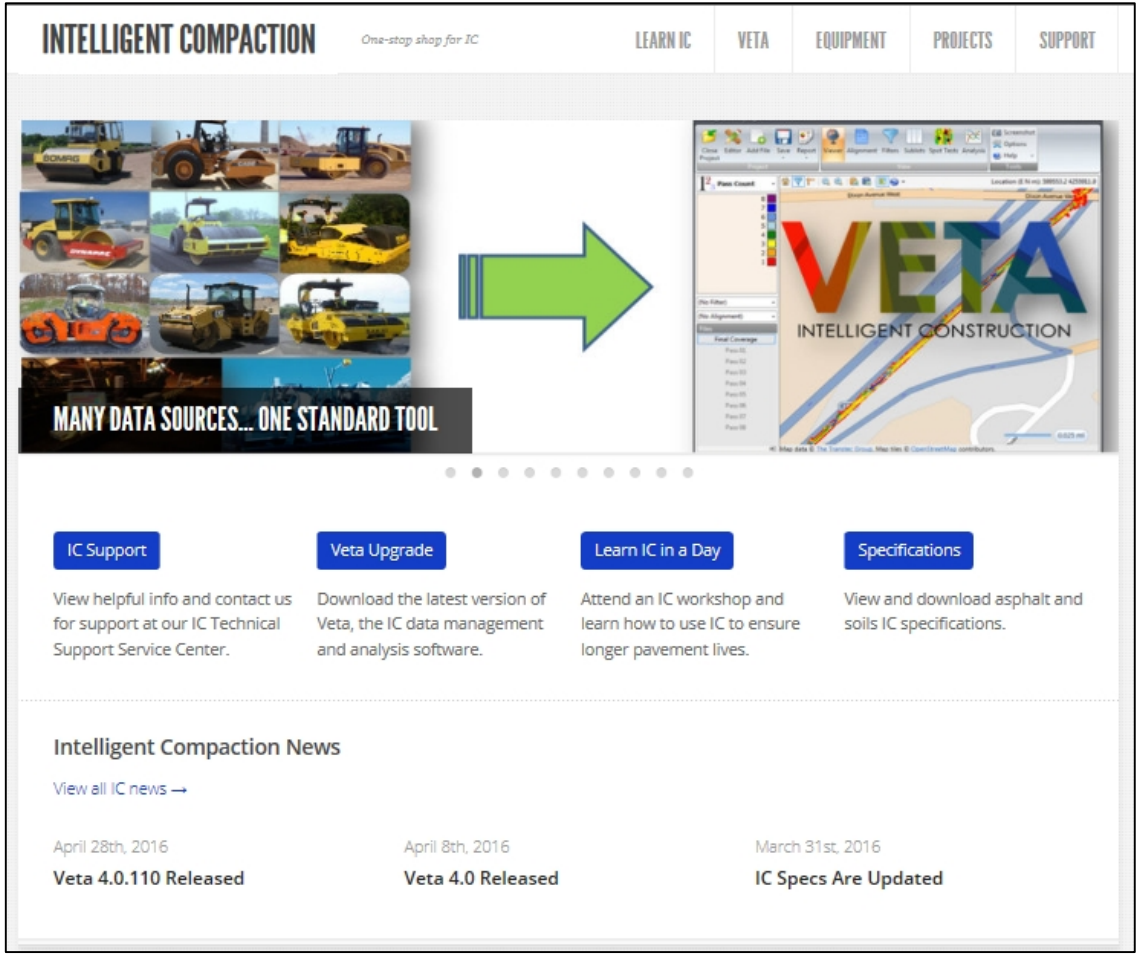
Intelligent Compaction Training

BUILT FOR IT.

CAT

IC Overview

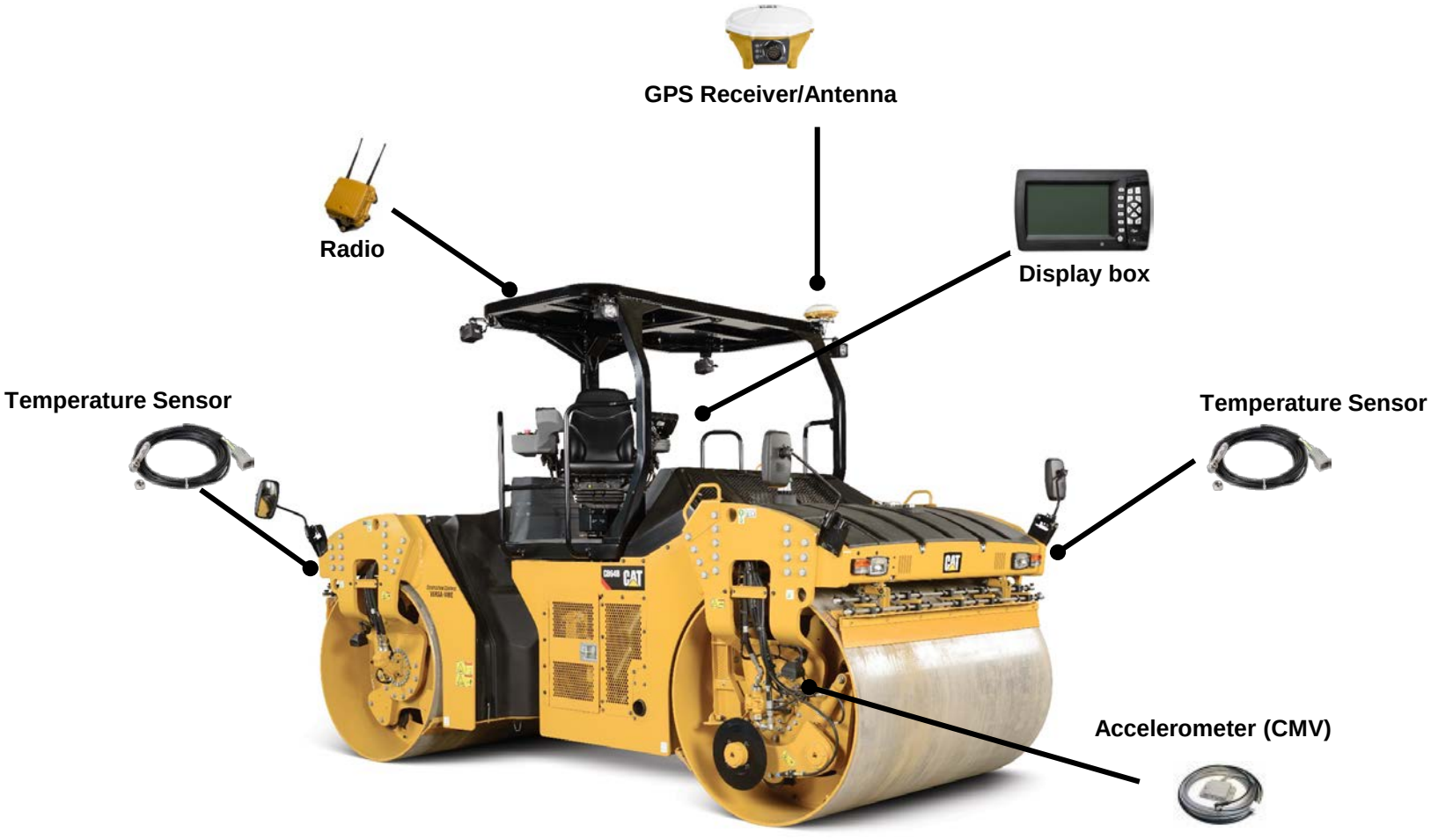

INTELLIGENT COMPACTION
One-stop shop for IC
LEARN IC
VETA
EQUIPMENT
PROJECTS
SUPPORT
MANY DATA SOURCES... ONE STANDARD TOOL
VETA
INTELLIGENT CONSTRUCTION
IC Support
View helpful info and contact us for support at our IC Technical Support Service Center.
Veta Upgrade
Download the latest version of Veta, the IC data management and analysis software.
Learn IC in a Day
Attend an IC workshop and learn how to use IC to ensure longer pavement lives.
Specifications
View and download asphalt and soils IC specifications.
Intelligent Compaction News
View all IC news →
April 28th, 2016
Veta 4.0.110 Released
April 8th, 2016
Veta 4.0 Released
March 31st, 2016
IC Specs Are Updated


With the conventional compaction measurement, what percentage of the surface is actually tested?
Less than 1%

Basic Components of IC:

