

Meeting Minutes: NRRA Intelligent Construction Technologies (ICT) Team

(Agency & Associate Member Meeting)

Date: June 3, 2021
 Minutes prepared by: Rebecca Embacher
 Location: Microsoft Teams
 NRRA Team Webpage: <http://www.dot.state.mn.us/mnroad/nrra/structure-teams/intelligent-construction/index.html>

Attendance

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Other Attendees: Emil Bautista (MnDOT)

Decisions Made

- None

Action items

- Continue working on contract paperwork for projects approved for funding.

Agenda

- Veta Web and Veta MDMS Contract
- Schedule
- ICT During MnROAD Reconstruction
- Round Robin

Next Meeting

Date: July 8, 2021

Time: 10:30-11:30AM Central Time

Location: Microsoft Teams

Agenda items: Complete Brainstorming of ICTs to use during MnROAD Reconstruction

Meeting Notes

July Meeting Date Change (Embacher)

Discussed next meeting date falling on a Thursday before the Holiday weekend. All agreed to move the meeting to the subsequent Thursday for those traveling. Next meeting now scheduled for Thursday, July 8, 2021.

Open Discussion

(Kowalski) ISIC is putting package together for evaluating ICT systems in field (i.e., independent verification of ICT measurements to meet the CFR requirements). Committee is made up of mostly manufacturers, and consequently, they do not feel comfortable putting this package together due to possible conflicts of interest. Manufacturers would like to be expert liaisons for states putting together procedures. A lot of time and money has been put into equipment and there are concerns as to the procedures that states may develop and the appropriateness of these procedures. For example, holding independent measurements, with lower accuracy levels, at an acceptance level that is not appropriate for the ICT systems that measure at higher accuracy levels. Additionally, independent measurements inappropriately stopping production, or the use of a given vendor's system.

(Embacher) Stated that states would be interested in working with vendors to ensure that procedures, independent testing equipment accuracy levels, and acceptance criteria is appropriate. Additionally, the FHWA Resource Center will be assisting with this process. Currently, states have not progressed very fast with this independent verification process development due to COVID and other variables. More work is needed. Minnesota is currently only focusing on the PMTP method, as incentives are not provided with the IC method. Currently, pilot procedures are looking promising for independent verification of the

PMTP data, however, better data sets will be captured this construction season, as Minnesota is requiring high accuracy PMTP systems. Converting Veta from a desktop platform to a web-based platform will also assist with efforts to increase the security of data from tampering.

(Angerhofer): Asked whether the independent verifications will be completed “real time” or “at a later time”.

(Embacher) Currently, any developed review procedures would require being completed as a post-process method, as Veta is currently a desktop platform. However, after Veta is converted to a web-based platform, procedures could possibly be developed to allow for real-time reviews. However, correct live filtering of the data would be required.

(Kowalski / Nars) Discussed the concerns and complexity related to accurate yield checks should as-built information be added into the MDMS.

(Embacher) As-built information will not be added to the MDMS at this time. Discussions would still need to be held regarding the import of this type of information. Additionally, a lot of work still needs to be completed with the collection of ‘basic’ information into these systems, and therefore, state resources will be put towards these initiatives first. However, Manufacturers are free to start discussions in this area sooner, if they believe this is a high priority item.

(De Vries) Most states use yield checks to verify paper tickets quantities to ensure on track. This information is not being used for tabulation of quantities for use in pay vouchers.

(Angerhofer) Will additional work be required from the ICT vendors to import data into Veta web?

(Chang) There will be a “Smooth” transition for vendors from Veta desktop to Veta web.

Funded ICT Ideas

See attached slides 4-5. Reminded everyone of the two ideas that were currently funded. Currently working on contract paperwork.

Phase II Schedule

See attached slides 6. Reminder of project schedules.

September Workshop

See attached slide 7. Workshop is being discussed by the executive committee. Please hold the dates (September 13-17, 2021). They are hoping that it will be a live event, however, if travel is still not allowed it will be held virtually.

