MDOT AVL and MDSS Implementation

2014 Michigan Winter Operations Conference
October 28-29, Gaylord

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Contract Overview

- Awarded Contract to Delcan Technologies September 15th, 2013

- Contract is for 3 years with options for 2 additional years.
- Contract provisions include instrumenting all MDOT Fleet vehicles and Heavy Equipment
- Initial phase/priority is Winter Maintenance Trucks (267 Statewide First Year)
  - Permanent assigned truck
  - 2000 model year or newer
  - Dickey John Control Point spreader controller

Project Goals

Fleet Management

- Accurate mileage and hours reporting
- Ability to monitor current location of vehicles
- Monitor engine and on-board equipment status remotely.

Winter Maintenance Operations

- Accurate reporting of equipment and material usage
- Route monitoring and optimization
- Maintenance Decision Support System (MDSS)

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MDOT's Role

Equipment Installation

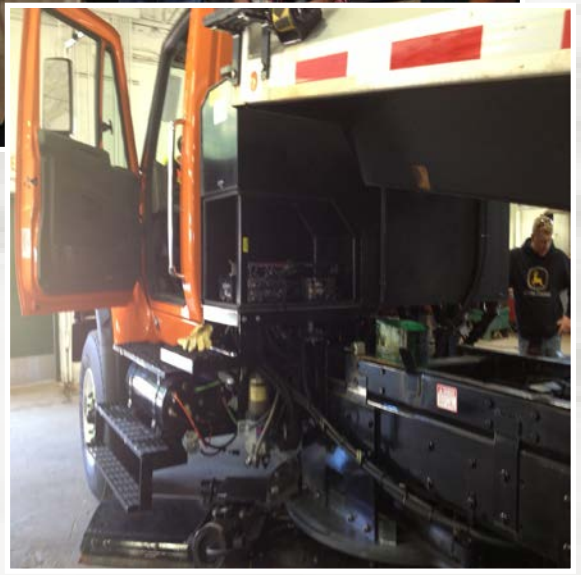
- MDOT Mechanic installations with vendor support
- Installation inspection and sign off

Support

- Provide support to region staff for common issues/easy fixes
- Coordinate Trainings

Project Management

- Weekly conference calls with vendor
- Ensure contract and Department goals are being met



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Vendor's Obligation

One point of contact that is required to:

- Provide working AVL equipment and sensors
- Secure and manage cellular communications from AVL devices (Verizon)
- Ensure necessary information is available to users for both AVL (Delcan) and MDSS (Iteris) websites
- Provide customer support to all users
- Provide training and training materials as needed
- Project management and weekly calls with MDOT

Delcan TECHNOLOGIES a PARSONS Company

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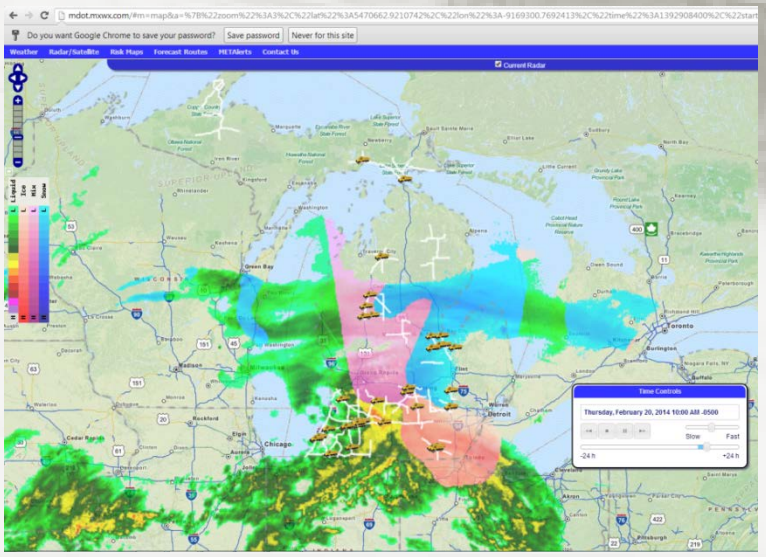
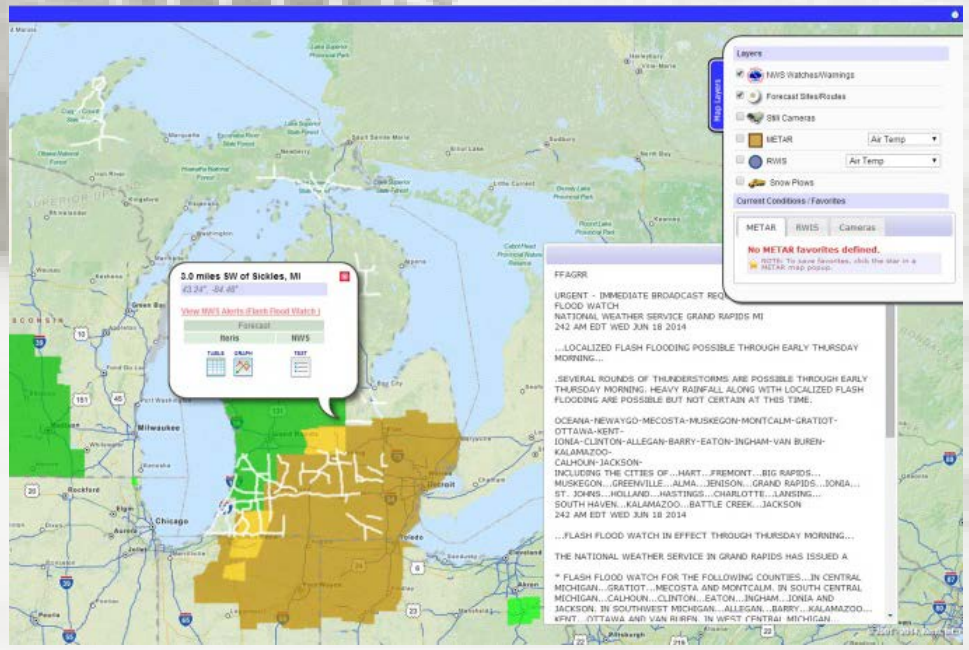
What is MDSS?

- Maintenance Decision Support System
- Weather Forecasting Service Catered to Road Agencies.
- Offers treatment recommendations based on MDOT parameters, weather, and reported maintenance activities.
- AVL units automatically feed MDSS, making recommendations more efficient and real-time.
- Treatment Recommendations not Treatment Absolutes





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Data Collection

Info Collected &Transmitted for Winter maintenance

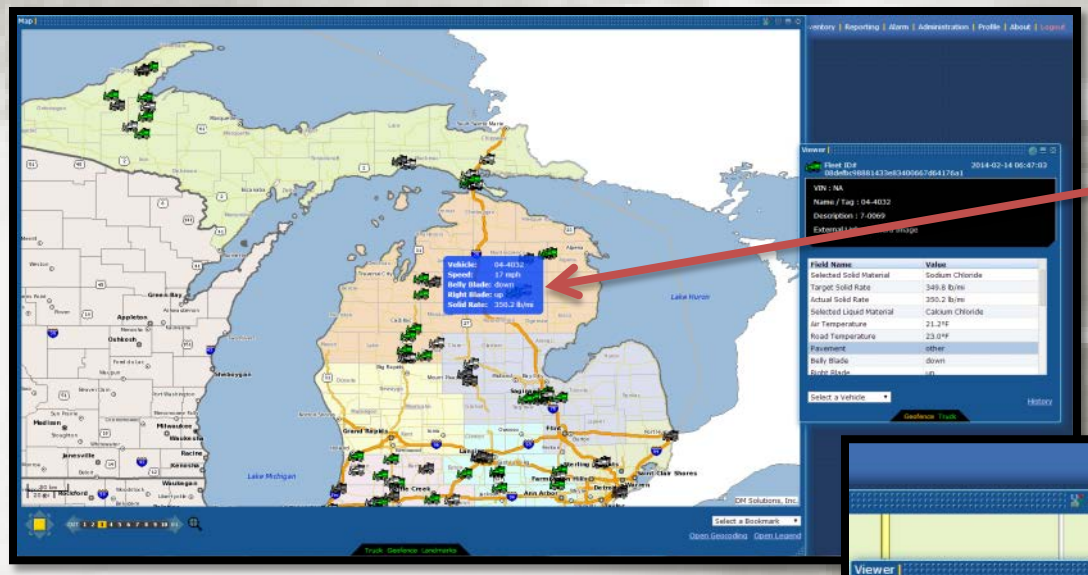
- Air and Pavement Temps
- Blade Up/Down
- Wing/ Plow Usage
- Camera Images
- Weather information (MDSS)
- Maintenance treatment recommendations (MDSS)
- Spreader Information
  - Material Type
  - Application Rate
  - Amount Used