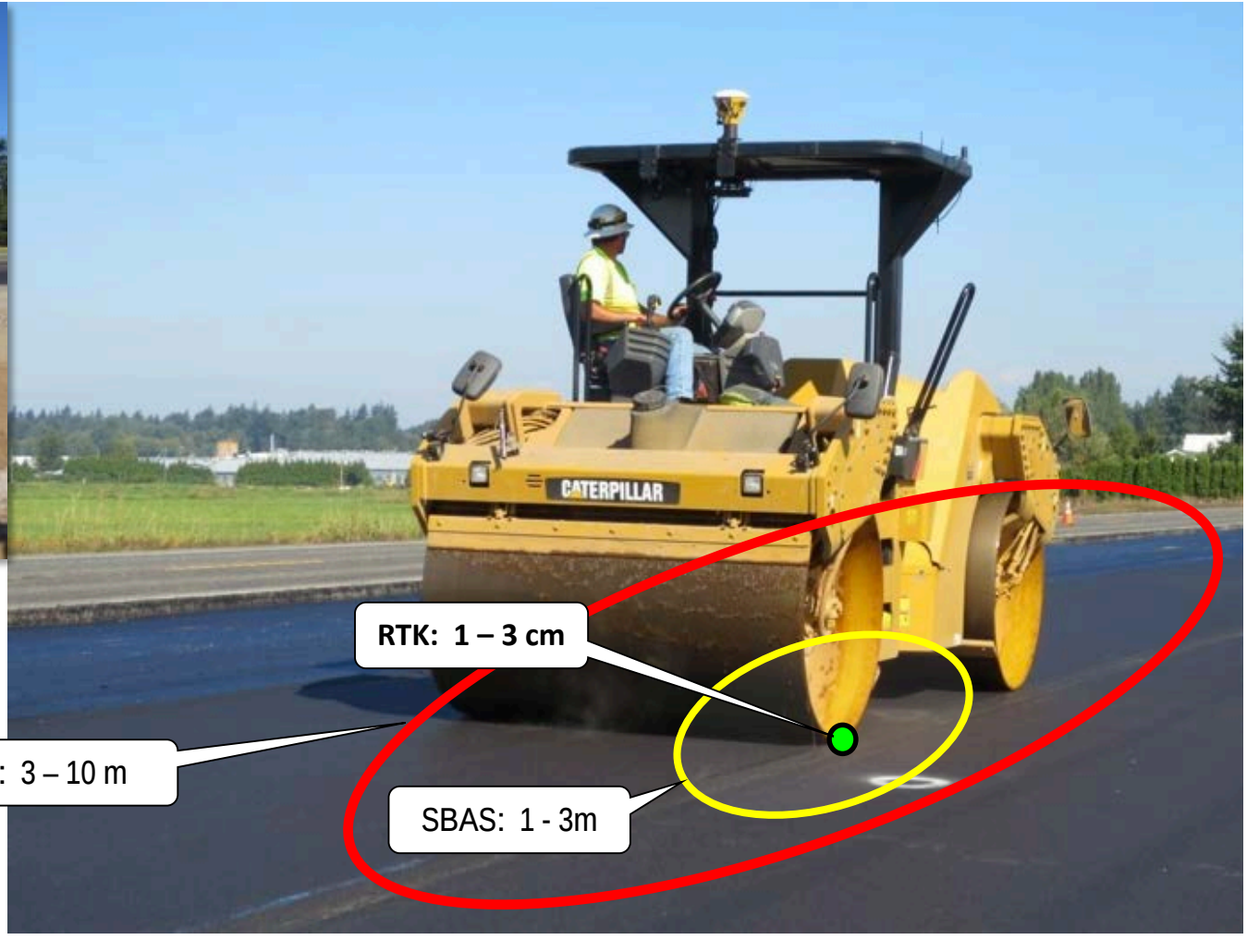
1. Positioning (GPS) – Pass Counting & Location
   - Global Positioning System (GPS), SBAS, UTS, VRS
2. Compaction Meter Value (CMV)
   - accelerometer
3. Temperature measurement
4. Color-coded video display of “real-time” info
5. Office software – VisionLink™ (Caterpillar/Trimble software)
   - Storing & analyzing data
   - VETA 4.0 (FHWA Software for analyzing data)

Components of IC Roller

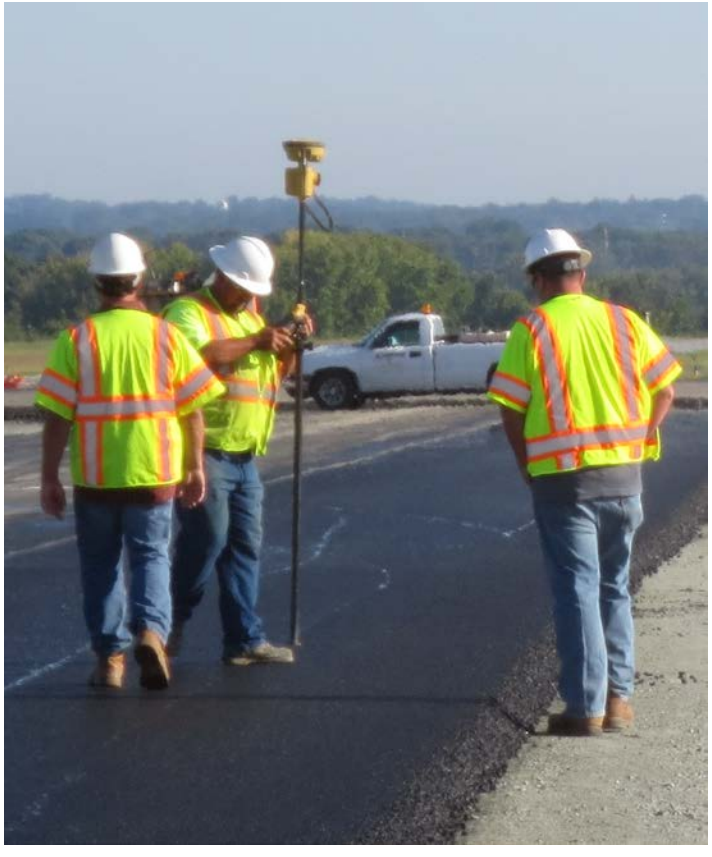


Operator’s view…..

Positioning Accuracy



Base Station & Rover

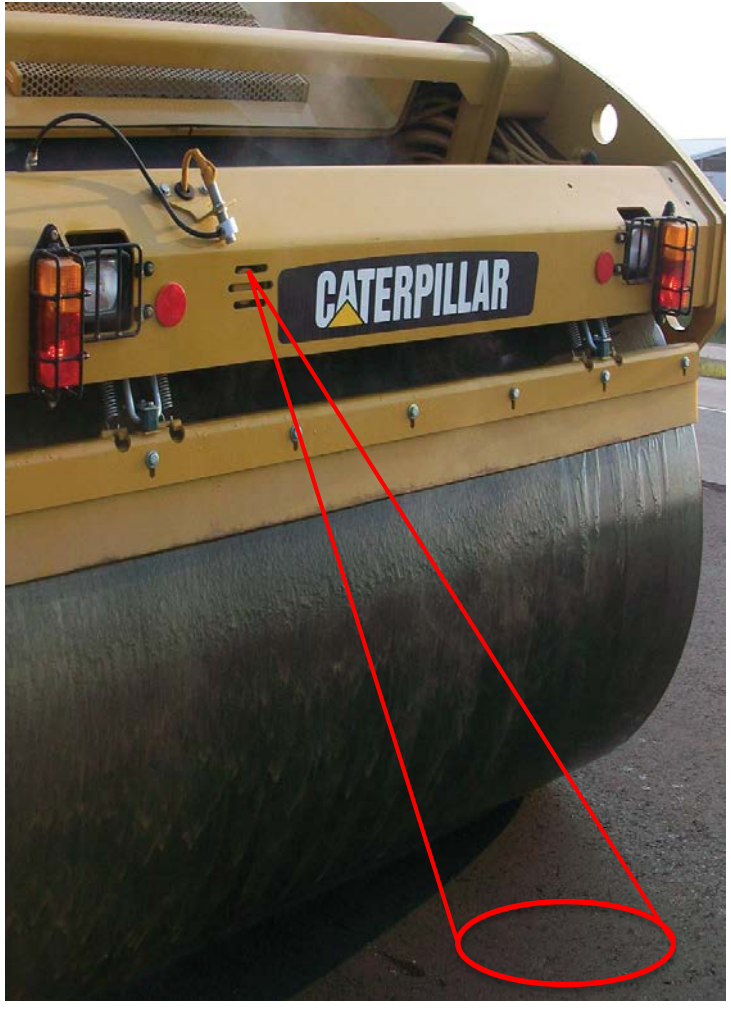


- Base station gives RTK-GPS accuracy
- Rover is used to verify roller positioning system
- Rover can also be used to identify “points of interest” on the job