MnROAD Reconstruction – ICT Brainstorming

See attached slides 8-23. Started brainstorming, however, only got through reflective cracking study test cells. The remaining cells will be discussed at the July meeting.

Slide 10 contains the notes listing the proposed technologies to use for the reflective cracking cells (cells 16-23).

Intelligent Construction Technology Team

Meeting | 06/03/21

Microsoft Teams



National Road
Research Alliance

Agenda

Veta Web and Veta MDMS Contract

Schedule

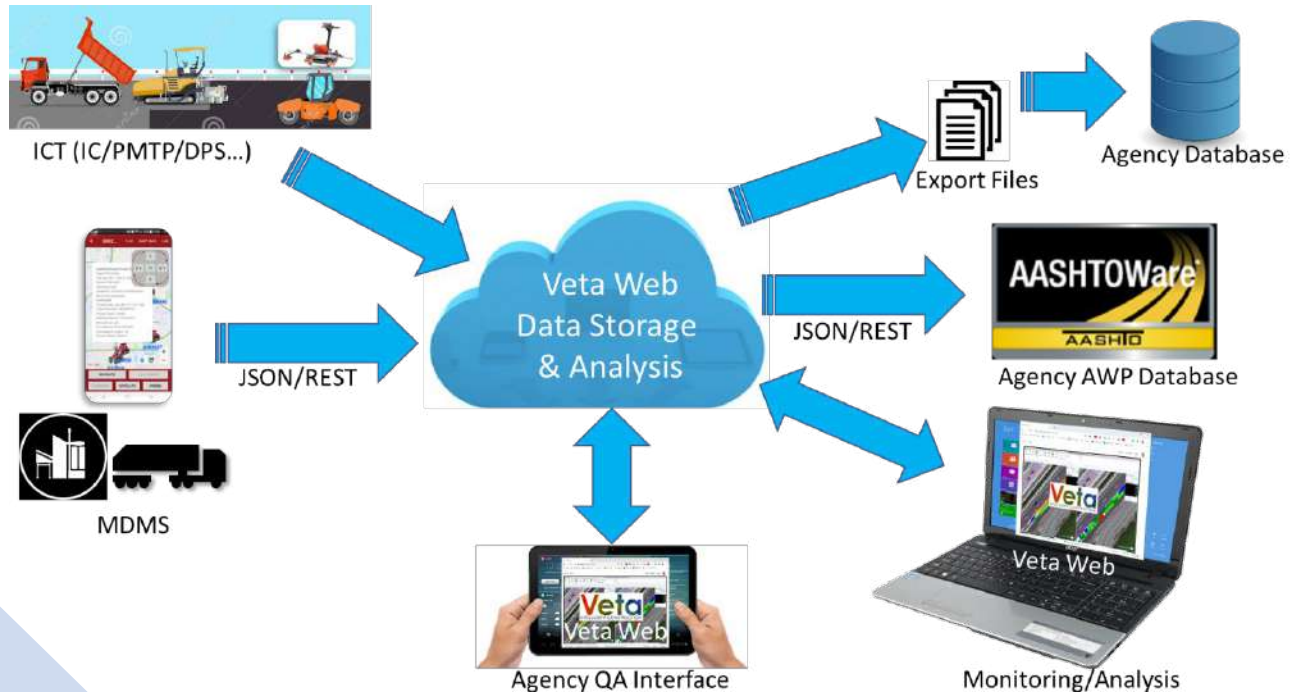
ICT During MnROAD Reconstruction

Round Robin

July Meeting Date Change?