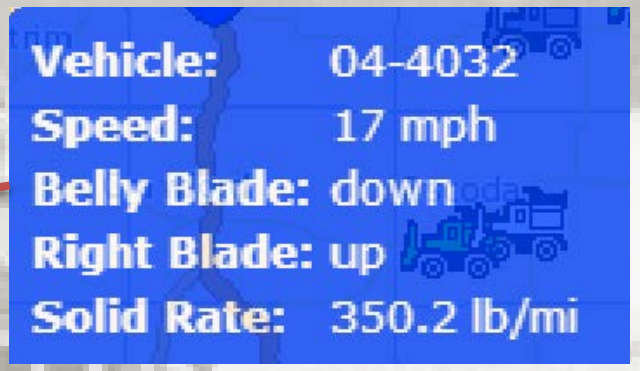
Data Transfer Process

WMTs

AVL Website

http://mdot.delcan.net





Real-time Data

- Operational
- Engine
- Camera Images

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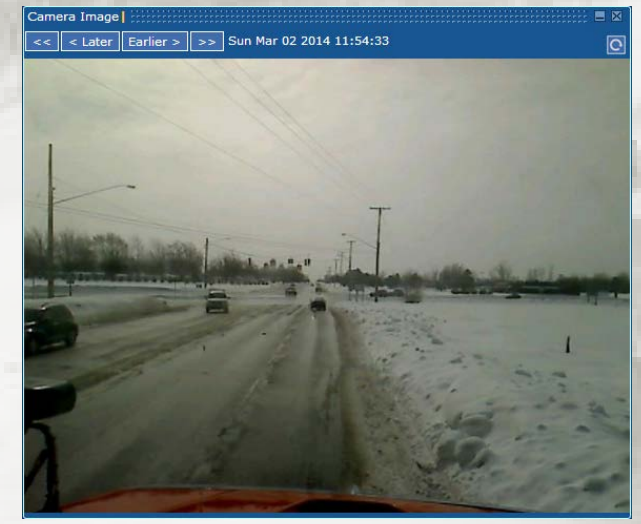
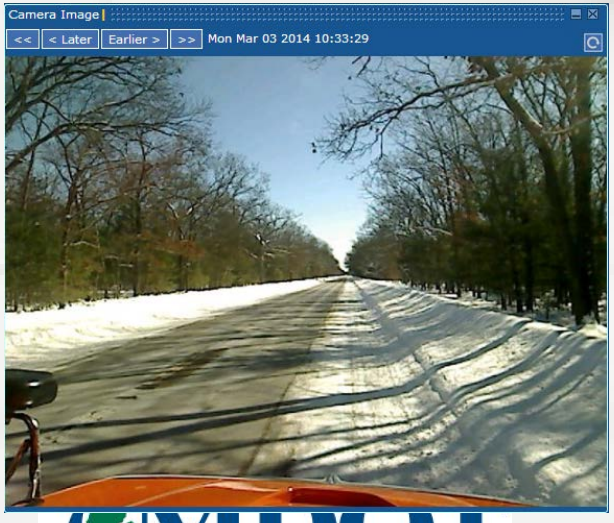
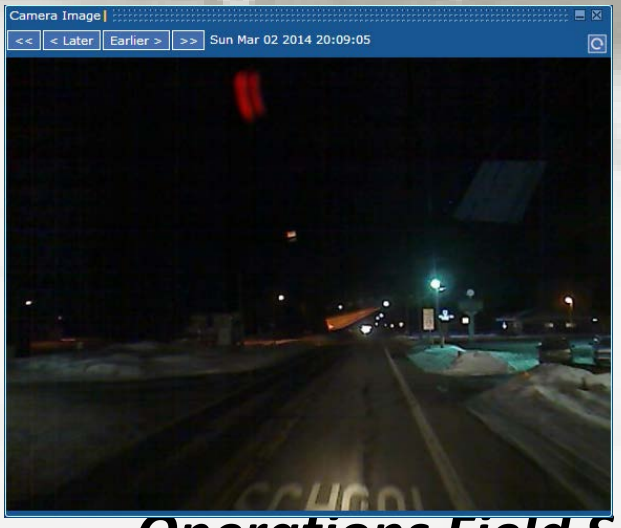
AVL Website

http://mdot.delcan.net

24 Hours of Camera Views







AVL Website

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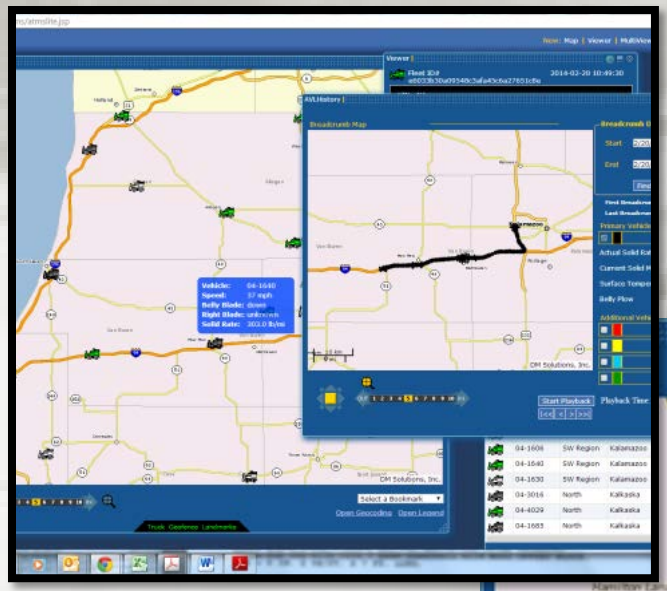
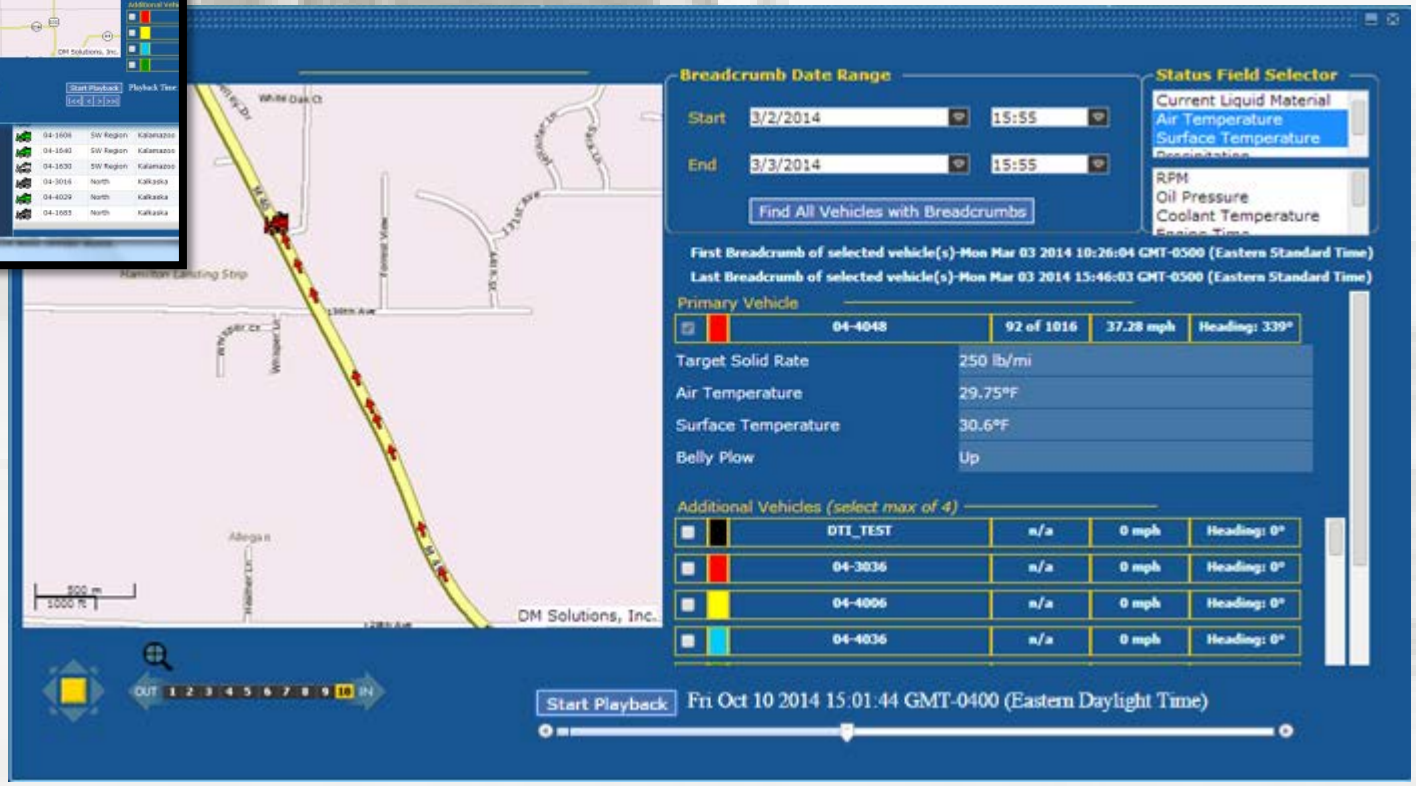


- **Historical Operations Playback**
  (Breadcrumbs)



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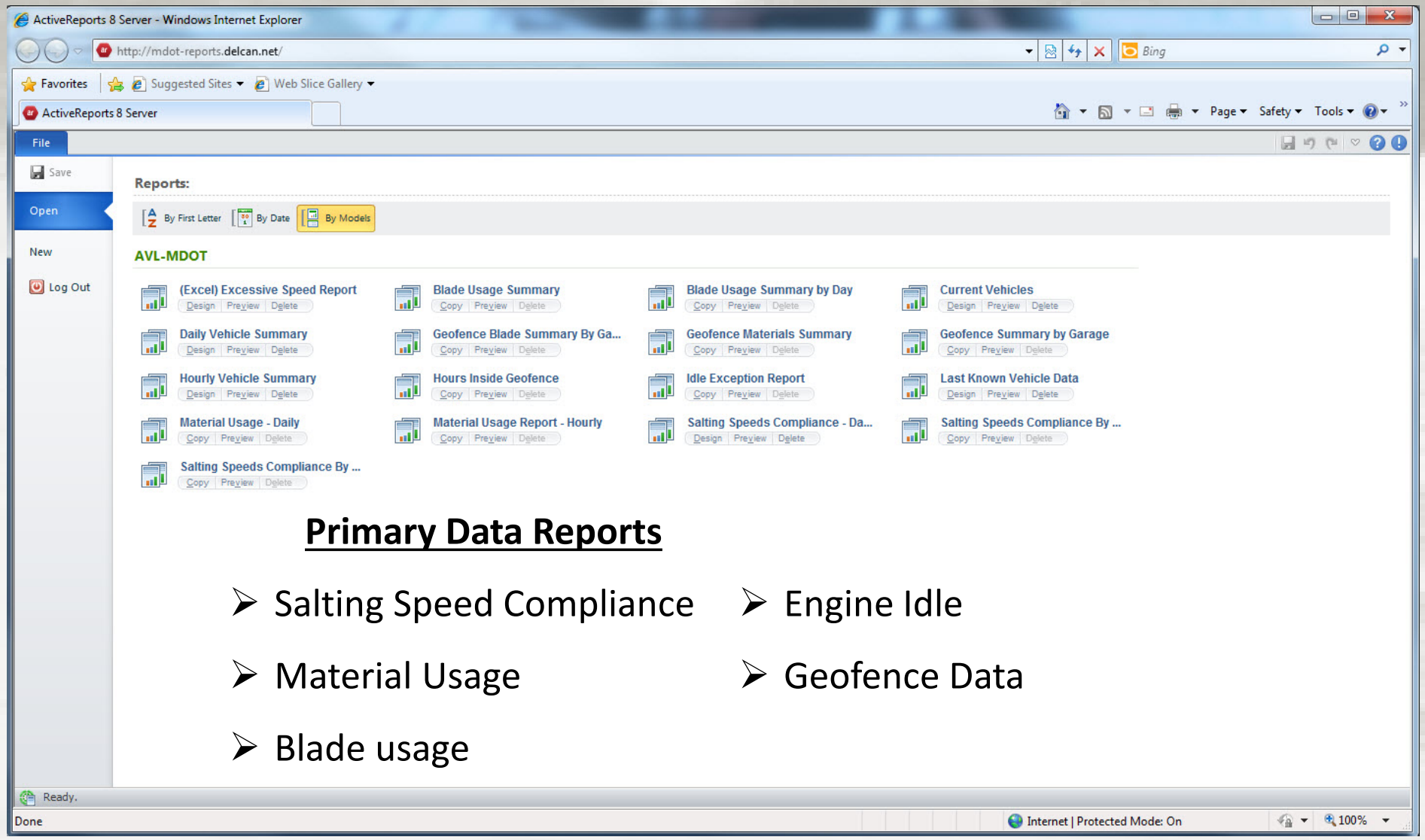
AVL Data Reports

