State Planning and Research Program
Quarterly Report

PROJECT TITLE: TPF-5 (334): Enhancement to the Intelligent Construction Data Management System (Veta) and Implementation

OBJECTIVES:
Using ICDM-Veda as a tool/platform, the objectives of this effort are to incorporate features and enhancements such as the following:
• Analysis platforms
 * Filtering, computations, modeling, etc.
• Management of database and project files
 * Enhancements and additions to existing logic and coding to facilitate efficiency and added features;
• Mapping
 * Mapping performance, print feature;
• Correlation analyses
 * Correlations between different data sets (intelligent compaction, thermal profiling, GPR, pavement smoothness, FWD, density, etc.);
• Spot tests
 * Management of conventional spot test data (import, filtering, mapping, correlations);
• Data import and mapping
 * Import data sets from ProVAL, ground penetrating radar, and delimited text data;
• Contract administration
 * Automated items needed to administer geo-spatial technologies during construction for QC/QA);
☐- Data import/mapping, acceptance, basis of measurement and documentation of quantities;
• Asset management
 * Mapping of final project QC/QA data collection for use as a supplement Pavement Management Systems

PERIOD COVERED: April – June 2016

PARTICIPATING AGENCIES: California, Connecticut, Georgia, Maine, Minnesota, Missouri, Oregon, Pennsylvania

PROJECT MANAGER: Rebecca Embacher **LEAD AGENCY**: Minnesota Department of Transportation **PRINCIPAL INVESTIGATOR**: George Chang	**SP&R PROJECT NO**:	PROJECT IS: _____ Planning _____ Research & Development X Development
ANNUAL BUDGET: Current Budget: $120,000	**PROJECT EXPENDITURES TO DATE**: $00.00	

WORK COMPLETED:

WebEx Meeting #1 (April 20, 2016):
This meeting was a kick-off meeting to start discussions among pooled fund participants. The objective of this meeting was to allow each state to share their current implementation schedule, acceptance criteria, submittal requirements, reporting and printing requirements and lessons learned to the other pooled fund participants. Additionally, the history of Veta development and a live demonstration of Veta was provided to familiarize pooled fund participants with the software. The action items generated from this meeting were:

1) MnDOT and Transtec compile previously requested enhancements for Veta and organize listing for review by pooled fund participants and to
2) schedule a second meeting to provide hands-on training of the Veta software to pooled fund participants and industry.

See attached for meeting agenda and minutes.

WebEx Meeting #2 (May 24, 2016):
The objective of this meeting was to familiarize pooled fund participants and industry with the existing features of Veta. MnDOT led this hands-on class for both intelligent compaction and thermal profiling data. Participants completed Veta projects from start to finish for these technologies. Construction highlights with other data sets were intermittently shared to further expand on features in Veta that assist with monitoring of workmanship issues. No meeting minutes were collected as this was hands-on training. The files used for this lecturer-led training are on the Advanced Materials and Technology Website: http://www.dot.state.mn.us/materials/amt/veta.html. The action items generated from this meeting were:

1) for pooled fund participants to continue to familiarize themselves with the Veta software and to determine enhancements that they would recommend for inclusion into the master wish list of tasks,
2) for MnDOT to send out current listing of requested enhancements for pooled fund participants to review and to add additional tasks and
3) to schedule the subsequent meeting to review the Veta enhancement 'wish list' and to determine the top priorities. Using Doodle scheduling, the next week was scheduled for July 13th.

SUMMARY OF ACTIVITIES EXPECTED TO BE PERFORMED NEXT QUARTER:

1. Pooled fund participants will narrow down wish list to top 20 priorities. This listing will then be ranked (1-highest priority, 20 highest priority) to again narrow down listing to meet the available budget.
2. Pooled fund participants will finalize scope of work and begin putting together contract for selected Veta Enhancements.
3. Pooled fund participants are invited to attend, via WebEx, the next IC-TP ETG meeting on September, 28, 2016 from 8:00am to 4:00pm CDT.