- Scheduled for Thursday, July 1st
- Change to Thursday, July 8th ? **Moving forward with July 8th.**

Funded ICT Ideas



FUNDED (ICT1)

Phase I: Convert Desktop Version of Veta to a
Web-Based Application
(Hybrid Veta Desktop – Web Version)

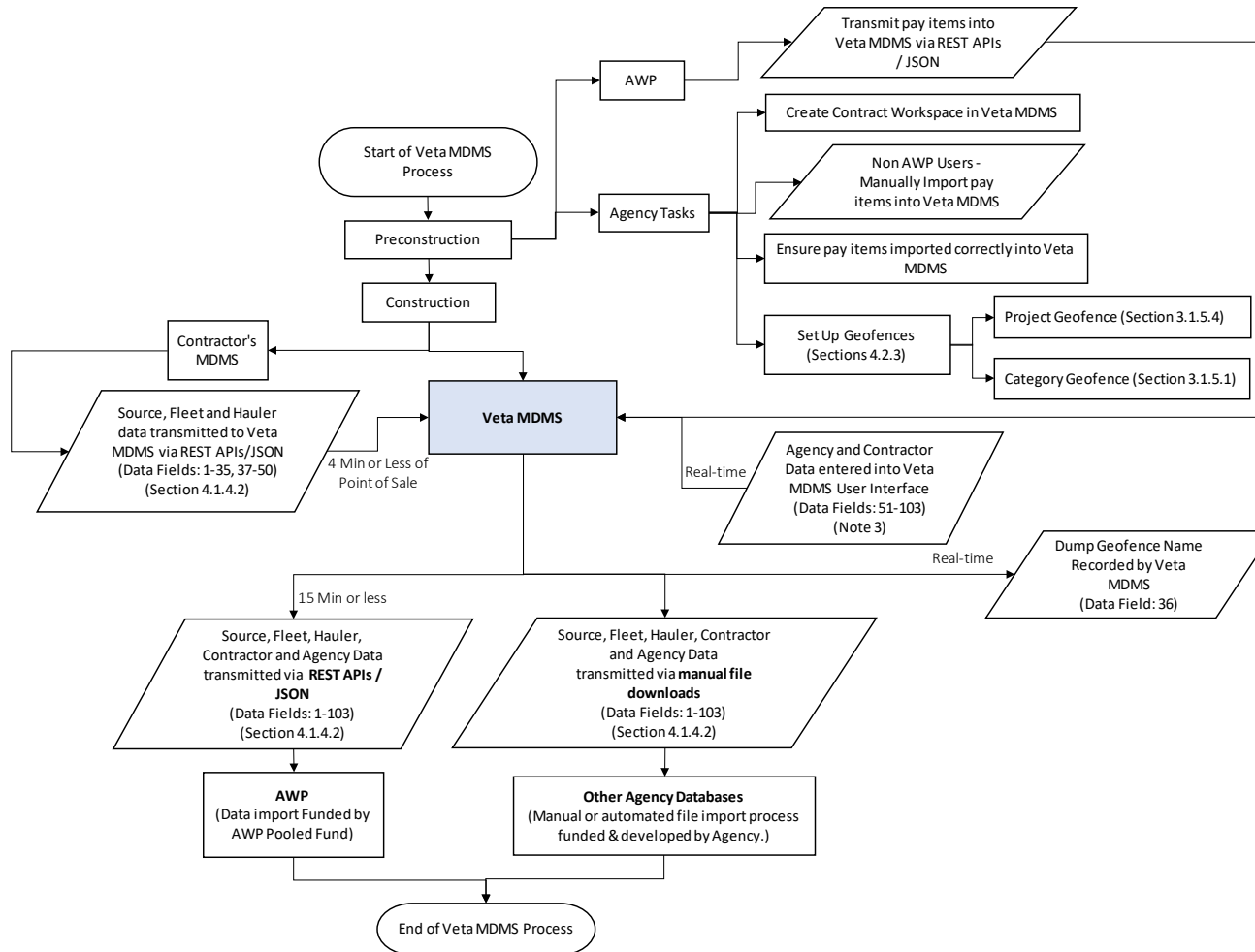
...