http://mdot-reports.delcan.net



Primary Data Reports

- Salting Speed Compliance
- Material Usage
- Blade usage
- Engine Idle
- Geofence Data

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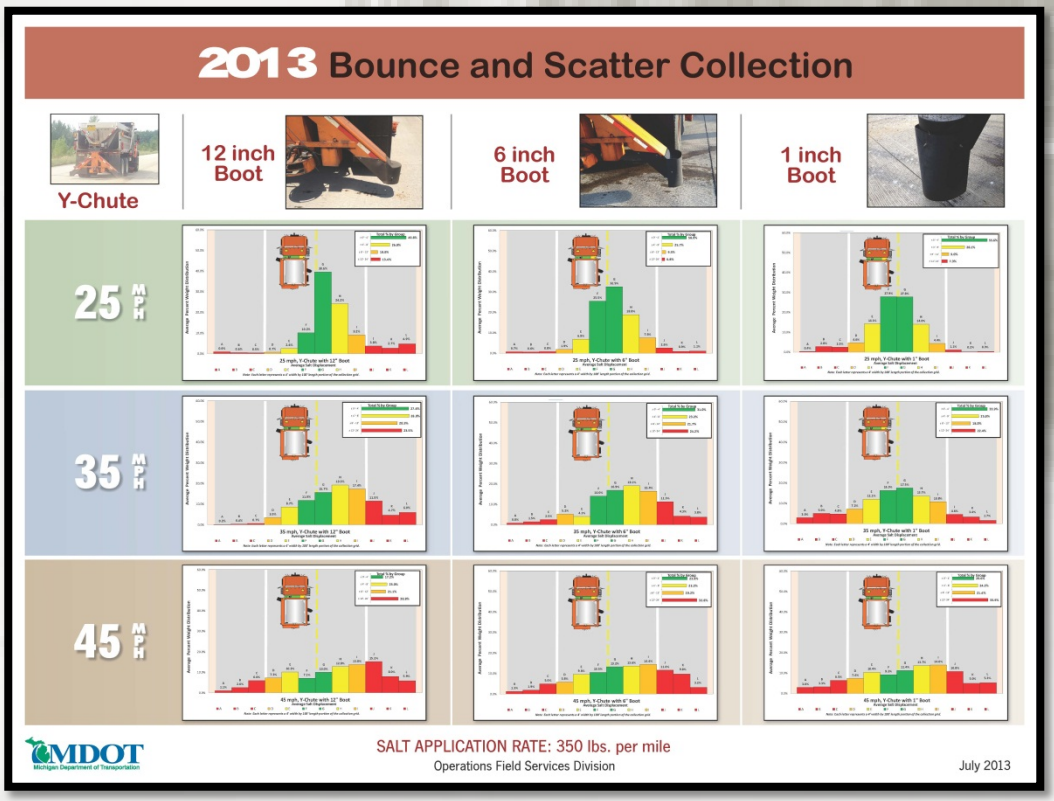
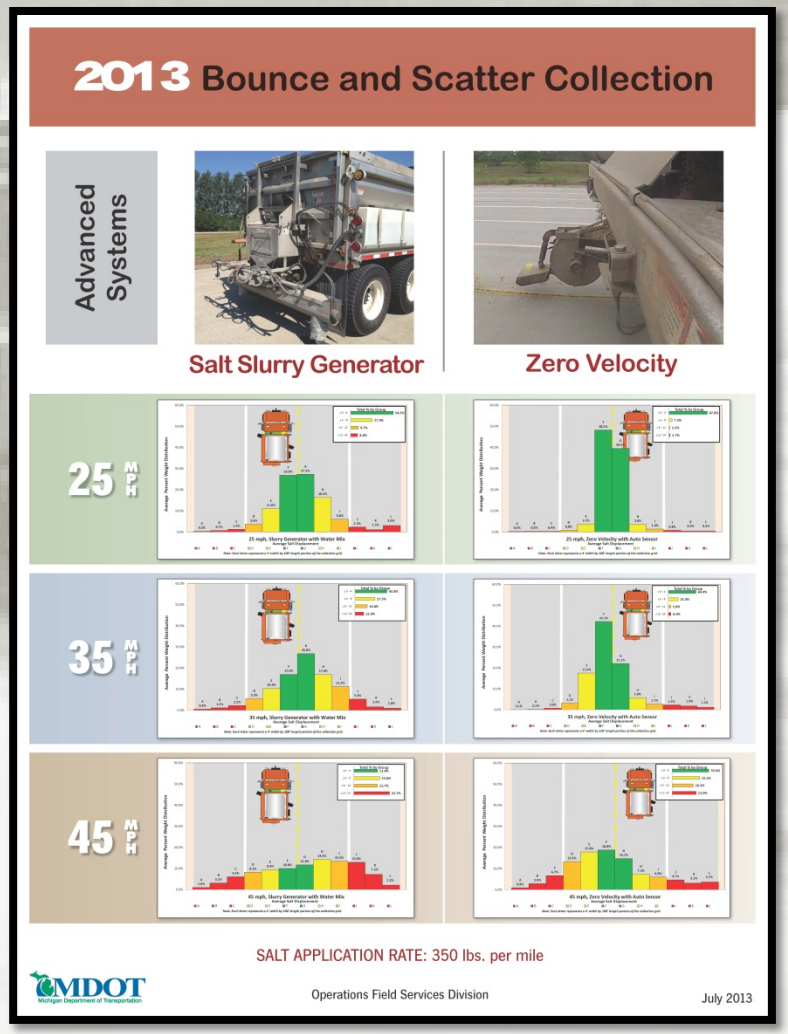
Salt Bounce and Scatter

General Concluions:

Slower truck speeds and prewet salt reduces waste





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Salting Best Practices

Maintenance Advisory

MA 2013-01
August 27, 2013

From Mark Geib, Engineer of Operations Field Services Division

MDOT
Operations Field Services Division
6333 Lansing Road
Lansing, MI 48917

Questions regarding this advisory should be directed to:

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Best Practices for Applying Deicing Materials

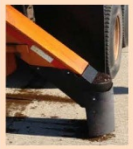
Due to increasing costs and growing environmental concerns regarding the use of deicing materials for winter maintenance operations, it is critical we do everything possible to reduce the use of these materials, while still providing adequate levels of service. A major component of reducing the amount of deicing material required is conducting operations in ways that limit the amount of material that bounces and scatters off the roadway during application. The 2012 MDOT Salt Bounce and Scatter Study concluded that using pre-wet salt and applying deicing materials at slower speeds significantly increases the amount of material that stays on the roadway. Incorporating these practices into MDOT's winter operations program will ensure that as much deicing material as possible remains on the roadway and within the target area (4' on either side of the centerline), where it is most effective.

In order to keep the most deicing material on the roadway during the application process, the following guidelines should be followed *(for all MDOT maintenance facilities beginning with the 2013/2014 season)*:

1. The truck's speed should operate between 20-25 mph while applying deicing material. Every effort should be made to maintain as slow a speed as possible while applying deicing material.

   Justified exceptions to this practice may include:
   - Peak hours on high-speed roads
   - Trucks equipped with technology that limits salt scatter, such as zero-velocity spreaders, slurry generators, etc. Based on results from the 2013 MDOT Salt Bounce and Scatter Study, these advanced systems should not operate faster than 35 mph
   - Other circumstances approved by the Region Engineer

2. All salt applied to a roadway should be pre-wet with a liquid chloride product. Rates of pre-wetting should be between 7 to 10 gallons per ton of untreated salt (salt slurry will require more, per manufacturer's recommendations). Salt can be treated at the stockpile, by the truckload, or at the point of application on the truck.



3. For all material delivery systems that allow it, a "boot" sleeve system, which decreases the amount of drop between the spreader and pavement, should be utilized (between 1-6 inches for a loaded truck). This decreases bounce and scatter, but not enough to maintain acceptable efficiencies at speeds above 25 mph.

4. The updated MDOT salt application rate chart should be followed. The chart has been revised to reflect the use of pre-wet salt at slower truck speeds.