Pass Count: Number of Passes

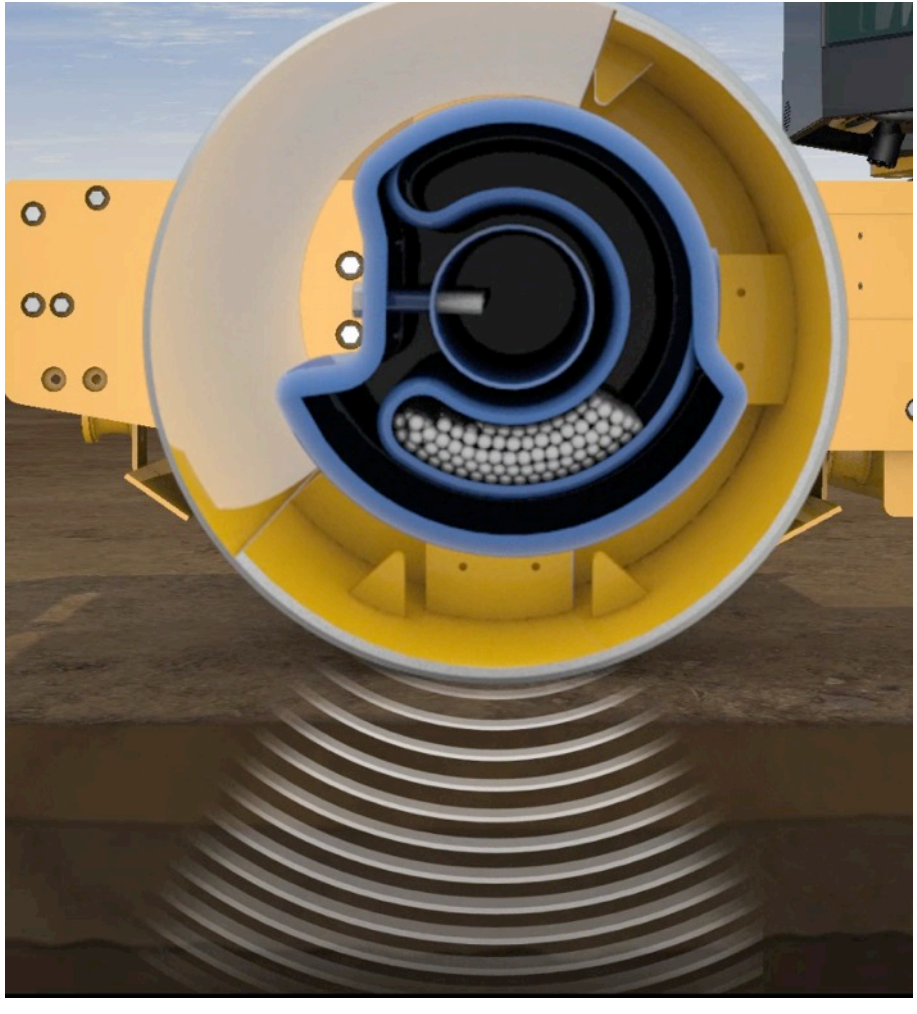
- Number of Passes over any area is known because GPS positioning data is recorded and stored on the machine
- All other data is stored by position (location)
- All data is “time-stamped”

Temperature Measurement



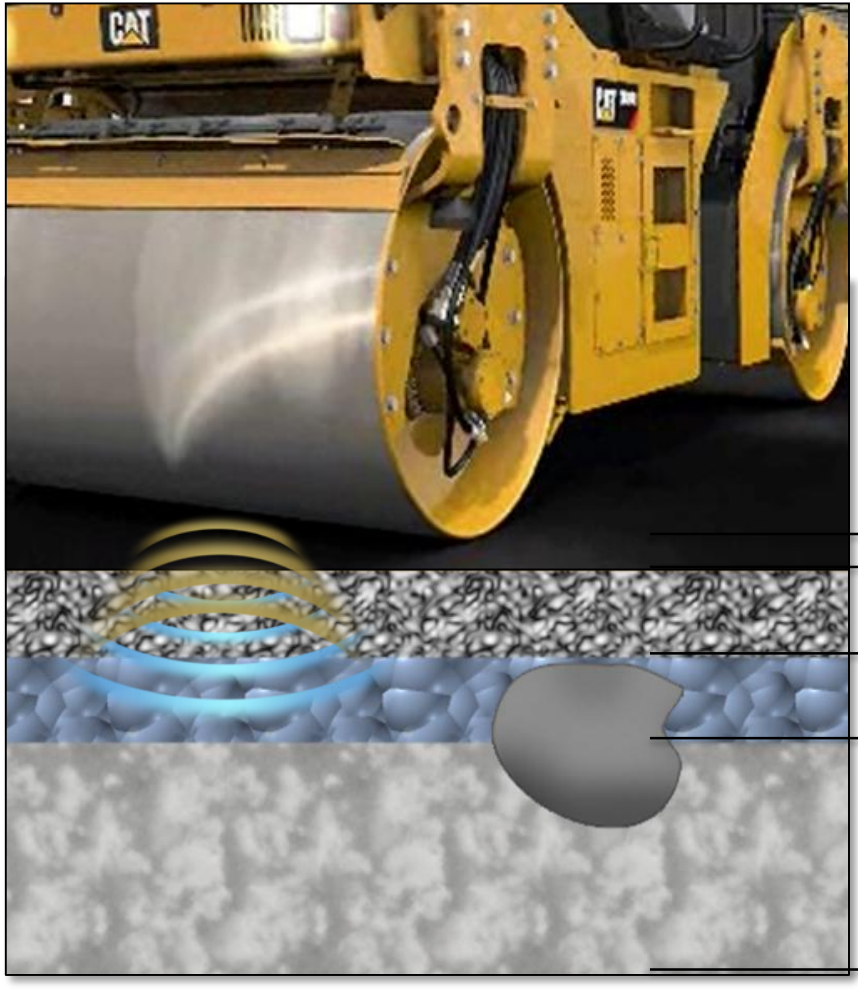
- Dual temp sensors to allow mat temp reading ahead of water spray from the drum
- Keeps operator informed of temperature zones
- Can help avoid tender-zones
- Eliminates hand-held devices
- Temperature data is tied to position by GPS

Accelerometer: Measures Material “Stiffness” (rebound)



- CMV value comes from accelerometer
- Vibration is required to get CMV
- Measuring “stiffness” - not density
- Mounted at front drum
- CMV is located by GPS

Accelerometer measures more than lift being paved…



- Accelerometer technology measures deeper than the freshly paved lift of asphalt
- CMV is a *composite measurement of the current lift and the layers below it*

Color-coded Video Display

Maps show:

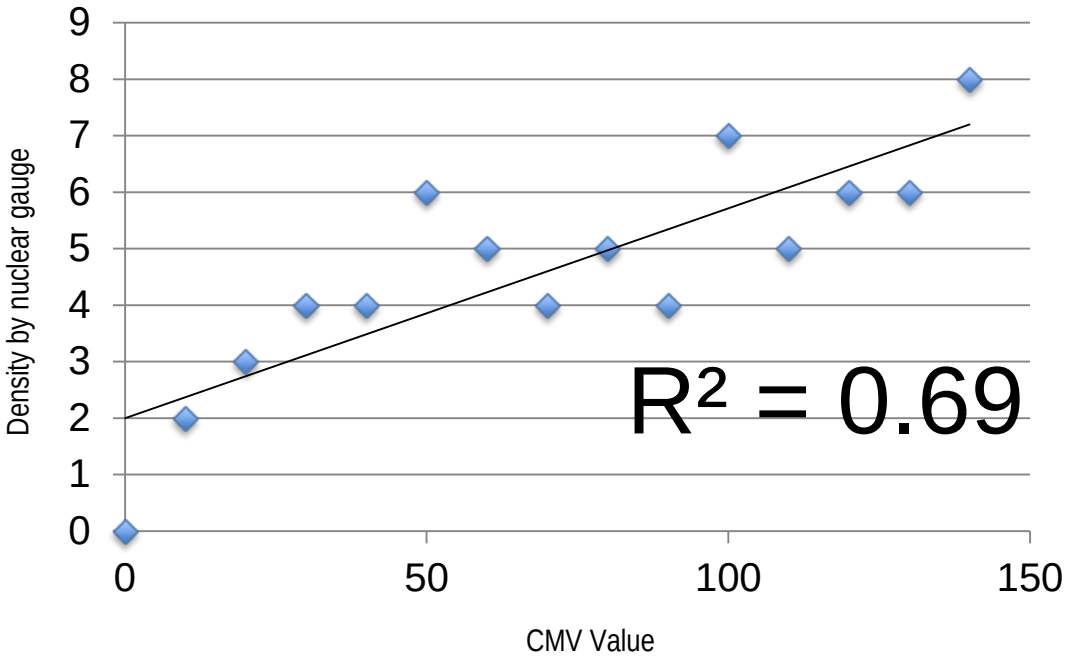
1. Number passes
2. Temperature map
3. CMV map