Machine Collected Data Stored on Server
Manage Users, Permissions, Projects
Calculations Performed on Server
(Filtering, Analyzing, Reporting, Map Creation)
Viewing of Maps, Analyses Results, Creation of
Filter Done Using Desktop Version

Not Funded (ICT3)

Phase II: Full Veta Web Implementation
Remaining Veta Software Components
Recreated on the Web
(Desktop Version no Longer Supported)

Funded ICT Ideas



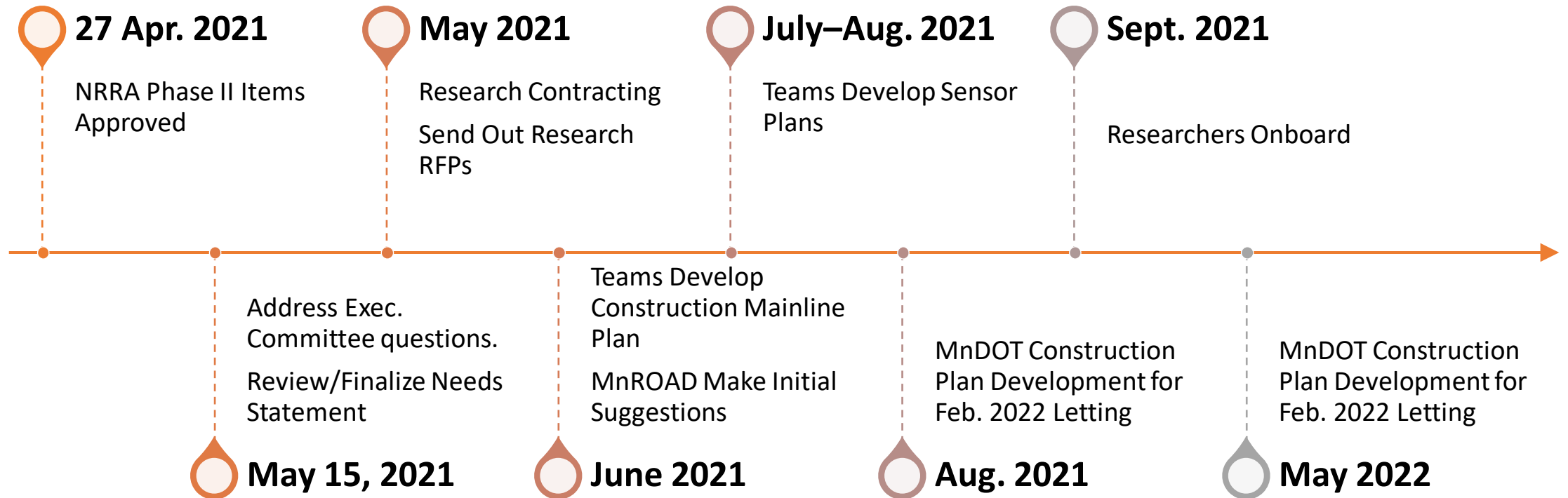
FUNDED (ICT2)

Create a Standardized Material Delivery Management System (MDMS) Platform
(MDMS is the expanded form of E-Ticketing)

...

- User Interface Data Entry
- AASHTOWare (AWP) Integration
- Non- AWP – File Exports
- Static Geofences (Project & Funding Category)
- Record Dumping Geofence Name (Eliminate Nested Geofences in Vendor Systems)
- Import Contractor MDMS Data Dashboards
- Data Analyses
- Mapping

Schedule



NRRA, MnROAD, NCAT Sponsor Meeting Minneapolis, MN | September 13-17, 2021

<p>NRRA National Road Research Alliance Meeting</p>	<p><u>Sept 13 – Monday (2-6 Hotel)</u></p> <ul style="list-style-type: none"> • NRRA Focus <ul style="list-style-type: none"> ○ (2:00-6:00) NRRA Topic or Training, implementation efforts, discuss at NRRA meetings for topics/need? ○ (4:00-6:00) NRRA Executive Meeting ○ (6:30) NRRA reception <p><u>Sept 14 - Tuesday</u></p> <ul style="list-style-type: none"> • NRRA Full Day (9-5 Hotel) <ul style="list-style-type: none"> ○ Executive and Teams will provide input for agenda
<p>Combined Tours</p>	<p><u>Sept 15 – Wednesday (9-5 offsite)</u></p> <ul style="list-style-type: none"> • AM - Tour of MnROAD • Northern Lights – NRRA construction and PG deeper study focus / Lunch Northern Lights • PM - Tour (TH-169, CSAH-8) • MnROAD/NCAT Sponsor Dinner (hotel)
<p>MnROAD/NCAT Sponsor Meeting</p>	<p><u>Sept 16 - Thursday (9-5 Hotel)</u></p> <ul style="list-style-type: none"> • MnROAD/NCAT Sponsor Full Day <ul style="list-style-type: none"> ○ Work with NCAT on agenda items <p><u>Sept 17 - Friday (8-11 Hotel)</u></p> <ul style="list-style-type: none"> • NCAT Focus Topic(s) <ul style="list-style-type: none"> ○ (9:00-11:00) PG Technical advisory panel next two years?, training?, Discuss with NCAT/need?

