual construction area
 - Construction areas not meeting the density criteria **discovered through core samples** will require an investigation of the IC data by NJDOT if the IC Construction Operations Criteria does not affect the standard NJDOT acceptance processes for the materials or construction operations
 - Prepare and submit a written Data Collection Plan (DCP) for the project in conjunction with the Paving Plan in Section 401.03.03 to be submitted to the RE

Lessons Learned

- Proper data management is absolutely necessary!
- The total file size of the current project is 7.42 GB
- There was an initial question of grid sizing of the data imported into VETA
 - Once exported the grid sizing can not be changed in VETA, there must either be access to manufacturer software or data must be reformatted by the contractor
- Data analysis is much easier on a nightly basis with access to the project
- As time continues advances are being made frequently, the benefits of this technology are only increasing



Questions/Comments?

Thank You for Your Attention!!!