Operator can toggle between 3 maps

Other information is shown along the side panel

Correlation of CMV with existing test methods

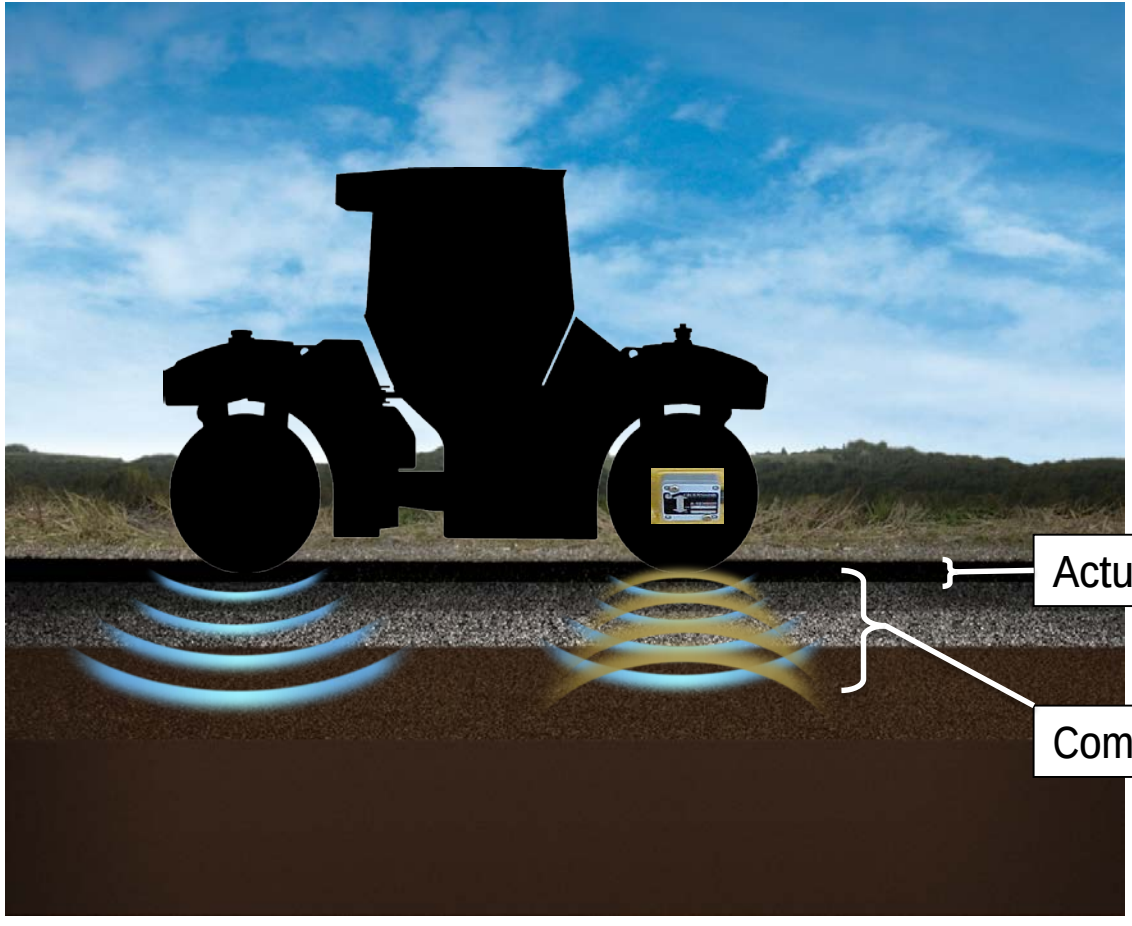
Correlating CMV with existing test methods



R^2 = 1.00 = perfect correlation

- Plot a linear regression analysis of core data and CMV data to establish an R^2 value
- VEDA 4.0 plots correlation
  - if density data can be uploaded
  - Needs a minimum of 3 passes
- R^2 is an indication of how well CMV represents the density or other test method (i.e. LWD)
- Repeatable correlations have not been proven

Accelerometer measures more than lift being paved…



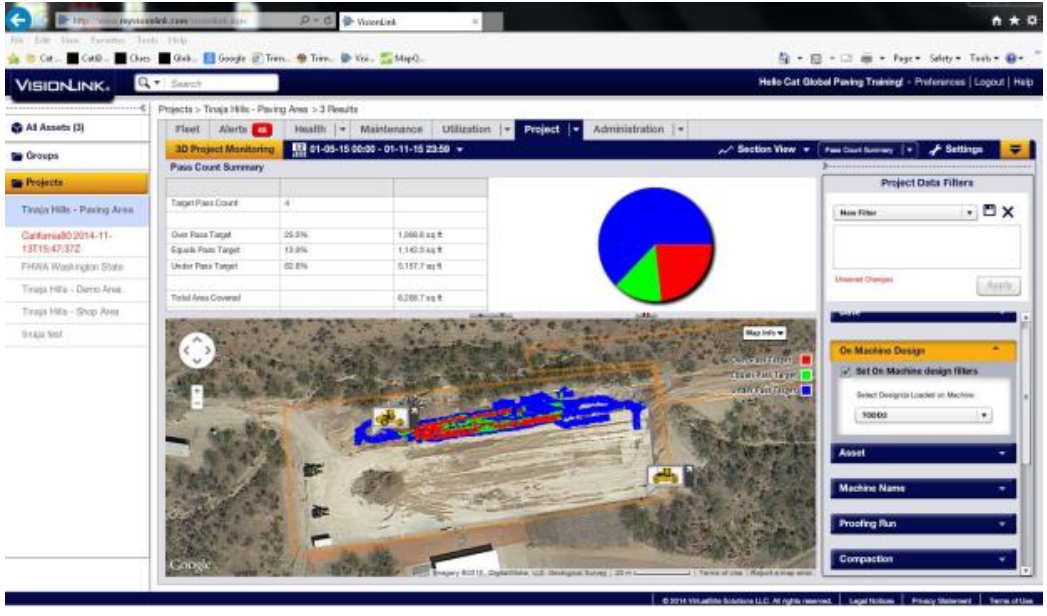
- Measurement depth varies based on amplitude setting
- Useful indicator of base and sub-base layer stiffness

Things to understand about CMV…

- CMV is an indicator of material stiffness, not a measure of density.
- CMVs are influenced by sub-surface conditions up to 6 feet below the surface
- CMVs are influenced by many factors: speed, direction, amplitude, frequency, material properties, and more…
- Correlations between CMV and conventional measurement methods are difficult to achieve, but possible in some cases (LWD)
- Repeatable correlations between CMVs and Density have not been shown to exist
- CMV values are not comparable between machines (unless ALL conditions are equal)

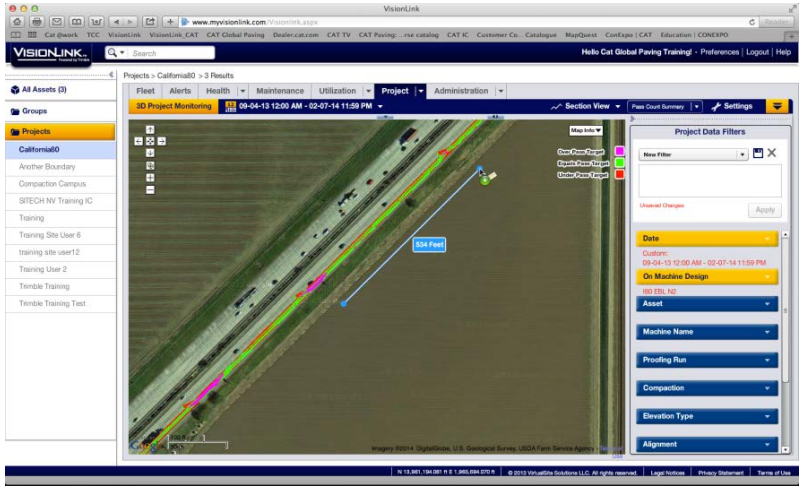
CMV ≠ Density

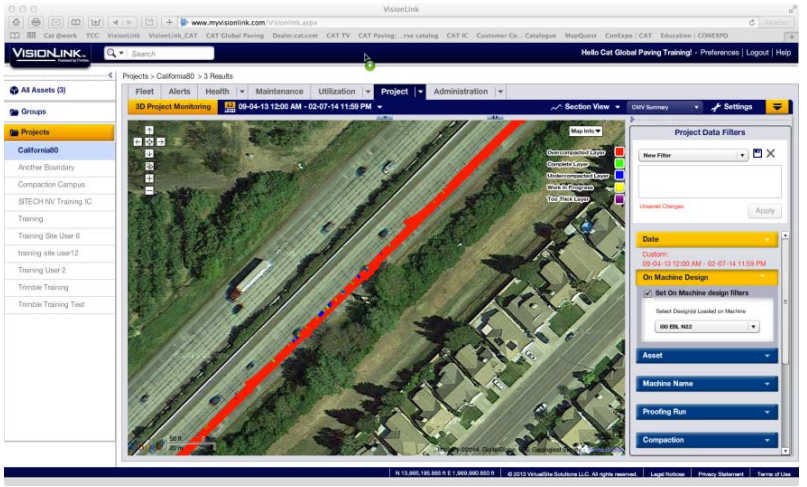
VisionLink™ Data Management & Analysis Software