HMA Reflective Cracking Study

- tied to NCAT additive and Missouri test sections
- Existing Test Sections: 16-23 (4,487 feet)
- Construction:
 - Remove 5" HMA – Replace with 6" HMA mix on 12" class-6 granular base
 - 10 test sections (400 feet with 25' before and after for coring ~450 feet total of each mix)
- Action Needed:
 - Flexible Team determine what 10 HMA mixes are needed?
 - GeoTechnical Review (at a later time) base materials (we need a consistent base for study)
 - ICT Team – what technology could be utilized in this ~4,500 ft of granular base or HMA paving?

Reconstruction of Cells 16-23

4,500 feet

2016 HMA Performance Testing Test Sections (tied to NCAT)

Replace:
with 6" HMA
3, 2" Lifts

Remains:
12" Class 6

	23	22	21	20	19	18	17	16
	5" HMA PG 64E-34	5" HMA PG58H-34	5" HMA PG 58H-34	5" HMA PG 52S-34	5" HMA PG 64S-22	5" HMA PG 64S-22	5" HMA PG 64S-22	5" HMA PG 64S-22
	Low LTC Potential 15% RAP HiMA	High LTC Potential 20% RAP LMS	Med LTC Potential 20% RAP Typical Mix	Med/High LTC Potential 30% RAP	Med LTC Potential 20% RAP 3% Air Voids	Med LTC Potential 20% RAP	High LTC Potential 10% RAP 5% RAS	High LTC Potential 20% RAP 5% RAS
	12" Class 6	PG Binder + anti-strip 12" Class 6	12" Class 6	12" Class 6	12" Class 6	12" Class 6	12" Class 6	12" Class 6
	12" Class 3	12" Class 3	12" Class 3	12" Class 3	12" Class 3	12" Class 3	12" Class 3	12" Class 3
	7" Select Gran	7" Select Gran	7" Select Gran	7" Select Gran	7" Select Gran	7" Select Gran	7" Select Gran	7" Select Gran
	Clay	Clay	Clay	Clay	Clay	Clay	Clay	Clay
Opened Length (ft)	Sept 16 500	Sept 16 500	Sept 16 500	Sept 16 500	Sept 16 500	Sept 16 500	Sept 16 500	Sept 16 500
Gap (ft)		80	80	90	50	70	70	47

10 Test Sections @ 450 feet

Material	Technology	
Pre-Milling	3D GPR (thickness), FWD, TSD (traffic speed deflectometer / NCHRP project) Smoothness Scan road and 3D model development Is milling texture being looked at and affect on bonding (e.g., drum speed)?	
Milling	Variable Depth Milling ($\geq 1,000$ feet) – tie Phase I milling study – Contract Item	
12" Granular Base	IC Pre-Mapping (Phase I project – level 3 ICMV depending upon timing) – contract item LWD, DCP (assuming refusal) Scanning of Moisture (Phase I project) Corrective Action Needed?...	
6" Hot Mix Asphalt	Variable Depth Paving – Contract Real-Time Smoothness (Phase I project – if available) – Change Order IC - contract PMTP - contract MDMS - contract Smoothness - - contract FWD - research DPS – research (collaboration on cores w/ Flex Team) Seismic - Geotech Road Doctor (include GPR – layer thickness) - research TSD (Pay for service is available)	All spot tests – collect GPS coordinates and/or station/offset Monitoring Plan Laser Scanning? As-Built recorded during AMG milling & paving