MDOT maintenance facility supervisors must submit written plans for their facility to their Associate Region Engineer of Operations by October 1st of each year, detailing intended actions for implementation. Exceptions to these guidelines must be justified in writing on a case-by-case basis (example: per snow route). Consolidated action plans for each region should be submitted to the Engineer of Operations Field Services by October 15th of each year.

http://www.michigan.gov/documents/mdot/MA_2013-01_Best_Practices_for_Applying_Deicing_Materials_432480_7.pdf

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AVL Data Reports

Speed Compliance Report

Salting Speeds Compliance By Garage- Daily Custom Enhanced

Garage: Adrian

Dates: 3/1/2014 to 3/15/2014

Date	First Timestamp	Last Timestamp	25mph Compliance	(Data Points)	35mph Compliance	(Data Points)	Total Data Points	Solids Spread (ton)
Name: 04-1475			**22.46 %**	**227**	**75.81 %**	**581**	**776**	**15.2**
3/2/2014	7:39 AM	12:33 PM	**40.28 %**	143	**100.00 %**	355	355	8.0
3/5/2014	7:52 AM	8:50 AM	**26.92 %**	35	**78.46 %**	102	130	2.1
3/12/2014	6:41 AM	7:04 AM	**18.75 %**	18	**69.79 %**	67	96	2.7
3/13/2014	5:24 AM	6:38 AM	**15.90 %**	31	**29.23 %**	57	195	2.4
Name: 04-1626			**25.17 %**	**608**	**95.70 %**	**2171**	**2264**	**60.5**
3/1/2014	8:56 PM	11:59 PM	**25.19 %**	97	**100.00 %**	385	385	10.1
3/2/2014	12:00 AM	12:00 PM	**33.03 %**	433	**98.40 %**	1290	1311	21.2
3/3/2014	5:31 AM	10:48 AM	**75.00 %**	9	**100.00 %**	12	12	0.5
3/12/2014	6:01 AM	10:04 PM	**12.41 %**	69	**87.05 %**	484	556	28.7
Name: 04-1648			**30.12 %**	**1242**	**87.00 %**	**3633**	**4162**	**55.6**
3/1/2014	8:36 PM	9:13 PM	**16.27 %**	27	**100.00 %**	166	166	3.1
3/2/2014	1:38 AM	6:42 AM	**50.23 %**	429	**100.00 %**	854	854	9.2
3/3/2014	3:03 AM	10:49 AM	**40.68 %**	24	**91.53 %**	54	59	1.1
3/8/2014	9:59 AM	12:54 PM	**4.07 %**	22	**56.19 %**	304	541	4.8
3/10/2014	12:19 AM	12:28 AM	**25.64 %**	10	**69.23 %**	27	39	0.1
3/12/2014	8:26 AM	11:27 PM	**29.17 %**	730	**89.01 %**	2228	2503	37.3
Name: 04-1669			**20.14 %**	**1218**	**94.88 %**	**5815**	**6122**	**75.3**

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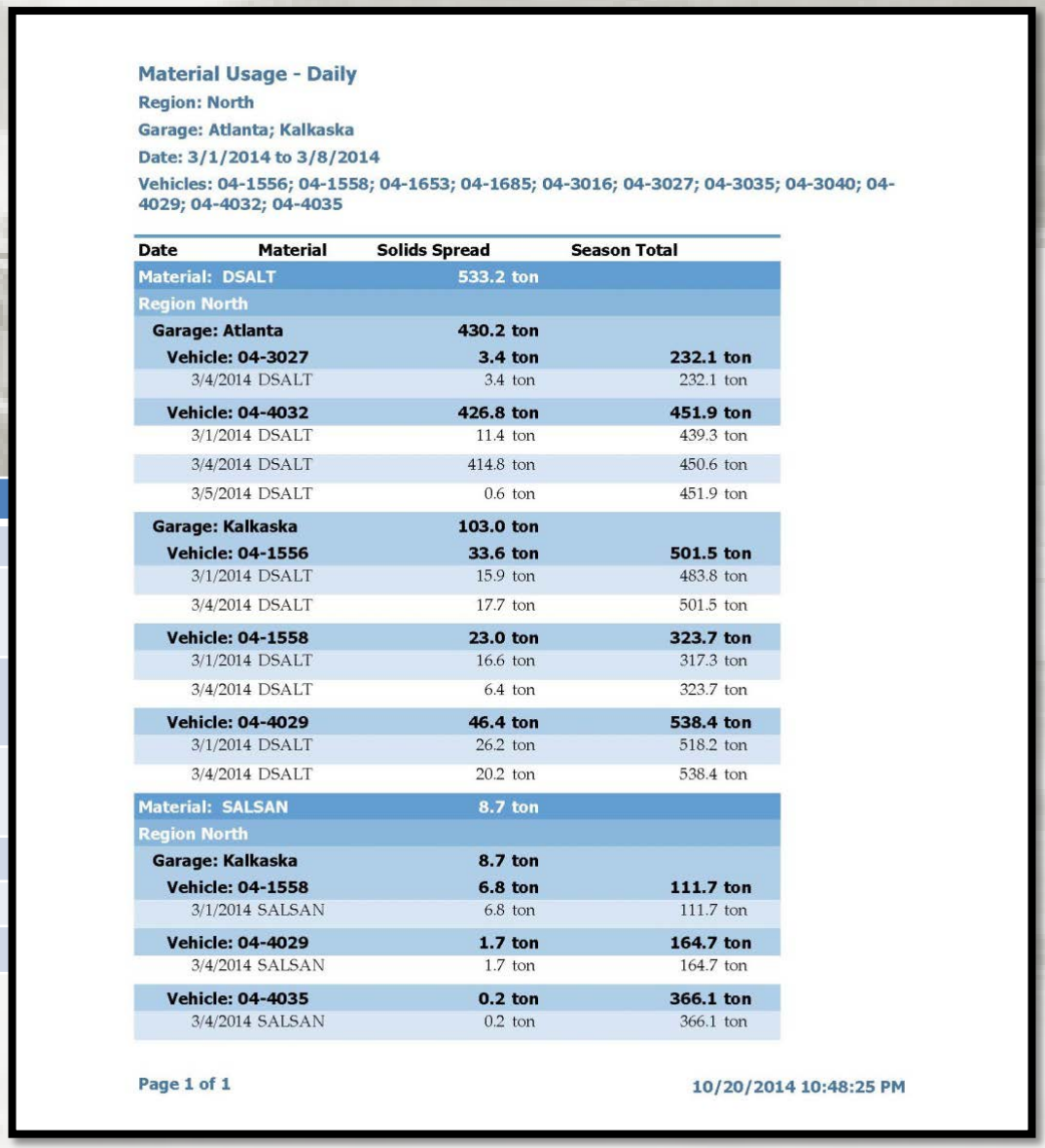
AVL Data Reports

Material Usage Report

Material Usage

- Data from Spreader Controller
- Consistent Naming

Solid Material	Solid Code
Prewet Salt with Calcium Chloride (8 gal per ton)	WSalCa
Prewet Salt with Salt Brine (8 gal per ton)	WSalBr
Dry Salt for spreader prewet	DSalt
Sand only (dry)	Sand
Salt/Sand Blend	SalSan



Material Usage - Daily

Region: North

Garage: Atlanta; Kalkaska

Date: 3/1/2014 to 3/8/2014

Vehicles: 04-1556; 04-1558; 04-1653; 04-1685; 04-3016; 04-3027; 04-3035; 04-3040; 04-4029; 04-4032; 04-4035

Date	Material	Solids Spread	Season Total
Material: DSALT		**533.2 ton**	
Region North			
Garage: Atlanta		**430.2 ton**	
Vehicle: 04-3027		**3.4 ton**	**232.1 ton**
3/4/2014	DSALT	3.4 ton	232.1 ton
Vehicle: 04-4032		**426.8 ton**	**451.9 ton**
3/1/2014	DSALT	11.4 ton	439.3 ton
3/4/2014	DSALT	414.8 ton	450.6 ton
3/5/2014	DSALT	0.6 ton	451.9 ton
Garage: Kalkaska		**103.0 ton**	
Vehicle: 04-1556		**33.6 ton**	**501.5 ton**
3/1/2014	DSALT	15.9 ton	483.8 ton
3/4/2014	DSALT	17.7 ton	501.5 ton
Vehicle: 04-1558		**23.0 ton**	**323.7 ton**
3/1/2014	DSALT	16.6 ton	317.3 ton
3/4/2014	DSALT	6.4 ton	323.7 ton
Vehicle: 04-4029		**46.4 ton**	**538.4 ton**
3/1/2014	DSALT	26.2 ton	518.2 ton
3/4/2014	DSALT	20.2 ton	538.4 ton
Material: SALSAN		**8.7 ton**	
Region North			
Garage: Kalkaska		**8.7 ton**	
Vehicle: 04-1558		**6.8 ton**	**111.7 ton**
3/1/2014	SALSAN	6.8 ton	111.7 ton
Vehicle: 04-4029		**1.7 ton**	**164.7 ton**
3/4/2014	SALSAN	1.7 ton	164.7 ton
Vehicle: 04-4035		**0.2 ton**	**366.1 ton**
3/4/2014	SALSAN	0.2 ton	366.1 ton