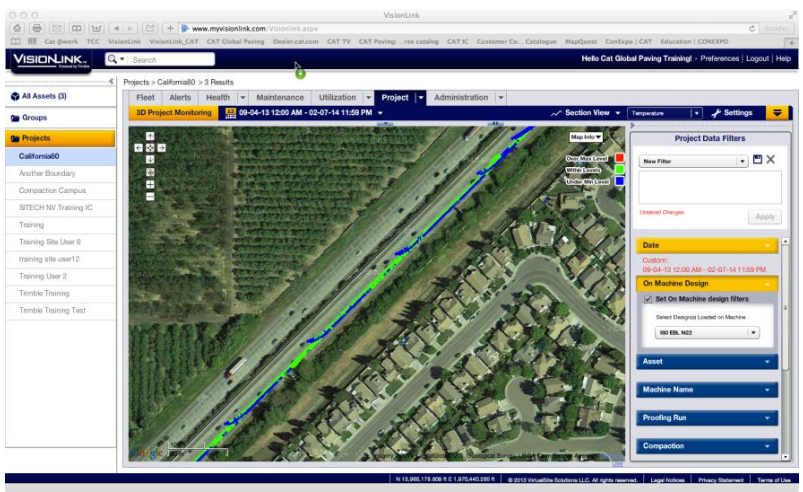


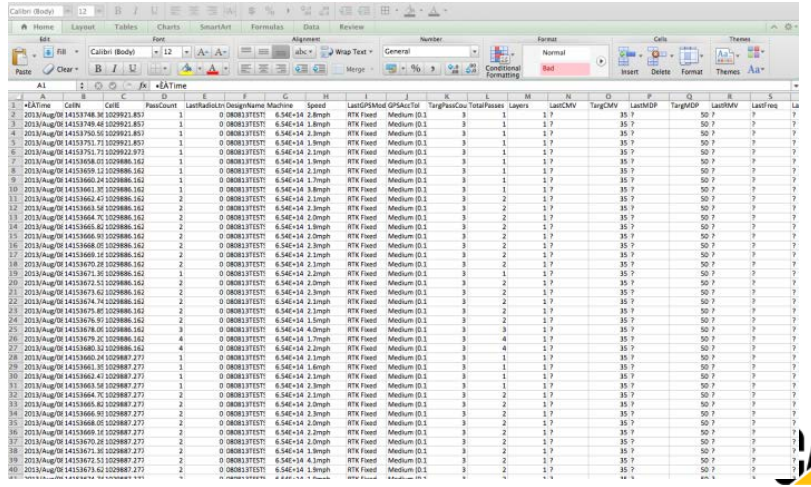
- Compaction module in VisionLink
- Web-based
- Data uploaded wirelessly or by USB flash drive
- Need a paid subscription and user-account
- Login at www.myvisionlink.com

VisionLink™ screens and data file in *.csv format







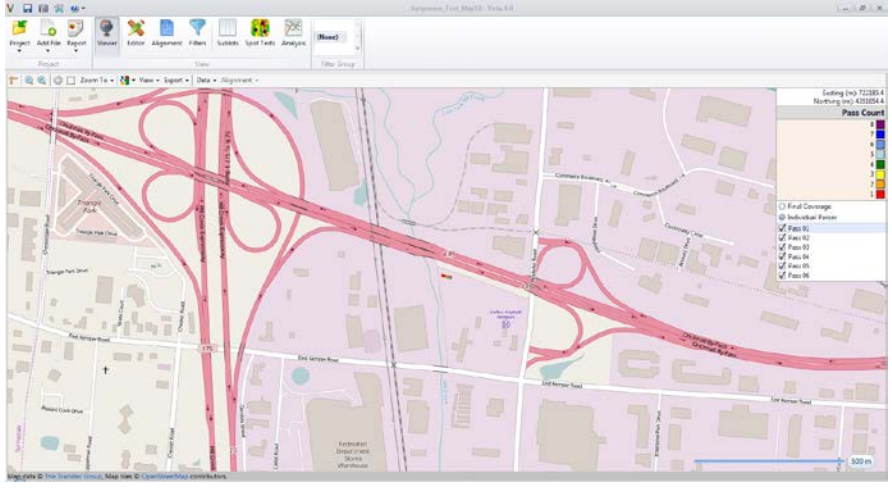


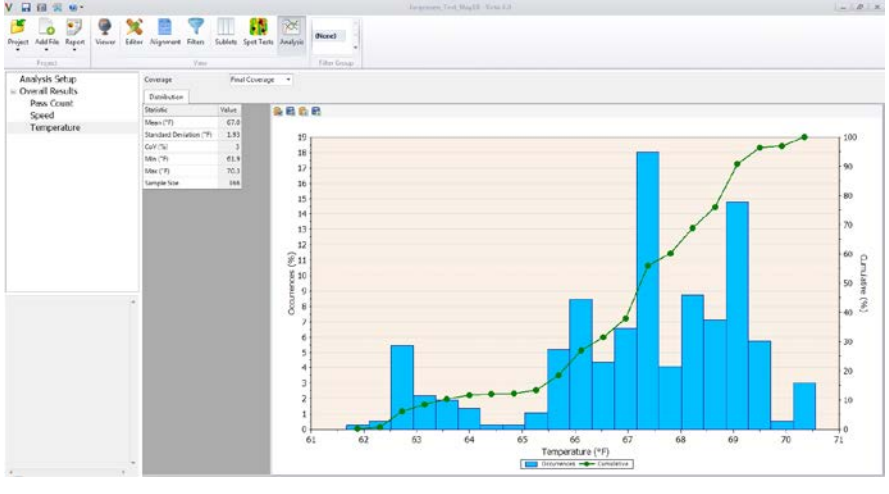
VETA 4.0 Sofware (KYTC)

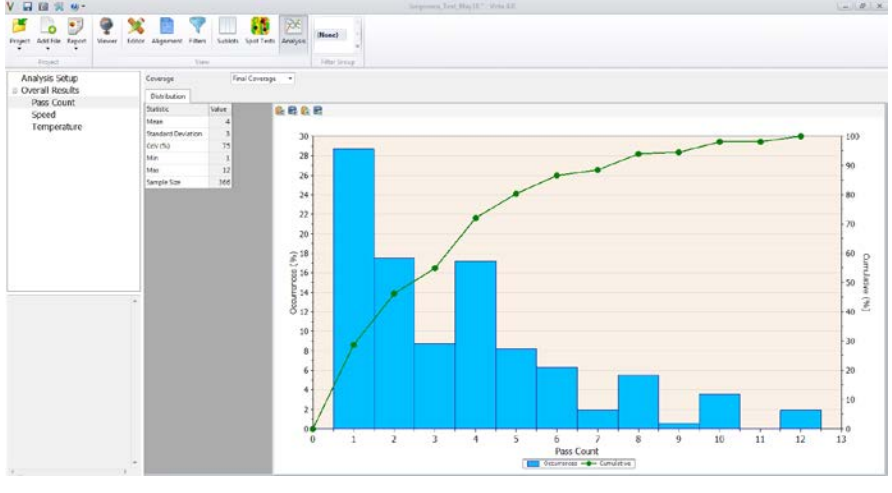
VETA

INTELLIGENT CONSTRUCTION

4.0.110







How is it set up in the field on a daily basis?

1. Setup GPS Base Station
2. Attach GPS antenna and display box to roller
3. Start machine
4. Check GPS connectivity – may require moving the roller back and forth
    - If the roller is mapping, GPS is connected
5. Verify the roller coordinates match rover coordinates (per spec)
6. Set target pass counts and target temperature ranges if different from previous day
7. Start a new map (depends on file naming convention) if required
8. Download data twice per day via USB (per spec) and e-mail to office

This can take anywhere from 5 to 15 minutes

Recommendations…

- Decide *in advance* on a File Naming convention for each day of paving
- Set the TIME ZONE on the roller so that it matches local time with file names
- Practice transferring data *before* the job starts and *who* is responsible
- Who will download data from the roller? Once per day? Twice per day (spec)?
- How will roller data get transferred to KYTC? Via USB in the field? By e-mail?
- Who will upload data to VisionLink?
- Who will export the “All Passes” data from VisionLink?
- Who will import the VisionLink data to VETA 4.0 software?
- Have a list of phone numbers handy for GPS or machine issues

Benefits of IC

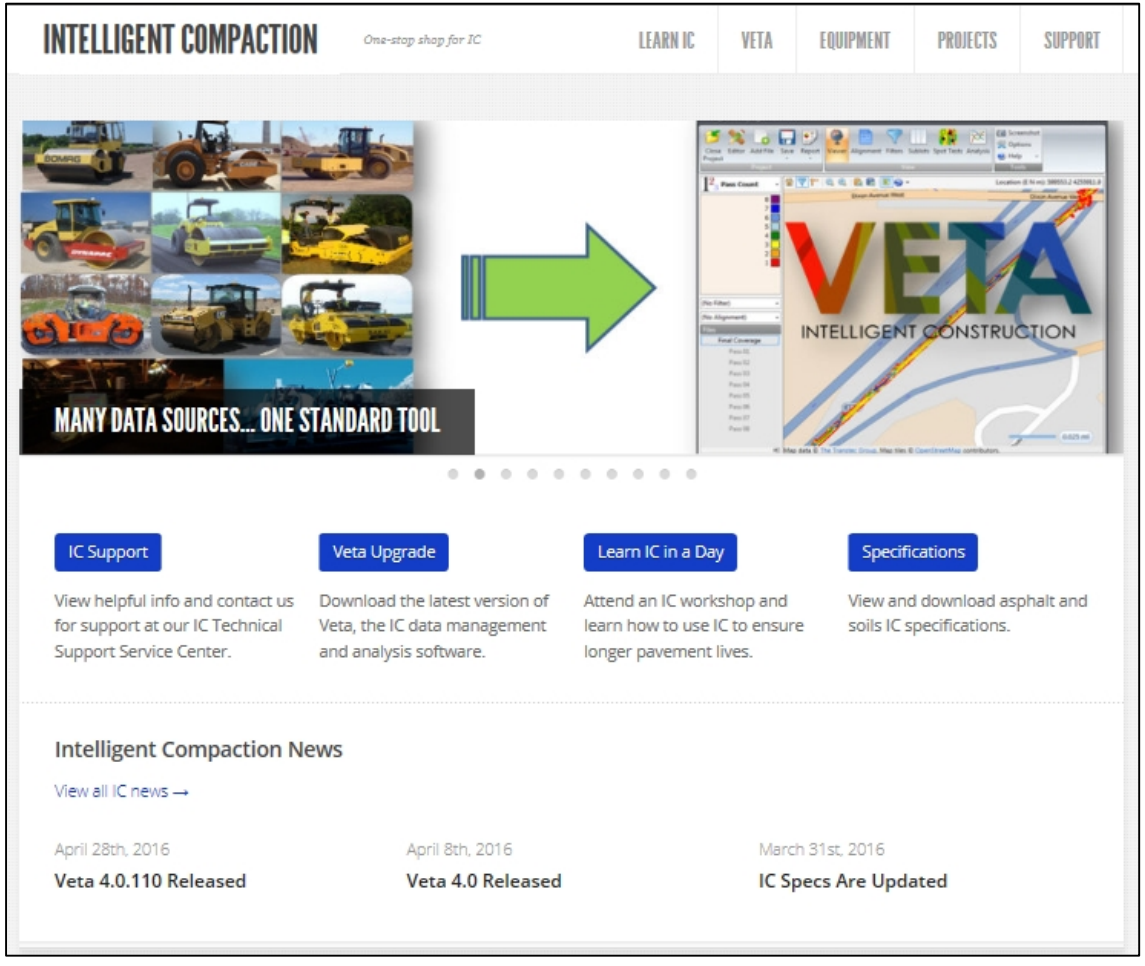
- Information that is “actionable” in real-time on the job
- Operator – self-training and self-monitoring tool
- Uniform coverage = better density & better smoothness
- Transition zones - statistical pay factor specs PWL
- Night work
- Temperature monitoring
- Longitudinal joint overlap/joint density
- Identifying relative soft spots in base
- Documentation of 100% of job!!
- Reduced field testing = safety/cost