3 Concrete Studies

12	72	73	71	70	96	162	160	9	8	7	806	706	606	506	805
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Study - Use of Carbon Dioxide for Sustainable and Resilient Concrete Pavements

Study - Reduced Cement in Concrete

Alternative Cementitious Materials – Geopolymer Concrete

- (three studies – Rigid team determines the number of cells for each)
- Existing Test Sections:
 - First Grouping - 506, 606, 706, 806, 7, 8, 9 (2,074 feet)
 - gap
 - Second Grouping - 96, 70 (648 feet), 71, 73, 72 (945 feet), 12 (499 feet)
- Construction:
 - Remove existing concrete and base materials varying depths
 - Pave 7.5" PCC with common drainable granular base – 15' panels - input from Geotech team
 - First Grouping - 8 test sections (~250 feet each with no transitions)
 - Second Group – 8 test sections (~250 feet each with no transitions)
- Action Needed:
 - Rigid Team determine the number and concrete mixes for each study from the above utilizing the 16 test section locations.
 - Rigid Team discuss the need for a consistent base support (can the geotechnical have variations built into the test sections and not effect the surface material studies)?
 - GeoTechnical Review (at a later time) base material
 - ICT Team – what technology could be utilized in this granular base or PCC paving?
 - Assume a common control mix could be shared as one test section leaving 15 test sections.
 - Note that cells 71,73,72 do not have to be reconstructed due to pavement condition. Could be withheld from the contract if costs come in high.

Reconstruction of Cells 12, 70-73 & 96

Remove Existing Concrete & Base at varying depths

~ 2,000 feet

7.5" PCC
15' Panels

Common
Drainable Base

SHRP-II Composite Pavements				Wh Reir
72	73	71	70	96
3" PCC 15'Lx12'W 1.25" dowel	3" PCC 15'Lx12'W 1.25" dowel	3" PCC 15'Lx12'W 1.25" dowel	3" 64-34 Saw/Seal	MicroSurface 6" Fiber Reinf. PCC
6" PCC Low Cost	6" PCC Low Cost	6" PCC Recycle	6" PCC Recycle	2011 Traditional Grind
8" Class 7	8" Class 7	8" Class 7	8" Class 7	7" 58-28 93HMA
Clay EAC Surface	Clay Innovative Grind (Driving Ln) Convent. Grind	Clay Innovative Grind (Driving Ln) Convent. Grind	Clay 15'Lx12'W Driving Ln 1.25" dowel	Clay 5'Lx6'W Polyolefin Fibers 25pcy
May 10 469	May 10 210	May 10 267	May 10 480	Oct 97 168

5

8 Test Sections ~ 250 feet (no transitions)

Reconstruction of Cells 7-9, 506, 606, 706, 806

Remove Existing Concrete & Base at varying depths

7.5" PCC
15' Panels

Common Drainable Base

~ 2,000 feet

	Original 5-Year PCC			Fiber Reinforced PCC			
	9	8	7	806	706	606	506
	7.5" PCC 2008 Ultimate Grind	7.5" PCC 2007 Traditional Grind	7.5" PCC 2007 Innovative Grind	5" Fiber Reinf. PCC (High) Astro Turf	5" Fiber Reinf. PCC (Enhanced) Astro Turf	5" Fiber Reinf. PCC (Standard) Astro Turf	5" PCC Control No Fibers Astro Turf
	4" PSAB	4" PSAB	4" PSAB	11" Class 5Q	11" Class 5Q	11" Class 5Q	11" Class 5Q
	3" CI 4	3" CI 4	3" CI 4				
	Clay	Clay	Clay	3" Class 5	3" Class 5	3" Class 5	3" Class 5
	15'Lx14'W 15'Lx13'W	15'Lx14'W 15'Lx13'W	20'Lx14'W 20'Lx13'W 1" dowel	Clay	Clay	Clay	Clay
	13' PCC Shoulder	13' PCC Shoulder		Fibers 0.75% by Volume	Fibers 30% RSR	Fibers 20% RSR	
	Passing Ln 1" dowel	Passing Ln 1" dowel					
Opened Length (ft)	Sep 92 518	Sep 92 510	Sep 92 500	2017 131	2017 135	2017 134	2017 146
Gap (ft)	8	30	35	28			