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AVL Data Reports

Blade Usage Report

Blade Usage Summary

Garage: Adrian

Dates: 3/2/2014 to 3/8/2014

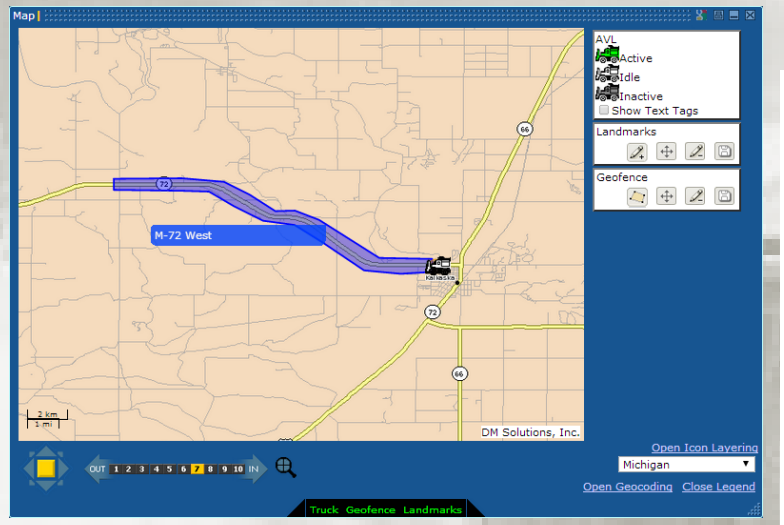
Minimum Speed: 4 mph

Name	Blade	Hours Down	First Timestamp	Last Timestamp
04-1491	BELLY	1.9	3/2/2014 1:09 AM	3/4/2014 12:59 AM
04-1491	FRONT	3.4	3/2/2014 1:09 AM	3/5/2014 1:43 AM
04-1491	LEFT	3.4	3/2/2014 1:09 AM	3/5/2014 1:43 AM
04-1491	RIGHT	3.4	3/2/2014 1:09 AM	3/5/2014 1:43 AM
04-1492	BELLY	5.0	3/2/2014 12:00 AM	3/5/2014 12:54 PM
04-1626	BELLY	10.9	3/2/2014 12:03 AM	3/5/2014 2:50 PM
04-1648	BELLY	5.4	3/2/2014 1:17 AM	3/3/2014 1:30 PM
04-1648	RIGHT	3.2	3/2/2014 1:17 AM	3/4/2014 9:10 AM
04-1669	BELLY	6.7	3/2/2014 1:13 AM	3/5/2014 2:26 PM
04-1669	RIGHT	5.6	3/2/2014 1:13 AM	3/3/2014 9:22 AM
04-4025	BELLY	3.6	3/2/2014 2:37 AM	3/5/2014 9:23 AM
04-4025	RIGHT	6.9	3/2/2014 2:37 AM	3/5/2014 1:23 PM

7/25/2014 9:28:40 AM

AVL Data Reports

Geofence Reports



- Can create shape boundaries around snow routes, service areas, etc
- Alarm notice option when trucks either enter or leave geofence area.
- Can report time, material used, blading, etc within geofence *(route comparison)*

Geofence Materials Summary

Dates: 3/1/2014 to 3/3/2014

Geofences: (select all)

Material	Start Time	End Time	Hours	Solids Spread
Geofence: Grand Region			**0.1**	**0.2 ton**
Vehicle: 04-1574			**0.1**	**0.1 ton**
SALT	3/2/2014 11:46 AM	3/2/2014 11:52 AM	0.1	0.1 ton
Vehicle: 04-4034			**0.0**	**0.1 ton**
DSALT	3/1/2014 10:24 AM	3/1/2014 10:25 AM	0.0	0.1 ton
Geofence: M-72 West			**2.1**	**8.4 ton**
Vehicle: 04-1558			**0.8**	**3.9 ton**
DSALT	3/1/2014 3:35 AM	3/1/2014 3:46 AM	0.2	0.6 ton
DSALT	3/1/2014 3:47 AM	3/1/2014 3:59 AM	0.2	1.5 ton
DSALT	3/1/2014 4:03 AM	3/1/2014 4:16 AM	0.2	0.8 ton
DSALT	3/1/2014 4:17 AM	3/1/2014 4:30 AM	0.2	1.0 ton
Vehicle: 04-4029			**1.3**	**4.5 ton**
DSALT	3/1/2014 6:39 AM	3/1/2014 6:51 AM	0.2	0.7 ton
DSALT	3/1/2014 7:00 AM	3/1/2014 7:30 AM	0.5	1.9 ton
DSALT	3/1/2014 9:10 AM	3/1/2014 9:47 AM	0.6	1.9 ton
Geofence: US-131 Osceola			**13.8**	**29.4 ton**
Vehicle: 04-1546			**0.0**	**0.1 ton**
DSALT	3/1/2014 10:31 AM	3/1/2014 10:31 AM	0.0	0.1 ton
Vehicle: 04-1564			**2.6**	**3.6 ton**
SALT	3/1/2014 7:24 AM	3/1/2014 7:53 AM	0.5	0.4 ton
SALT	3/1/2014 7:56 AM	3/1/2014 8:10 AM	0.2	0.8 ton

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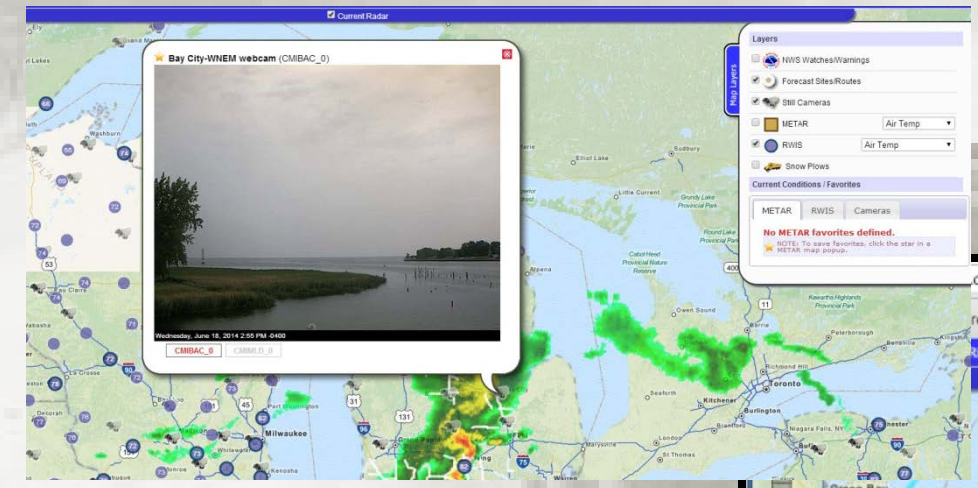
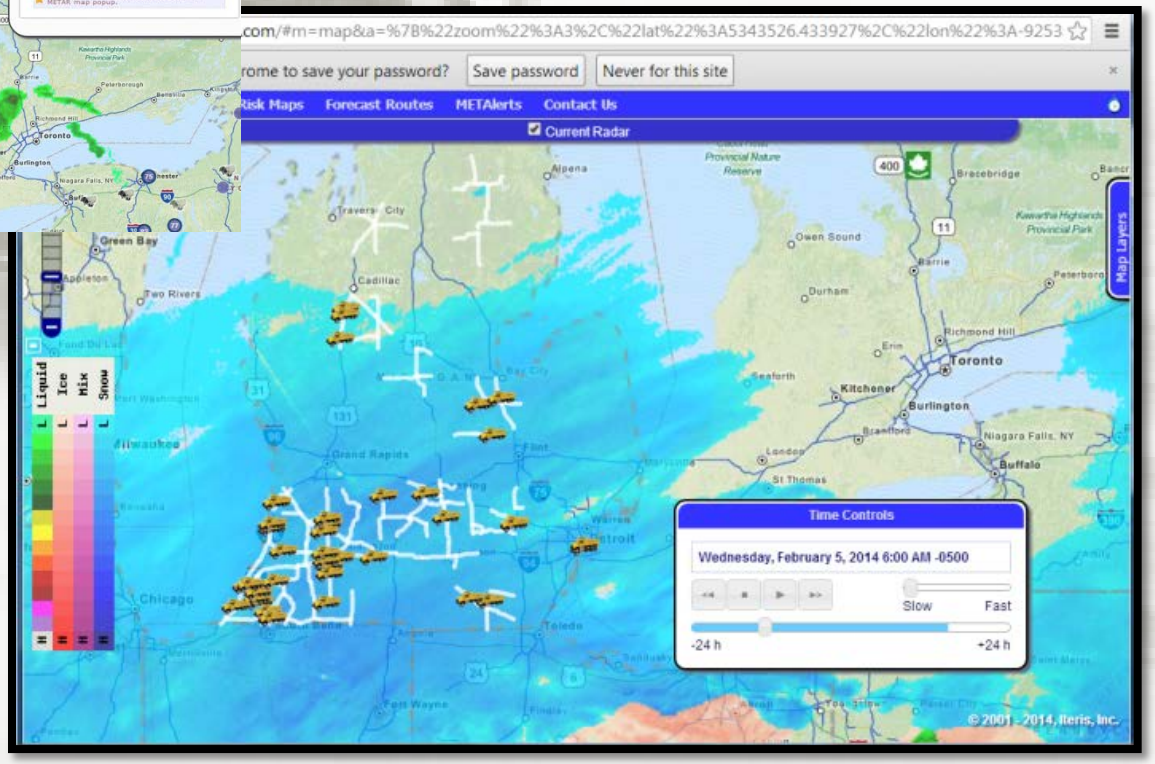
MDSS Website

www.mdot.mxwx.com





- **Weather Radar with WMT info.**
- **RWIS info & Camera images**
- **MDSS info provided direct to WMT cab** *(if equipped with monitor).*