STATUS AND COMPLETION DATE:
Working with pooled fund participants to finalize scope of work for creation of contract.
Completion Date: To be Determined for Phase I

TPF-5 (334) Veta Pooled Fund

Enhancement to the Intelligent Compaction Data Management System (Veta) and Implementation
Meeting No. 1

Meeting Agenda
April 20, 2016 / 10:00 AM to 2:30 PM CDT

10:00 to 10:10	Opening Remarks / Introductions
10:10 to 10:15	Update on Pooled Fund (Received Funds)
10:15 to 10:30	California Update
10:30 to 10:45	Connecticut Update
10:45 to 11:00	Maine Update
11:00 to 11:15	Missouri Update
11:15 to 11:30	Oregon Update
11:30 to 11:45	Pennsylvania Update
11:45 to 12:00	History of Veta Development
12:00 to 12:45	Break - Lunch
12:45 to 1:15	Minnesota Update Veta 4.0 General Information
1:15 to 2:15	Live Demonstration of Veta 4.0
2:15 to 2:30	Closing Remarks Action Items (Generation of Potential Veta 5.0 tasks) Schedule Next Meeting
2:30	Adjourn

Please include current implementation schedule, acceptance criteria, submittal requirements, reporting/printing requirements in update. These details will help with future discussions related to needed Veta enhancements.

TPF-5(334) Veta Pooled Fund

On-Line Meeting No. 1 Minutes

April 20th, 2016 / 10:00am-2:30pm CDT

Opening Remarks

- Curt Turgeon (MnDOT) – Get everyone on board and gather a list of wants and needs.
- Richard Duval (FHWA Technical Liaison) – FHWA continues to support intelligent compaction. Funding pushed over to resource center. Funding running out by the end of the year. SHRP2 RO2 is supporting IC, SHRP2 R07 looking at IC as a performance specification. Have not been able to put any money into this pooled fund.

Updates

- California Update (Ebi Fini)
    - 2014 first project, to date 37 HMA and 29 CIR.
    - Gone away from printing reports, contractors now upload to storage site.
    - 19 construction forms contractor fills out on a daily basis.
    - Use rolling pattern and temperature to determine areas requiring corrective action.
    - IC mandatory on CIR and HMA on CIR.
    - Two types of Specifications for HMA:
        - Method Specification: Number of passes and temperature
        - Performance Specification: Use test strip to determine rolling pattern and temperature requirements to meet density requirements.
            - 90% compliance with number of passes and temperature
            - Acceptance based on core – density
    - Cold In-Place Recycling
        - Establish test strips to determine number of passes
        - Monetary price adjustments based on temperature and coverage.
    - Seen much improvement with training and specific positions.
    - Data Transfer Issues
        - Size of files are too large
        - No access to high-speed internet in some locations
        - Firewall issues with various file share systems available
        - Two types of up-loadings:
            - Information – Machine data and Veta projects
            - Report Format – target values, curves, histograms

- Training
  - Just in time.
  - Field operation.
  - Geo-spacial – Data management.
- Positions Requiring Training
  - 1. Data analysis Technician
  - 2. IC quality control technician.

- Connecticut Update (Bryan Lee)
  - See attached slides.
  - Beginning stage of implementation, 5 projects to date.
  - Materials testing lab creates specs.
  - Construction advisory selects the number of projects.
  - Pavement management selects which projects.
  - Implementation plan: Familiarity > Growth > Management.
  - Reporting requirements.
  - Minimum Data Acquisition Frequency: 2X per day of operation.
  - Raw data and analysis within 24 hours.
  - Vendor software export on daily basis.
  - Electronic data from equipment and data analysis software provided upon completion of first day of paving.
  - Data summary provided at completion of contract.
  - Acceptance Criteria: "Acceptable documentation is considered a continuous period of data collection of 100% of the Essential Data Information and Data Elements for no less than 90% of the time period materials is being placed by the paver or compacted by the roller"
  - Phase 3 refine techniques, use data to refine deterioration curves.

- Maine Update (Dale Peabody)
  - 1 project in 2014. 2 projects in 2015. 2-3 demonstration projects this year, 2016.
  - 1-day, IC Workshop week of April 25th.
  - Struggle with contractors' equipment installation.
  - Working on specification, about 90% working off FHWA specification
  - This year focusing on data management piece, collecting data and bringing into Veta.
  - Issues:
    - Loose contract agreements
    - Contractors not fully on-board

        - Roller operators are not using displays
        - Missing data from given rollers

- Minnesota Update (Rebecca Embacher)
    - See attached slides

- Missouri Update (Bill Stone)
    - Part of SHRP2 07 (IC focus area)
    - Fall 2011, grading project using IC
    - Spring 2014 IC Workshop and Equipment Demo.
    - Summer 2014 Pilot Project.
    - Main issues were collecting data due to specification write-up poor data format preventing loading into Veta 2.0.
    - Use IR scanner.
    - This year, updating specification for May projects.
    - Focus on asphalt side of paving. No upcoming grading projects with any magnitude.
    - Looking for contractor to upload data into Veta and provide Veta projects along with raw data files.
    - Experiencing issues with large file sizes and time it takes to upload data.
    - Focus on coverage and passes.
    - Contractors good with Veta, sub-contractors not as good.