8 Test Sections ~ 250 feet (no transitions)

Cells 7-9, 12, 70-73, 96, 506, 606, 706, 806 ICT

Material	Technology	Comments
Drainable Base		
Concrete		

Studies

Reclamation and Recycling Techniques to Achieve Perpetual Pavements Characteristics Thinlays as a PM Treatment

Performance Evaluation of Wicking Geotextiles for Improving Drainage and Stiffness of Road Foundation (ties to 4 and 15 SFDR)

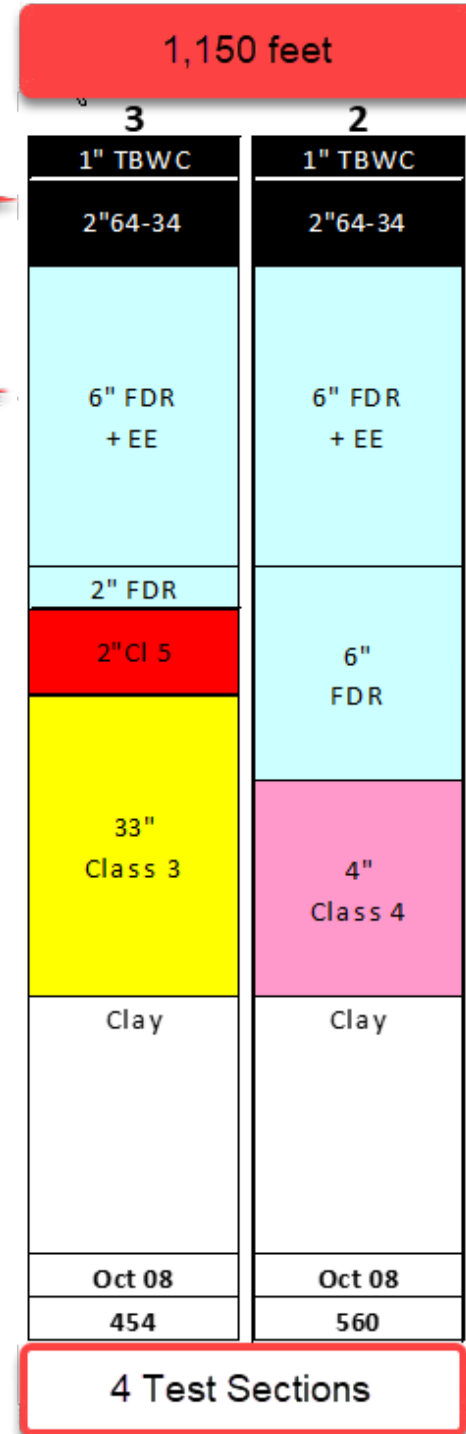
- Existing Test Sections: 2 (575 feet), 3 (575 feet) , 4 (575 feet), gap to, 115, 215 (573 feet)
- Construction:
 - Cell 2, 3 (minimal repair of SFDR) – split into 4 test sections with minimal PM treatment and thinlay as other treatment. Flex group designs if any milling is done and the mix designs. Example 102 PM treatment, 202 thinlay, 103 thinlay, 203 PM treatment.
 - Cell 4 (extensive repair of SFDR) – Flex and Geotech team design section. How can the wicking geotextile be used to improve system from the past (full depth section with no base was the original roadway before SFDR in 2007)
 - Cell 115, 215 (New reclamation of a ~14 inch full depth roadway with no granular base) – Flex and Geotech team to design section. How can the wicking geotextile be used to improve system?
- Action Needed:
 - PM and Flex design surface treatments for cells 2 and 3 good performing SFDR (thinlay and another surface treatment). Note cell 4 and 115-215 also will need surfaces.
 - Flex and Geotech design repairs to cell 4 – highly distressed SFDR
 - Flex and Geotech design a perpetual type of recycled cell to replace 115 and 215.
 - ICT Team – what technology could be utilized in this area?