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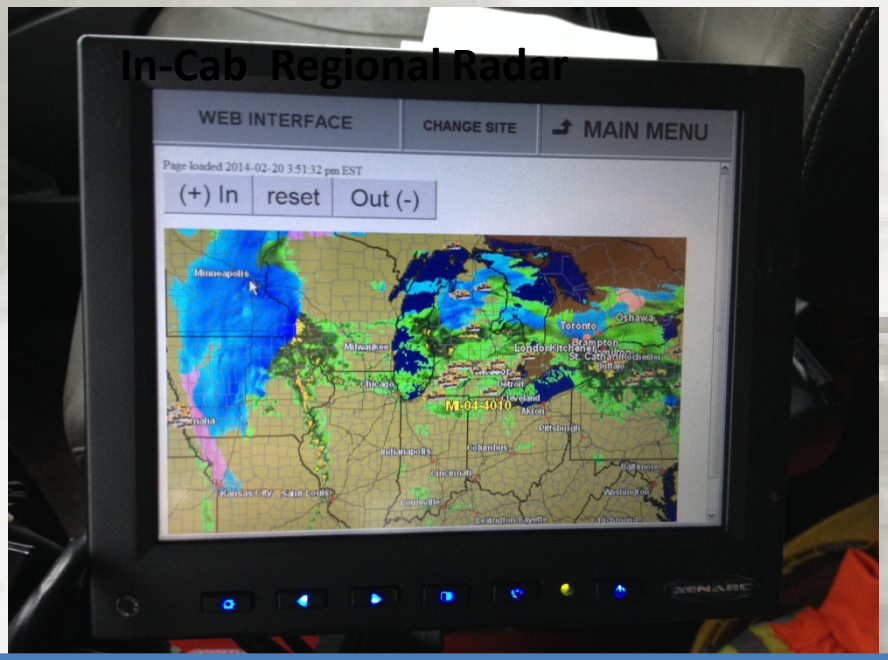
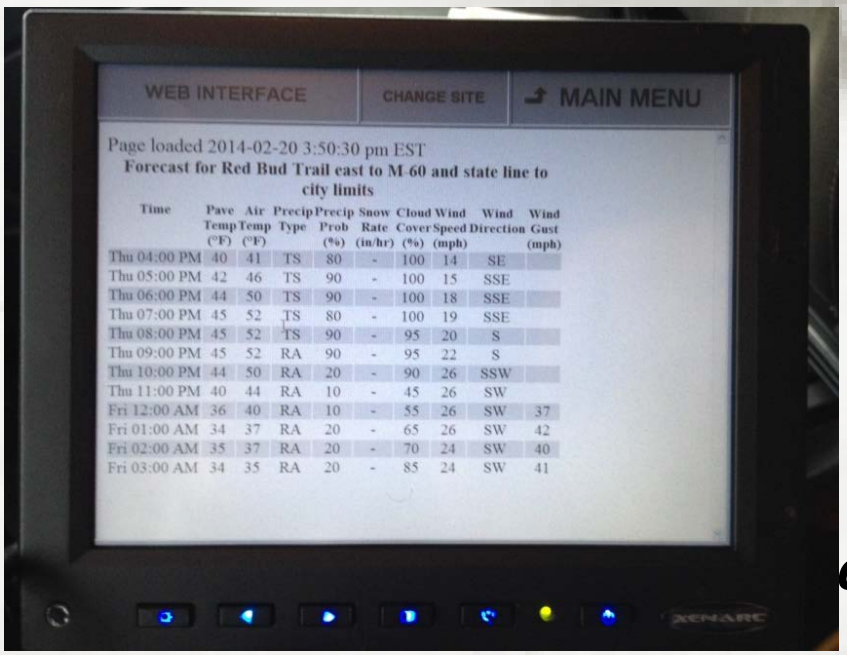
In-Cab Regional Radar



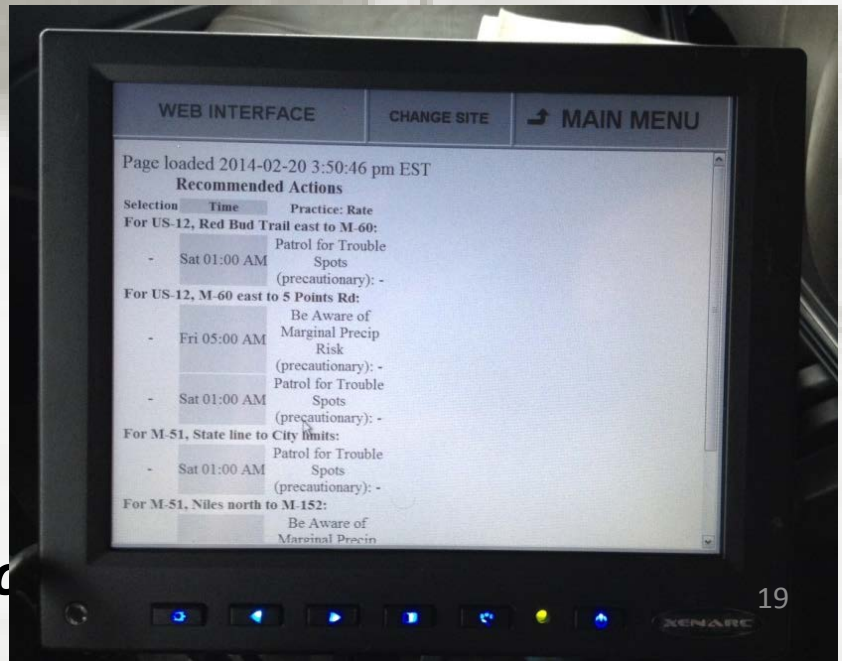
In-Cab Local Radar

In-Cab Weather Forecast



Time	Pave Temp (°F)	Air Temp (°F)	Precip Type	Precip Prob (%)	Snow Rate (in/hr)	Cloud Cover (%)	Wind Speed (mph)	Wind Direction	Wind Gust (mph)
Thu 04:00 PM	40	41	TS	80	-	100	14	SE	
Thu 05:00 PM	42	46	TS	90	-	100	15	SSE	
Thu 06:00 PM	44	50	TS	90	-	100	18	SSE	
Thu 07:00 PM	45	52	TS	80	-	100	19	SSE	
Thu 08:00 PM	45	52	TS	90	-	95	20	S	
Thu 09:00 PM	45	52	RA	90	-	95	22	S	
Thu 10:00 PM	44	50	RA	20	-	90	26	SSW	
Thu 11:00 PM	40	44	RA	10	-	45	26	SW	
Fri 12:00 AM	36	40	RA	10	-	55	26	SW	37
Fri 01:00 AM	34	37	RA	20	-	65	26	SW	42
Fri 02:00 AM	35	37	RA	20	-	70	24	SW	40
Fri 03:00 AM	34	35	RA	20	-	85	24	SW	41

In-Cab Treatment Recommendations



Selection	Time	Practice: Rate
For US-12, Red Bud Trail east to M-60:		
-	Sat 01:00 AM	Patrol for Trouble Spots (precautionary): -
For US-12, M-60 east to 5 Points Rd:		
-	Fri 05:00 AM	Be Aware of Marginal Precip Risk (precautionary): -
-	Sat 01:00 AM	Patrol for Trouble Spots (precautionary): -
For M-51, State line to City limits:		
-	Sat 01:00 AM	Patrol for Trouble Spots (precautionary): -
For M-51, Niles north to M-152:		
		Be Aware of Marginal Precip

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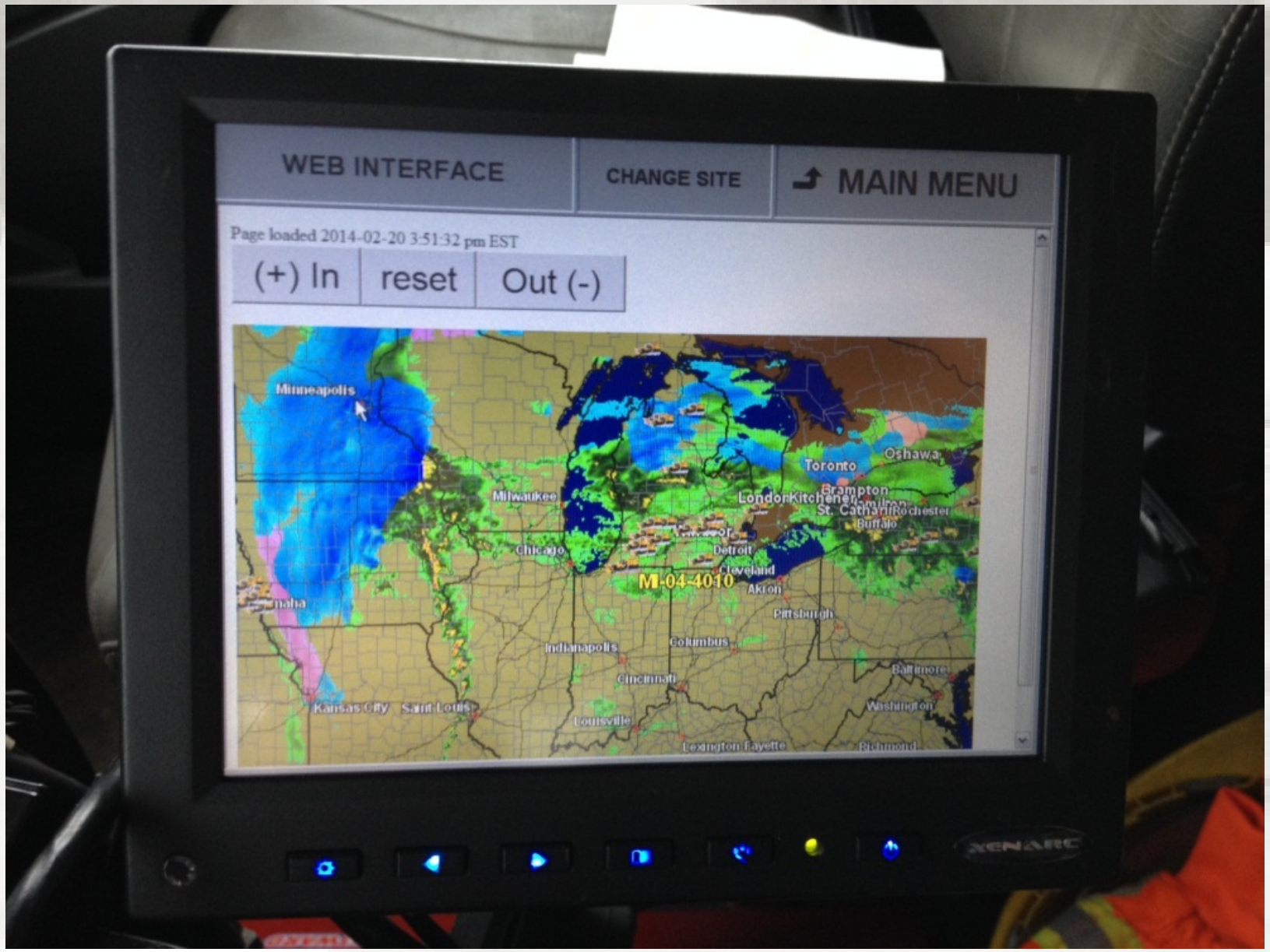
In-Cab Regional Radar