Summary: What IC can and cannot do

- Can record coverage (passes)
- Can record surface temperature
- Can identify “soft spots” at depth unknown
  - Can pre-map aggregate base
- Cannot measure density

CMV ≠ Density

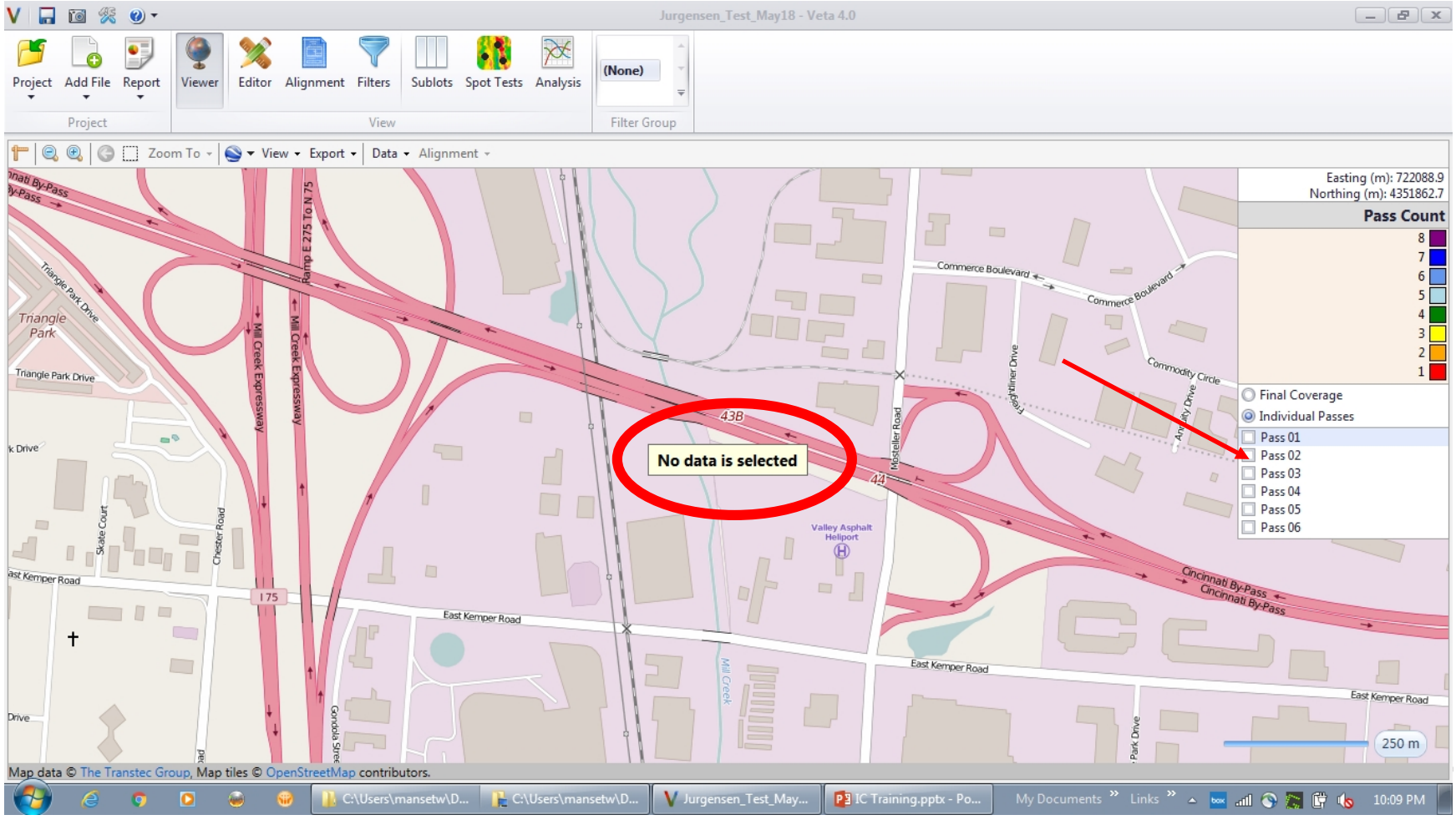
www.intelligentcompaction.com



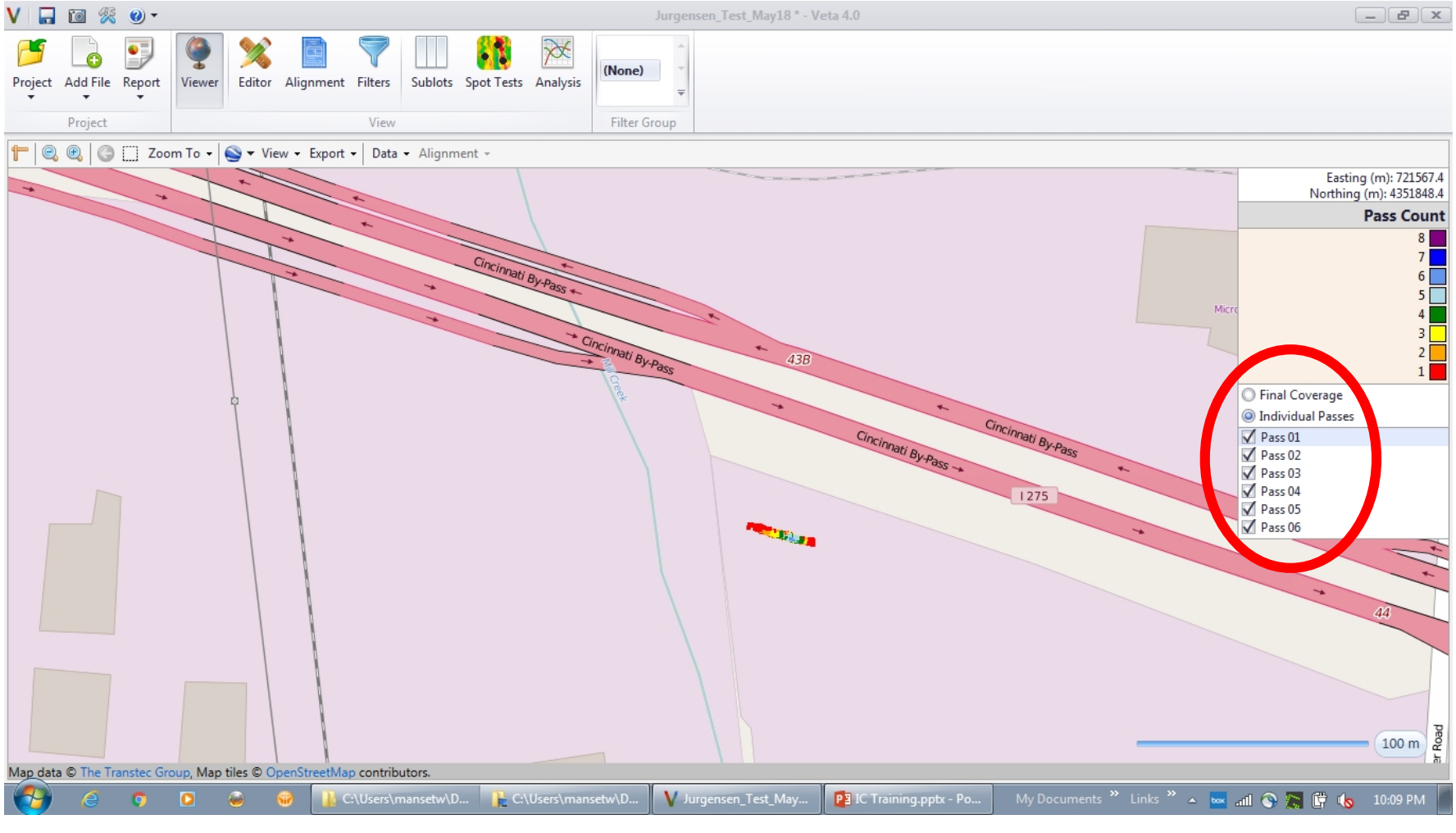
Import “All Passes” *.csv file to VEDA 4.0 software