Cells 2-3 ICT

Material	Technology	Comments
PM Treatments		
Thinlays		

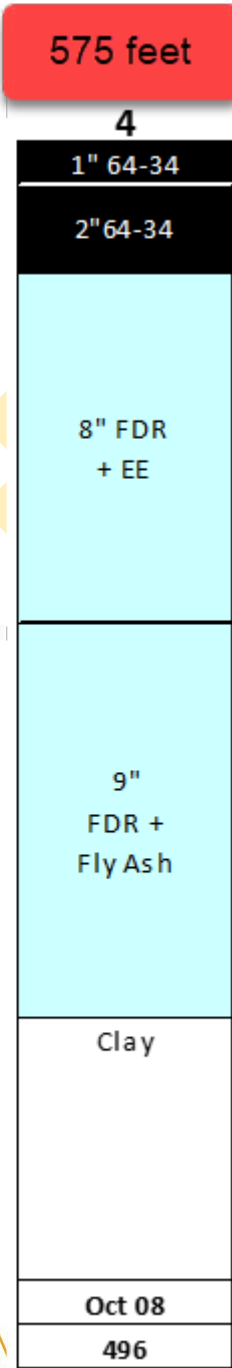
Possibly
2 Thinlays
2 PM Treatments

Minimal SFDR
Repair



Cell 4 ICT

Material	Technology	Comments
Surface (?)		
SFDR Repairs		



Extensive SFDR Repair

Flex & Geotech still need to design

Wicking Geotextile to be Used

Cells 115 & 215 ICT

573 feet

Asphalt Surface

14" Full Depth Reclamation (No Granular Base)

Wicking Geotextile to be Used

215	115
1.5" HMA	MicroSurface
2.25" WM 58-34	2.6" WM 58-34
11" 64-22 1993 HMA	11" 64-22 1993 HMA
Clay	Clay
M-Mill .75" Overlay 1.5" (2 0.75" lifts, 4.75 mm PG 58V-34)	M-Mill .375" Micro surface CQS-1P 0.375"
2017	2017
283	290

Material	Technology	Comments
HMA		
FDR		

Perpetual Pavements in Wet Freeze Climate

- Existing Test Sections: 101,201 (500 feet)
- Construction:
 - Flexible Team design needed
 - 1 or 2 test sections – match Wisconsin plus?
- Action:
 - Flexible Team – Designs needed for two perpetual pavements
 - Can a 250 foot section work?
 - ICT Team – what technology could be utilized in these test sections?

ICT team needs to wait for more details

Recycled Binder Availability

- Existing Test Sections:

- 160,162 (447 feet)
- (Break between the cells)
- 114,214,314,414,514,614,714,814,914 (520 feet)

- Construction:

- Remove 18" of whitetopping and clay subgrade on all cells and replace with a 12" granular base with 6" HMA surface
- 4 test sections at 250' each with transitions.

- Questions:

- Flex team – what mix four mix designs?
- Flex team – do these test sections have to be at MnROAD? Could they be on another roadway because instrumentation is not a priority?
- Geotechnical Group – What base is suggested?

Cells 160,162,114,214,314,414,514,614,714,814,914 ?

- 12" Granular Base
- 6" HMA
- 4 test section @ 250 feet each with transitions

Material	Technology	Comments
Granular Base		
HMA		

BCOA “Whitetopping” with Fibers

- Existing Test Sections: 114,214,314,414,514,614,714,814,914 (520 feet)
- Construction:
 - Remove existing 6” PCC + mill 1” HMA
 - Construct 5” FRC, 6’x6’ panels BCOA. Use fibers intended to enhance joint LTE (ranked #6)
- Question:
 - Test sections do need work
 - MnDOT would do the needed research at our costs

Cells 114,214,314,414,514,614,714,814,914 (520 feet)?

Material	Technology	Comments
Concrete		