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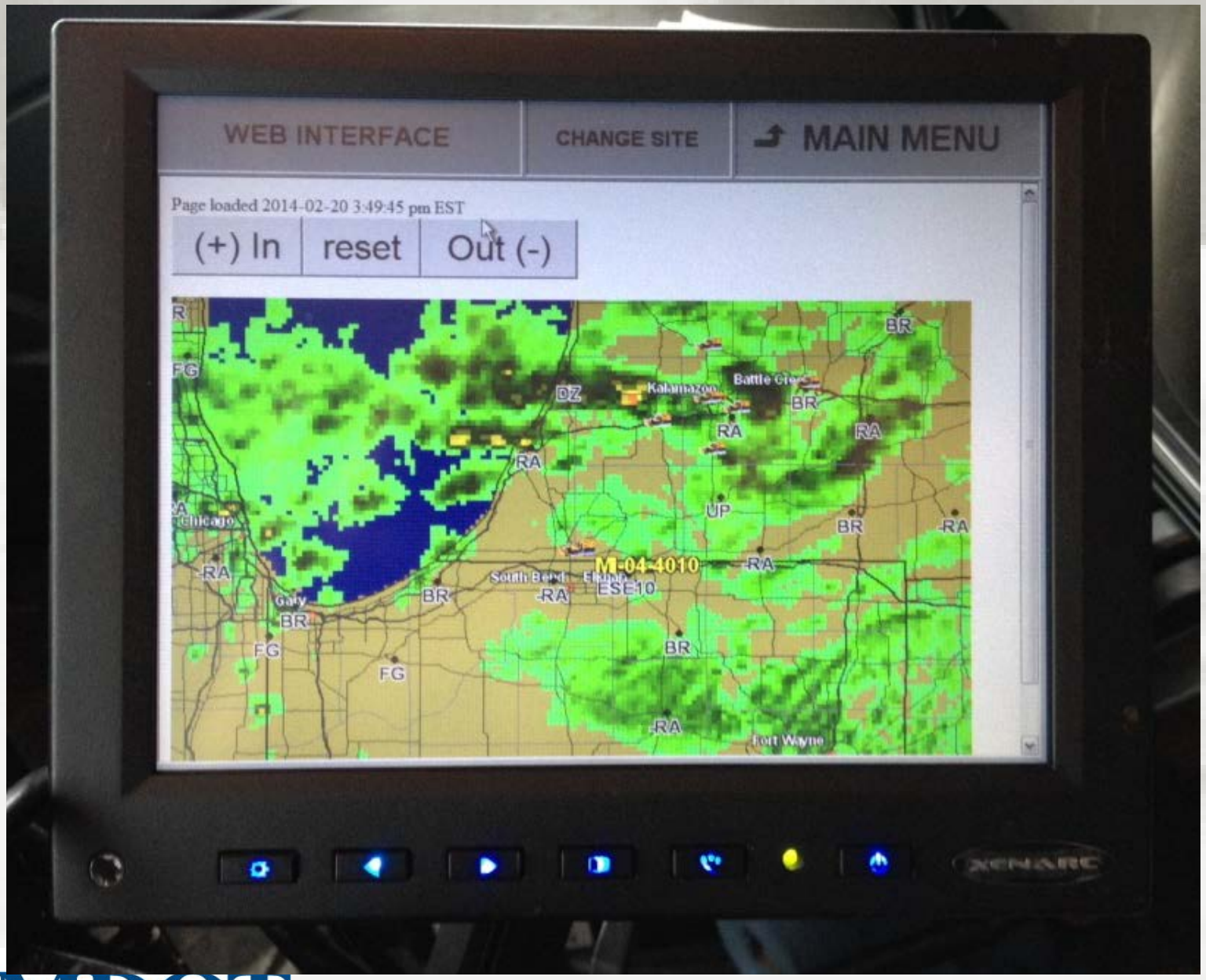
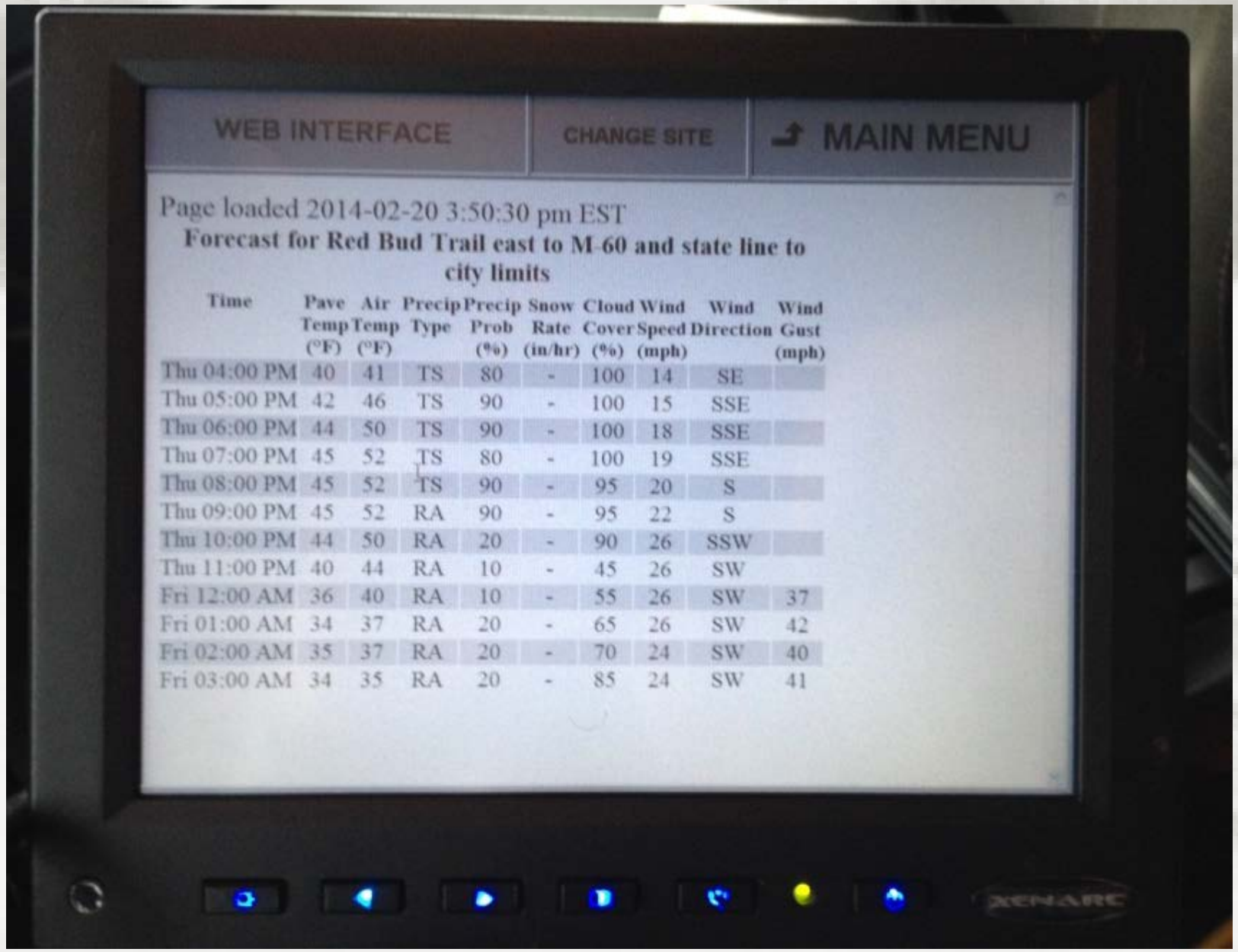
In-Cab Local Radar





In-Cab Weather Forecast

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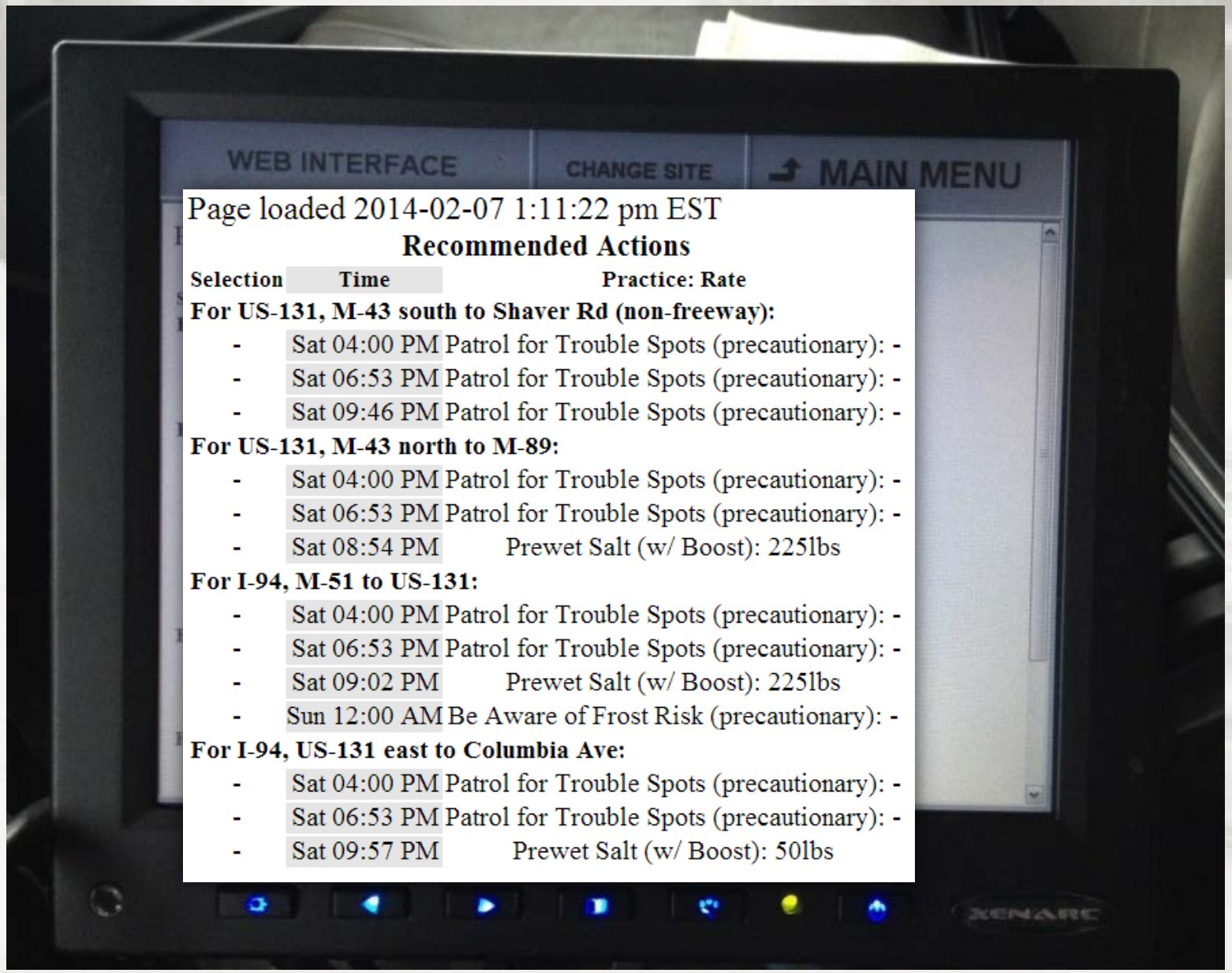