- Data from VL must now be imported to VETA 4.0
- VETA is designed to accept all OEMs intelligent compaction data
- Process of exporting data from OEMs software and then into VETA is the same for all OEMs
- Working towards direct data transfer in the future

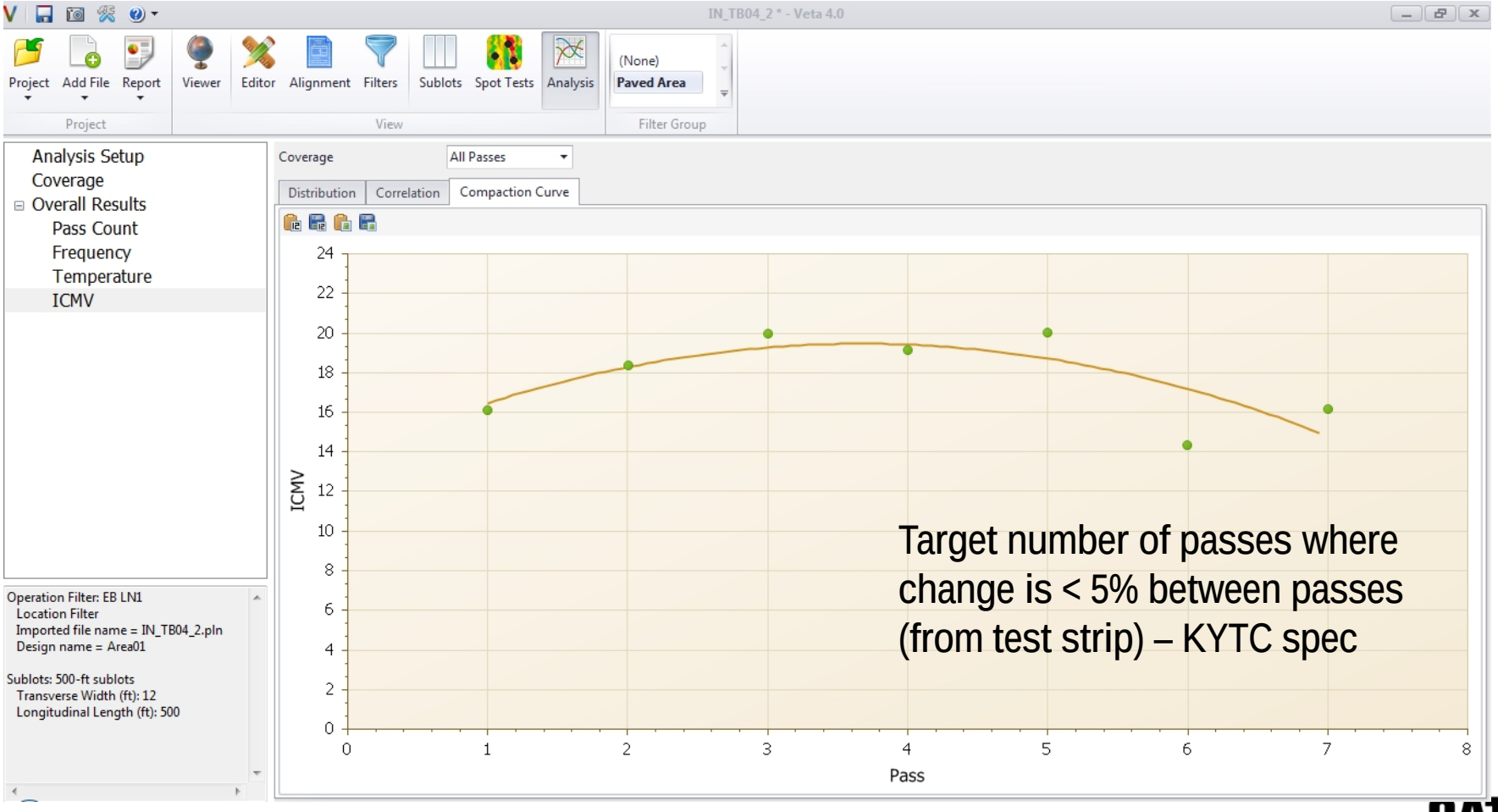
VETA 4.0 Overview



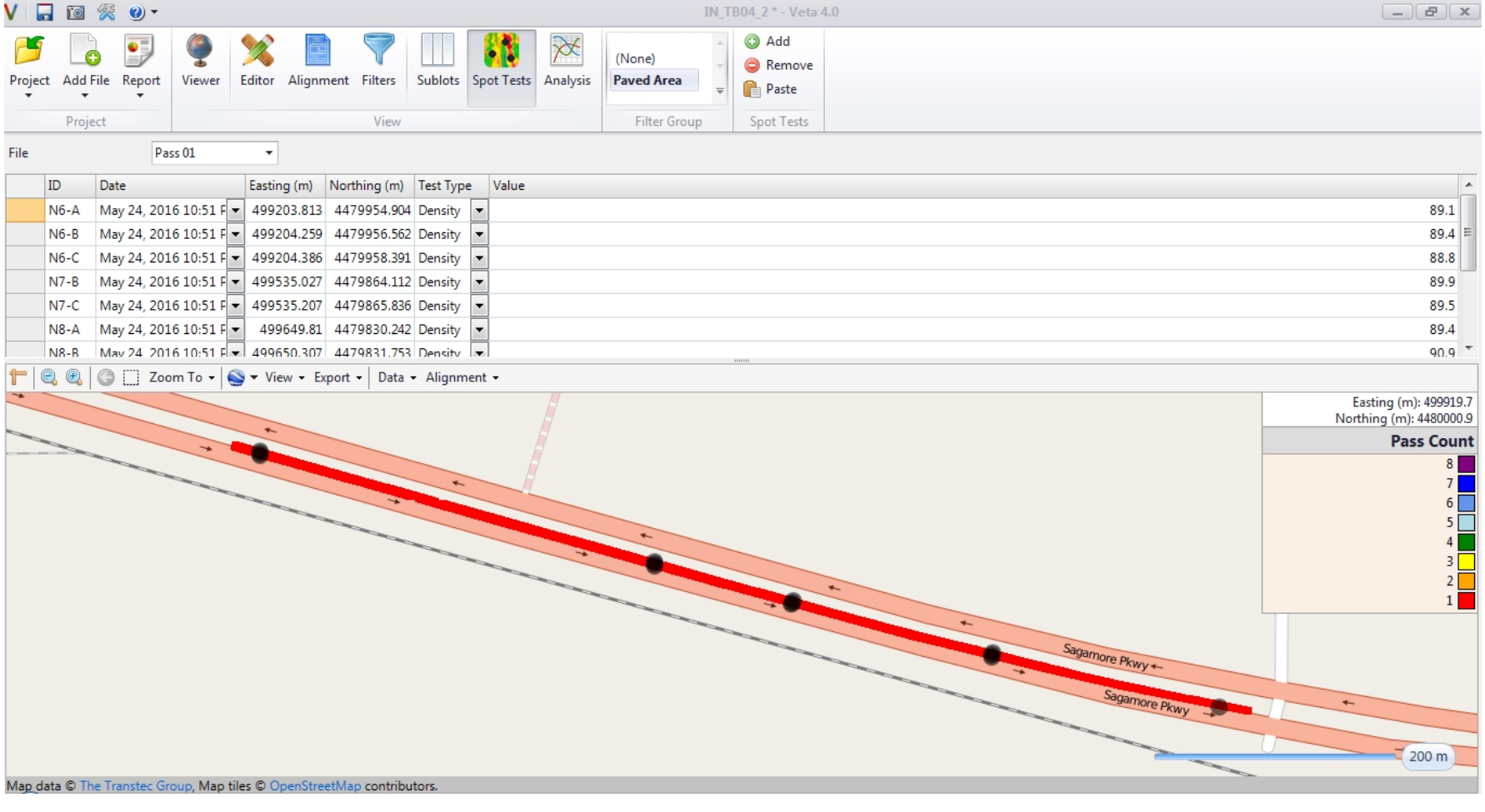
VETA 4.0 Overview



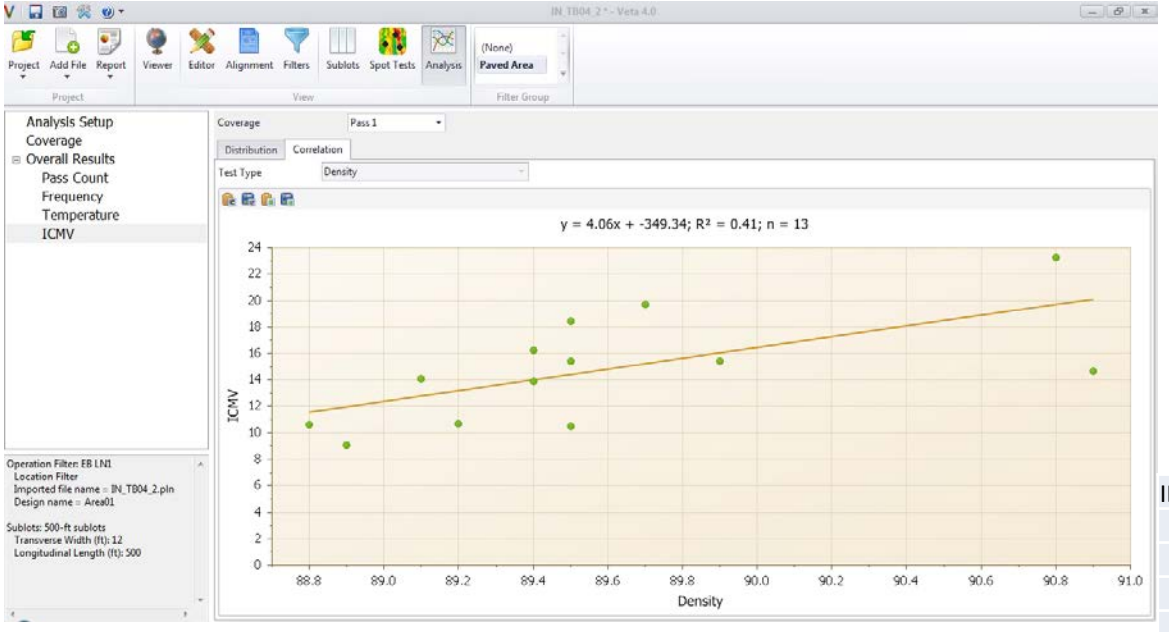
Create CMV Compaction Curve in VEDA 4.0 software



Import density data from test strip to VEDA 4.0 software



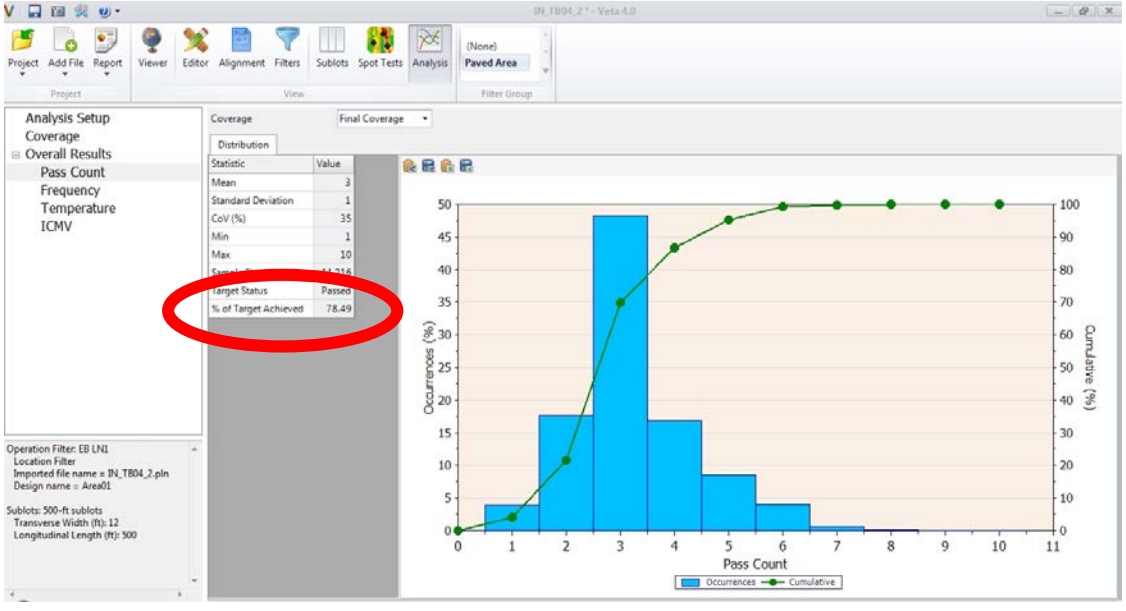
VETA 4.0 CMV Target Value



- Use imported core or density gauge data to correlate with CMV readings
- VETA plots a correlation between density and CMV
- Requires location of cores/density gauge readings

ID	Northing	Easting	Test Type	Value
N6-A	4479955	499203.8	Density	89.1
N6-B	4479957	499204.3	Density	89.4
N6-C	4479958	499204.4	Density	88.8
N7-B	4479864	499535	Density	89.9
N7-C	4479866	499535.2	Density	89.5
N8-A	4479830	499649.8	Density	89.4