- Oregon Update (Chris Harris was unable to join the meeting, but created slides to share with the group. Rebecca Embacher shared these slides.)
    - See Attached Slides
    - 2014, APAO/ODOT Advanced Pavers Workshop, contract change order for 1 IC roller on 1 project.
    - 2015, IC Data Management Workshop, contract change order to add IC on all rollers for 3 projects/3contractors.
    - 2016, bid 3 projects with full IC, formed IC framework and technology working groups, user guide developed for V3 and training.
    - 2-4 pilot projects per season until Framework group has made a decision on broader IC implementation. Goal is to have decision made by 2019.
    - Technology group to provide recommendations on IC specification, develop process to evaluate the pilot projects and determine how to best utilize IC data in real-time.
    - Currently no performance measures or price adjustments.

- ODOT responsible for downloading data from cloud.
- Data transfer daily by email or USB.
- ODOT performs analysis (roller coverage, temp, vibrations per foot, segregation, point data density, GPS).

- Pennsylvania Update (Dan Clark)
  - Implementation schedule 13 projects over last 2 years, 7 projects in 2016.
  - 2 grading projects.
  - Acceptance criteria, paying as long as they basically use machines.
  - No issues with not getting coverage.
  - Want data to be importable and viewable.
  - Large potential for screw-ups, can't open files, corrupted.
  - Sub-contractors good with data, contractors not as good.
  - No printing or reporting requirements. Concern: Scales used will affect visual.
  - Better off doing own analysis and reporting.
  - Contractors could tweak data.
  - Training 2-8 weeks before start of construction for contractor from vendor for data collection and operations. PennDOT attends and provides input to help guide discussions.
  - SITECH not familiar with Veta.

- Georgia Update (Al Casteel)
  - 1 project complete, 2 ongoing, on aggregate base and subbase only.
  - Lump sum.
  - Biggest challenge is getting data in and out of Veta.
  - 4 additional projects this year.
  - No asphalt projects in the near future.

INTELLIGENT COMPACTION

Connecticut's Experience

IMPLEMENTATION PLAN

- Step 1 • Familiarity
- Step 2 • Growth
- Step 3 • Management

REPORTING REQUIREMENTS

Essential Data Elements for Each Data Point

Item	Date Field Name	Example of Data
1	Date Stamp (YYYYMMDD)	e.g. 20080701
2	Time Stamp (HHMMSS.SS -Military Format)	e.g. 090504.00 (9 hr 5 min. 4.00 s.)
3*	Longitude (Decimal Degrees)	e.g. 94.85920403
4*	Latitude (Decimal Degrees)	e.g. 45.22777335
5*	Easting (m)	e.g. 354048.300
6*	Northing (m)	e.g. 5009934.900
7	Height (m)	e.g. 339.9450
8	Pass Number (Rollers Only)	e.g. 2
9	Direction Index	e.g. 1 for Forward, 2 for Reverse
10	Speed (kph) (Rollers and Pavers)	e.g. 4.0
11	Vibration On	e.g. 1 for Yes, 2 for No
12	Frequency (vpm)	e.g. 3500.0
13	Amplitude (mm)	e.g. 0.6
14	Surface Temperature (°C) (Rollers Only)	e.g. 120

Essential Data Information

Item	Description
1	Section Title
2	Machine Manufacturer
3	Machine Type
4	Machine Model
5	Drum/Screed Width (m)
6	Drum Diameter (m) (Roller Only)
7	Machine Weight (Metric Ton)
8	CSPC Zone
9	Offset to UTC (hrs)
10	Number of Data Points

SUBMITTAL REQUIREMENTS

Minimum Data Acquisition Frequency:
Two (2) Times Per Day of Operation

Raw Data and Analysis Results Availability:
Within 24 Hours of Data Collection

Vendor Software Export Frequency:
On a Daily Basis

Initial Data
Electronic data from the equipment and the data analysis software shall be provided upon completion of the first days paving.

Data Summary
A summary shall be given to the Department at the completion of the contract.

ACCEPTANCE CRITERIA

"Acceptable documentation is considered a continuous period of data collection of 100% of the Essential Data Information and Data Elements for no less than 90% of the time period material is being placed by the paver or compacted by the roller."