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In-Cab Treatment Recommendations

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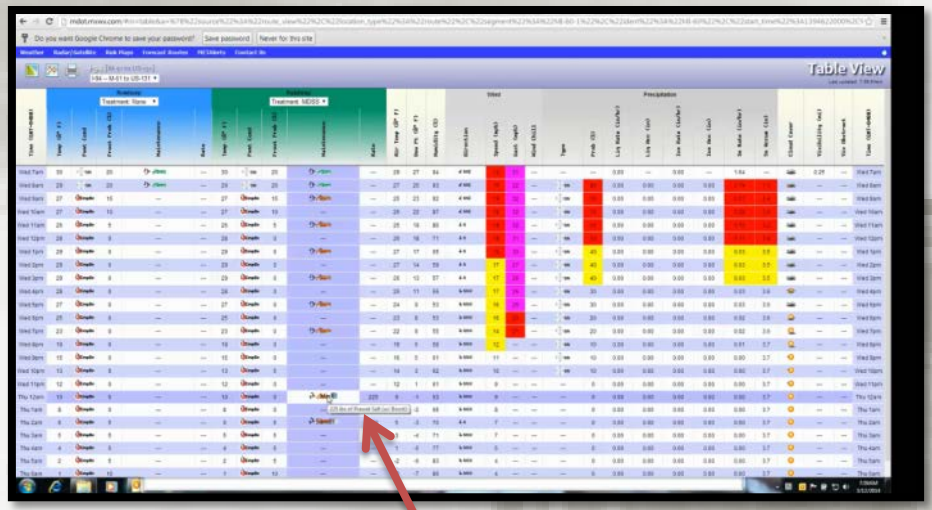
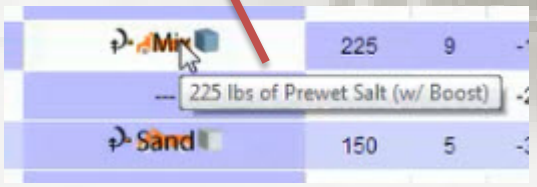
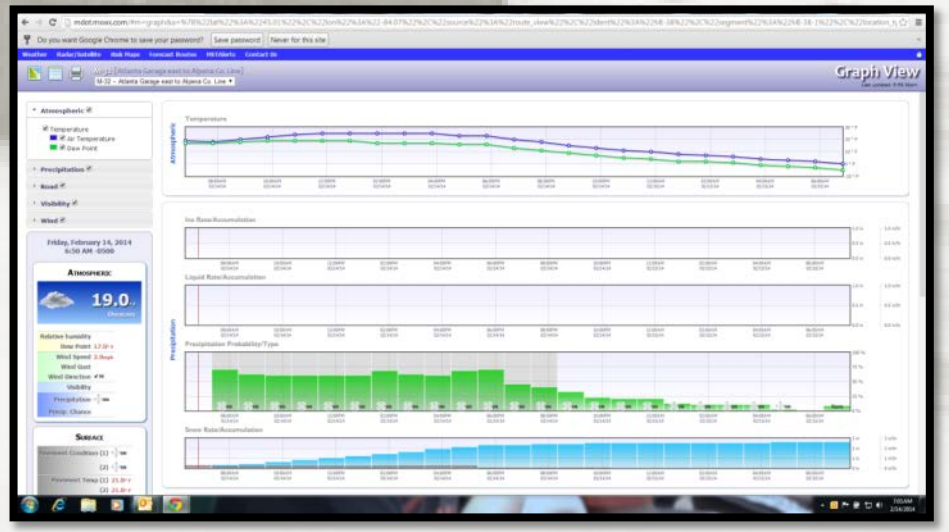
MDSS Website

www.mdot.mxwx.com







- **Snow Route Treatment Recommendations**

***(Rates per 12' Lane mile, not 24')*

- **Weather analysis/predictions per Snow Route (table and graph)**

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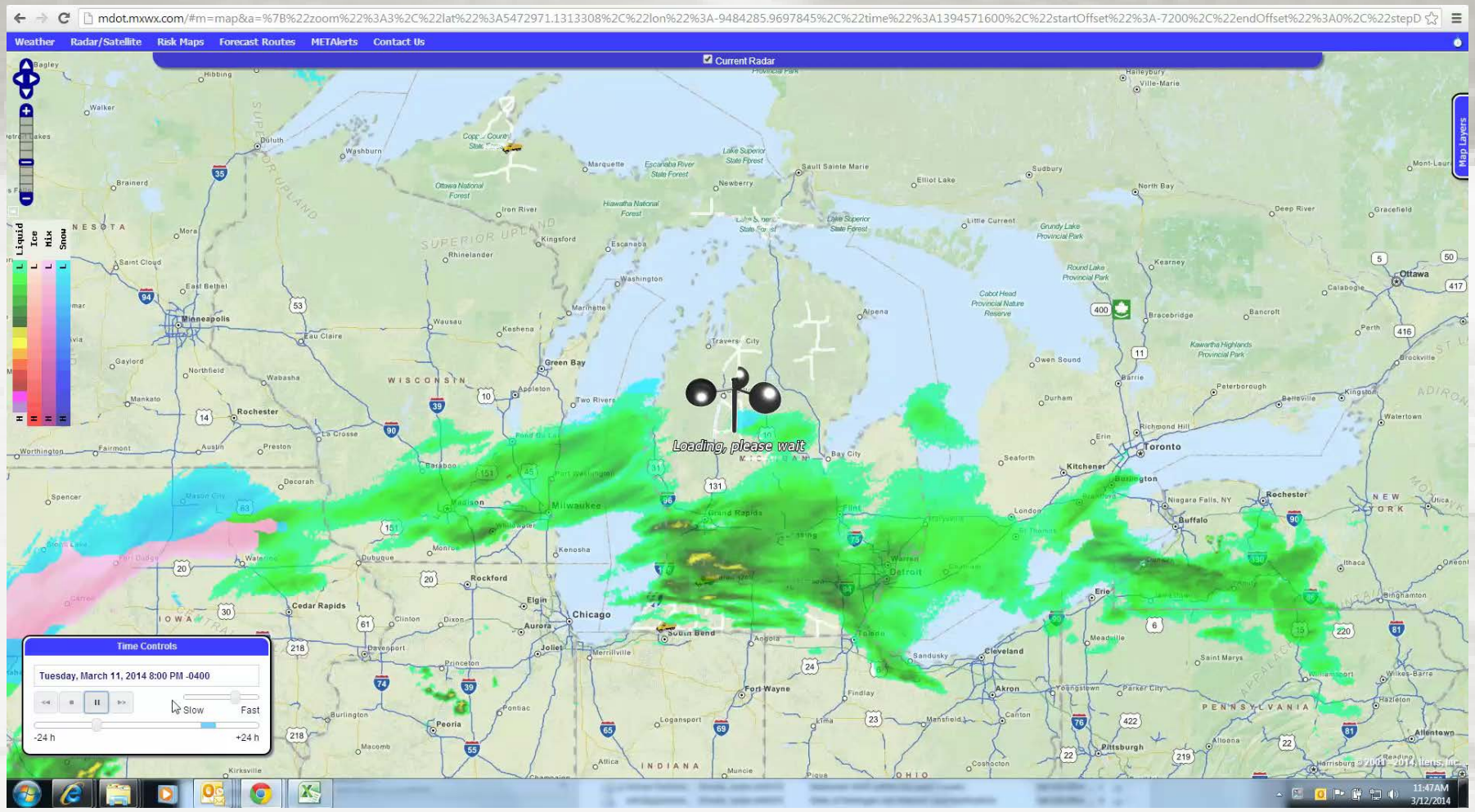
MDSS Website Video



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Keys to Success

Training, Training, Training

- Installation and Maintenance
- Annual Regional Training
- Annual Administrator Training

Communication: On Going Dialog

- Monthly Region Administrators Meetings
- "Office Hours": Twice a month open to all users
- Weekly Project Meetings
- Central Document Storage and Access
- Accountability
- Core Team of Testers and Certifiers (4 MDOT Staff)

Year One Accomplishments

- 267 snowplows outfitted
  - 6 regions
  - 30 garages
- Web based AVL & MDSS data access
  - All trucks report data
- Comprehensive trainings
  - 20 equipment installers
  - Over 200 website users
- 130 MDSS routes
- Created several standard reports
- Administrators team created

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Operations Field Services Division

Year One Experience

AVL and MDSS are game changers

- Proactive vs reactive
- Adapting operational approach based on MDSS
- Incorporating pavement forecasts into pre-storm planning
- Operators are more informed

Takes time to gain trust in MDSS treatment recommendations

Lots of data; What's the most useful?

- Material usage report
- Salting speed compliance reports
- Blade usage
- Supervisors know what their operators are applying

Lessons Learned

- **Get input** from all affected areas of the department before undertaking such a project: fleet, IT, executive management, and garage supervisors, at a minimum. Multiple areas should provide input for the RFP requirements
- **Weekly accountability meetings** with vendor and project management staff help to ensure the agency staff and vendor partners are held accountable for their tasks and deliverables
- To **gain buy-in**, it is necessary to focus more on how these tools can aid with current tasks and reduce manual reporting of labor, equipment and material usage by the operator so they can focus on their maintenance activities
- **Accepting change** takes some people longer than others

Questions

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