N8-B	4479832	499650.3	Density	90.9
N8-C	4479834	499651	Density	88.9
N9-A	4479786	499817.5	Density	89.5
N9-B	4479788	499818.1	Density	89.5
N9-C	4479790	499818.9	Density	89.2
N10-A	4479744	500009.2	Density	90.8
N10-B	4479747	500009.6	Density	89.7

Determining % Coverage



- 80% coverage of the Construction Area required by spec
- % Coverage can be determined by:
    1. Creating Filters in VETA
    2. Manually trimming data in VL before exporting
    3. Having roller operator manually turn mapping “on” or “off” when he/she leaves the ‘IC Area’

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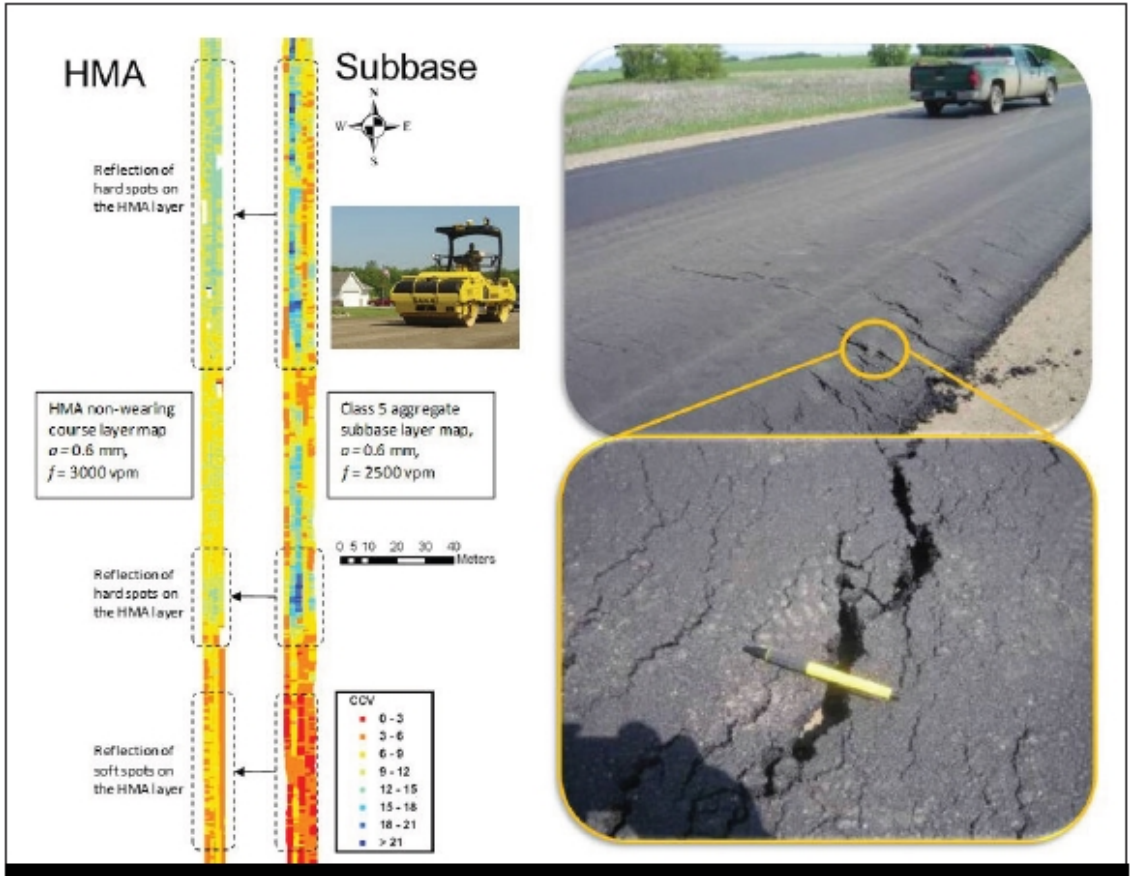
CAT®

MARCH 2017

Pre-Mapping and Paving



Premature pavement failure under construction traffic and ICMV maps for pre-mapping and HMA compaction at Route 4, MN under the TPF-FHWA IC study.

Strongly recommend reading this document!!

TECHNICAL BRIEF

U.S. Department of Transportation
Federal Highway Administration

DEFINITION OF PRE-MAPPING

INTELLIGENT COMPACTION FOR PRE-MAPPING

TECHNICAL BRIEF

BACKGROUND