OREGON

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HISTORY OF IC IN OREGON

2014
- APAO/ODOT Advanced Pavers Workshop - Presentation "Improved Asphalt Density Quality Control with Intelligent Compaction" by Antonio Nieves FHWA
- Contract Change Order for 1 IC Roller on 1 project

2015
- Intelligent Compaction Data Management Workshop, FHWA
- Contract Change Order to add IC on all rollers for 3 projects/3 contractors

2016
- Bid 3 projects with full IC for construction in 2016
- Formed IC Framework and Technology Working Groups (ODOT, Contractors, Vendors)
- User Guide developed for V3 and training is available

IMPLEMENTATION SCHEUDLE

- Framework group has an initial goal to make a decision on broader IC implementation by the 2019 construction season. Until that time, we can expect 2-4 pilot projects per season.
- Technology Group will provide recommendations on the IC specification, develop a process to evaluate the pilot projects, and determine how to best utilize IC data real-time.

DATA USEAGE

- Only for information
- Currently no performance measures or price adjustments
- ODOT is responsible for downloading data from cloud
- Point data (density) is transferred daily by email or USB
- ODOT performs all analysis

ANALYSIS

The types of information that are currently being analyzed are:
- Roller Coverage
- Temperature – Roller and Paver
- Vibrations per foot – calculation from vibration frequency and speed
- Truck segregation/Wing dumps – yield calculation for averaged distance per truck
- Point Data – Density from QC and QA
- Limitations of GPS – Undercrossings, canyons, tall buildings

Minnesota Update on IC and PMTP Technologies

TPF-5 (334) Veta Pooled Fund

Meeting #1, April 20, 2016

Rebecca Embacher, State Advanced Matl's & Technology Engineer

We all have a stake in A to B

Current Pooled Fund Participants

Current Participants

- California
- Connecticut
- Georgia (NEW! ☺ – 04/19/16)
- Maine
- Minnesota
- Missouri
- Oregon
- Pennsylvania

Commitments Received: $542,500
FHWA Technical Liaison: Richard Duval
Lead Agency Technical Contact: Rebecca Embacher

MnDOT's Implementation Schedule

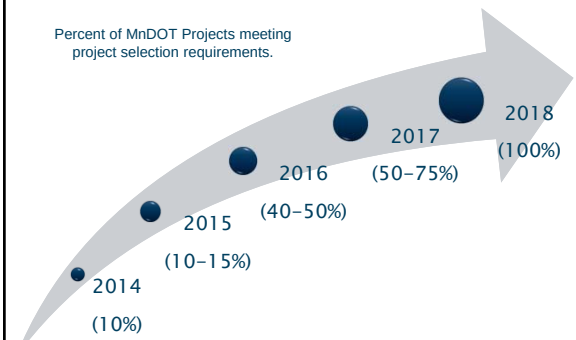
Geospatial Technologies

Intelligent Compaction & Thermal Profiling History

- 55 Projects on Asphalt Pavements
  - 37 Projects - Intelligent Compaction
  - 48 Projects - Thermal Profiling
- 26 Projects on Bound/Unbound Materials
  - 11 Projects - Bound (Aggregate Base, FDR, SFDR)
  - 16 Projects - Unbound (Non-Granular, Granular)
  - Minnesota requires instrumentation of the entire rolling train for embankment and asphalt pavement applications.

Intelligent Compaction & Thermal Profiling Implementation Timeline for MN

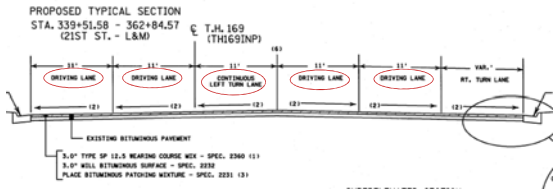
Percent of MnDOT Projects meeting project selection requirements.



Thermal Profile and Intelligent Compaction Measurements

100% of each lift

- Traffic Lanes (Driving/Thru Lanes)
- Auxiliary Lanes
  - Continuous Left Turn Lanes
  - Lanes for Speed Change



Project Selection Requirements

- Applications

Technology	Specification
Intelligent Compaction (IC) Method	2215 (SFDR), 2331 (CIR) 2353* (Ultrathin Bonded Wearing Course) 2360 (Plant Mixed Asphalt Pavement) 2365 (Stone Matrix Asphalt)
Paver Mounted Thermal Profile (PMTP) Method	2360 (Plant Mixed Asphalt Pavement) 2365 (Stone Matrix Asphalt)

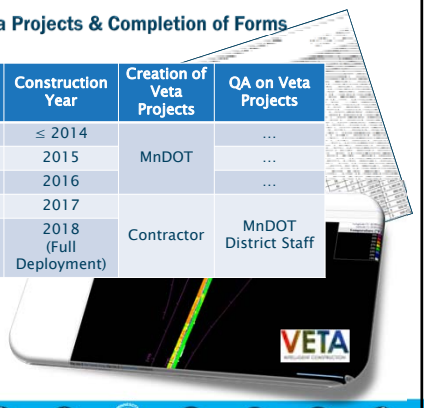
  - *IC is recommended for use with 2353 (Ultrathin Bonded Wearing Course), only when used in conjunction with 2360 (Plant Mixed Asphalt Pavement)
- ≥ 6 Lane Miles
- Cellular Coverage (at least one time per day)

Project Selection Requirements

- Geospatial Coverage
  - 100% Global Navigation Satellite System (GNSS) Coverage within project limits.
    - Intelligent Compaction: ± 2 inches Horizontally
    - Paver Mounted Thermal Profile Method: ± 4 feet Horizontally

Creation of Veta Projects & Completion of Forms

Software	Construction Year	Creation of Veta Projects	QA on Veta Projects
Proprietary	≤ 2014	MnDOT	…
Veta 3.0	2015		…
Veta 4.0*	2016		…
Veta 4.0 or Later	2017	Contractor	MnDOT District Staff
Veta 4.0 or Later	2018 (Full Deployment)		



Veta Lecturer-Led Classes (Hands-on training)

- Content
  - History
  - Deployment Schedule/ Project Selection
  - What is the technology
  - Why is MnDOT moving forward with these technologies
  - Construction Highlights
  - Review of IC and PMTP Special Provisions
  - Live demo of Veta
  - Hands-on creation of both an intelligent compaction and thermal profiling project from start to finish
- Classes
  - 2016
    - 9 Classes
    - ~ 20 students per class
  - 2017 …

Training (continued)

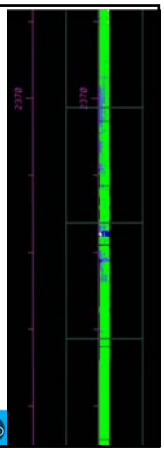
- E-Learning Class
  - Winter/Spring 2017
- Consultant Training
  - 4 Consultants
  - Real-time support of projects
    - ~ 3 project each
    - Creation of Veta Projects
    - Near, real-time review of data streams
    - Watch for workmanship issues

Paver Mounted Thermal Profile Method

2016 Quality Management

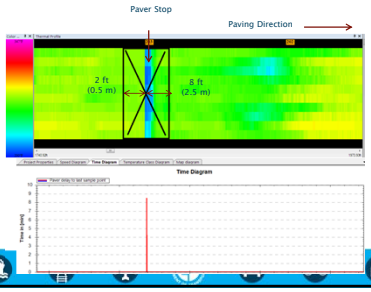
S-xx.3.D.2 Sublot Establishment

- Divide Lot into 150 linear-ft sublots
- Partial Sublots
  - Lots ≥ 150 linear ft
    - Sublots < 75 ft combined w/ previous sublot
    - Sublots ≥ 75 ft treated as one sublot
  - Lots < 150 ft
    - Treated as one sublot



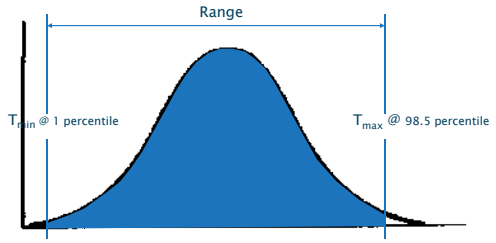
S-xx.3.I.1.a Calculations – Surface Temperature Readings

- Exclude following surface temp. readings:
  - < 180 °F
  - Paver stops > 1 min. in length



S-xx.3.I.1.b Calculations – Range (Equation 2016-1 (PMTP))

- Range = T_{max} - T_{min}



S-xx.3.I.1.c Thermal Segregation Severity Level

Sublot Temperature Differential		
Range		Thermal Segregation Category
	Range ≤ 25.0°F	Low
	25°F < Range ≤ 50°F	Medium
	50 °F < Range	High

Range = $Temp_{98.5Percentile}$ – $Temp_{1Percentile}$

S-xx.3.I.3.a Monetary Price Adjustment – Thermal Segregation

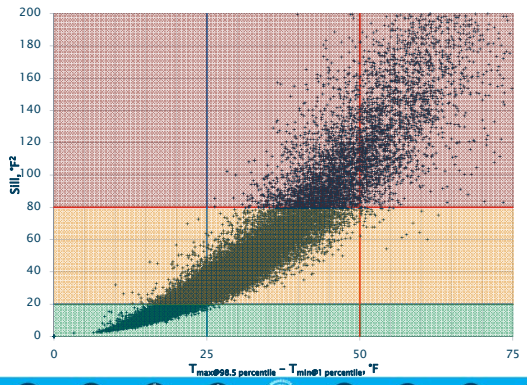
Table 2016–10 (PMTP) Monetary Price Adjustment for Thermal Segregation	
Thermal Segregation Category	Adjustment per Sublot
Low	$20 incentive
Moderate	No pay adjustment
Severe	$20 disincentive

- Sublots ≠ 150 linear feet
  - Prorate monetary price adjustment

Future – Thermal Segregation Classification

- Shadow Spec. (2016)
  - Replace Range Statistic w/ geospatial statistic (semi-variogram feature)
  - Implement 2017/2018
- Address Paver Stops
  - Stop Excluding?
  - Deduct for each?
  - Let smoothness spec deal with it/
- Increase $$$ (2017/2018)
  - monetary price adjustment table 2016-10 (PMTP)

Semi-Variogram Data



S-xx.3.I.3.a Monetary Price Adjustment – Thermal Coverage

Table 2016–9 (PMTP)
Monetary Price Adjustment for Thermal Coverage (TC)

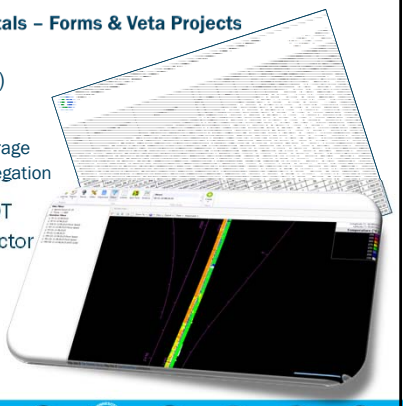
Thermal Coverage (%)	Total Price Adjustment Per Lift
≥ 70	No Price Adjustment
< 70	Total Price Adjustment (Disincentive) = (20 × TC – $1400) × (LM) where: TC = Thermal Coverage (whole number) LM = Lane Miles (hundredths)

S-xx.3.J.1 Submittals – Thermal Profiling Data

- Internal Storage until data transfer
- Cloud Storage ≤ 15 minute intervals
  - Limited cellular coverage – 1 x per day

S-xx.3.J.2 Submittals – Forms & Veta Projects

- Veta Project(s)
- Forms
  - Thermal Coverage
  - Thermal Segregation
- 2016 – MnDOT
- 2017 - Contractor

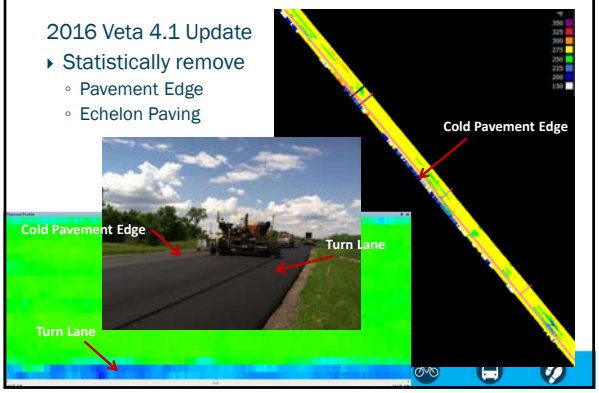


S-xx.5 Basis of Measurement

- Contract Lump Sum
  - 2016.601 Quality Management .....Lump Sum
- Includes all costs associated with this provision

Effects of Cold Pavement Edge & Echelon Paving

2016 Veta 4.1 Update
- Statistically remove
  - Pavement Edge
  - Echelon Paving



Intelligent Compaction Method

2016 Quality Management Special

S-xx.3.A.1 IC System Requirements – Instrumented Rollers

Table 2016-1 (IC)
Required Instrumented Roller Equipment

Specification	Description	Instrumented Rollers	Instrumented Roller Components				
			GNSS	Accelerometer	Temp. Sensor	Modem or Wi-Fi	Onboard Doc. System
2215 (SFDR), 2331 (CIR)	Self-Propelled, Vibratory: Smooth, Single-Drum Steel Smooth, Double-Drum Steel Pad (Sheep's) Foot	Required * ‖	Req'd †	Required ‡	None	Required §	Required † **
2215 (SFDR), 2331 (CIR)	Self-Propelled, Pneumatic Roller			None	None		
2353, 2360, 2365	Self-Propelled, Vibratory: Smooth Double-Drum Steel			Required ‡	Required #		
2360, 2365	Self-Propelled, Pneumatic Roller			None			

S-xx.3.D Design File (Background, Alignment File)

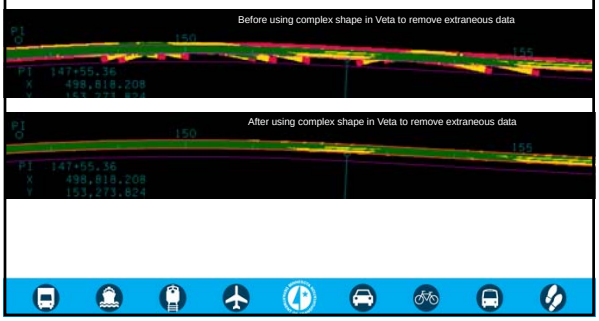
Layers
- Centerline
- Station Text
- Station Tick Marks
- Exceptions
- Closed Complex Shapes

Horizontal Accuracy
- ± 2 in (50 mm)

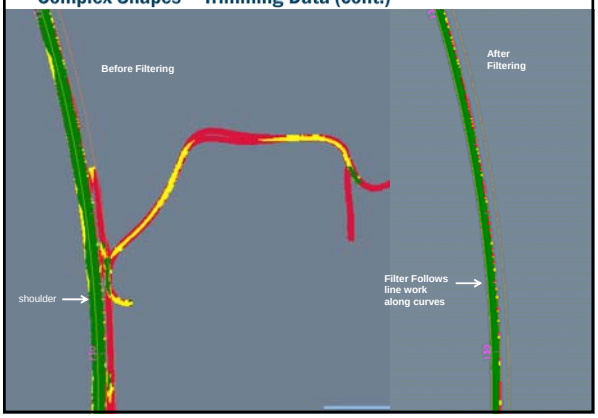
3 Working Days of Contract Approval
- Format
  - DGN
  - 2D-KMZ (Veta)
- County coordinate system used
- Total lane miles per lift (rounded to nearest hundredth)

Complex Shapes – Trimming Data

- Veta
  - Geospatial Analyses for Quality Control / Quality Assurance, Cleaning of Data

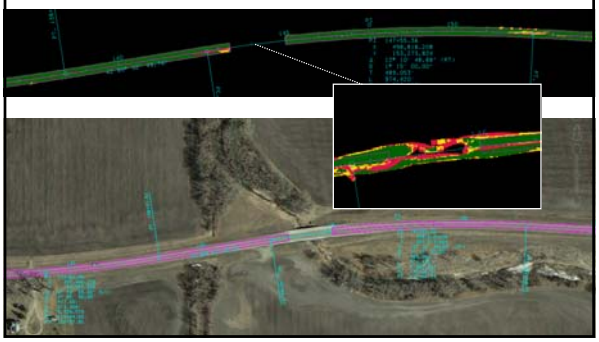


Complex Shapes – Trimming Data (cont.)



Complex Shapes - Exceptions

- Create separate complex shape, per lane, for each side of exception
- Example Below: Exception – Bridge, 2-lane highway
  - 4 Complex Shapes (1 per traffic lane on each side of exception)



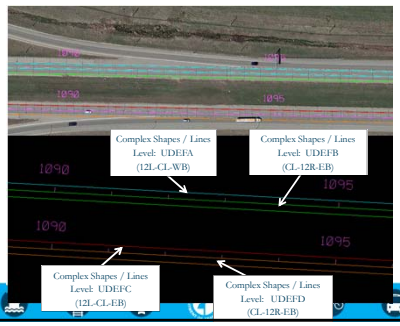
Possible Complex Shapes Variations

- Grading Application (full closure/detoured) – Full embankment width
  - 1 Complex Shape enclosing all adjacent traffic lanes

- Paving Application – 2 Traffic Lanes, 1 Auxiliary (Continuous Left Turn Lane)
  - 18-ft Paving (1.5 Lanes)
  - 2 Complex Shapes

Instructions for Creation of Complex Shapes

- Design Scene - Chapter 7 "Alignment" *(Link on AMT Website)*
- Default – Designers will create complex shapes by Traffic & Auxiliary Lane
- Notify Engineer if anticipate different production areas during paving/grading operations (e.g., 18ft paving). Additional, complex shapes can be created.



S-xx.3.G Intelligent Compaction Measurement Passes

Table 2016-7 (IC)
Required Measurement Pass Locations

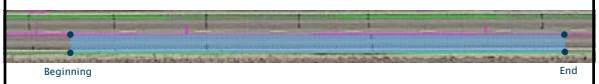
Specification *	Measurement Pass Location
2215 (SFDR), 2331 (CIR)	All roller passes on each lift.
2353, 2360, 2365	

*** Input (or select) the lot identification, using the on-board display, prior to compacting the given material.**

- Includes Control Strips – use different lot ID

S-xx.3.I Coordinates

- Engineer will collect lot boundaries:
  - form IC-106
    - 2215 (SFDR-Mixing/Injecting)
    - 2331 (CIR)
    - 2353
    - 2360
    - 2365
  - 4 Points (Begin / End of Each Lot)
  - Rover Style Sheet & Feature Code Library's
    - Currently, working with Frontier Precision & Trimble



S-xx.3.I Coordinates

- Optional

Desired – specification refinement & workmanship issues

- Verification/Quality Assurance *test locations*
  - *Cores, Nukes, DCP, LWD*
- Boundaries of areas requiring *corrective action* (form IC-105)
- Boundaries of areas *failing test rolling* (form IC-104)

S-xx.3.L.1 Calculations – Roller Coverage

- Calculated
  - Independently for each manufacturer's IC system
  - Per Lift
  - Per Material Type
- Roller Coverage is achieved when the

Cumulative Measurement Pass Count ≥ 1 x # Instrumented Rollers

- Tandem Rollers = 1 Instrumented Roller
- Calculate roller coverage on each side of an exception separately for lots extending through an exception.

S-xx.3.L.2 Monetary Price Adjustment – Roller Coverage

Table 2016–10 (IC)
Monetary Price Adjustment for Roller Coverage (RC)

Roller Coverage (%)	Total Price Adjustment Per Lift
≥ 70	No Price Adjustment
< 70	Total Price Adjustment (Disincentive) = (20 × RC – $1400) × (LM) where: RC = Roller Coverage (reported to the tenth) LM = Lane Miles (hundredths)

Future Efforts

- Further development of requirements– asphalt pavements
  - Easiest improvement:
    - Roller coverage at ± 1 ft of longitudinal joints
  - Compaction efforts during various temperature ranges
  - …

S-xx.3.M.2 Submittals – Forms & Veta Projects

- Veta Project(s)
- Forms
  - Roller Coverage
- 2016 – MnDOT
- 2017 - Contractor

S-xx.5 Basis of Measurement

- Contract Lump Sum
  - 2016.601 Quality Management Special.....Lump Sum
- Includes all costs associated with this provision

MnDOT Contract 1000576

Software License Agreement between Minnesota Department of Transportation and The Transtec Group, Inc.

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Recitals 3 - 5

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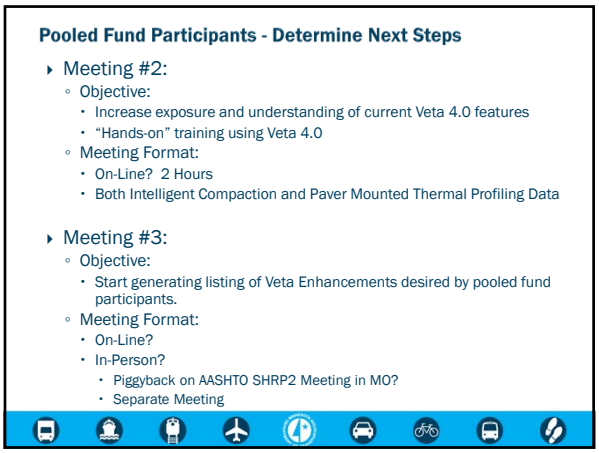
Live Demonstration of Veta 4.0

Intelligent Compaction and Paver Mounted Thermal Profiling Data

Next Steps / Action Items


Pooled Fund Participants - Determine Next Steps
Meeting #2:
Objective:
Increase exposure and understanding of current Veta 4.0 features
"Hands-on" training using Veta 4.0
Meeting Format:
On-Line? 2 Hours
Both Intelligent Compaction and Paver Mounted Thermal Profiling Data
Meeting #3:
Objective:
Start generating listing of Veta Enhancements desired by pooled fund participants.
Meeting Format:
On-Line?
In-Person?
Piggyback on AASHTO SHRP2 Meeting in MO?
Separate Meeting