

Improving Efficiency Of Winter Maintenance In A Constrained Budget Environment

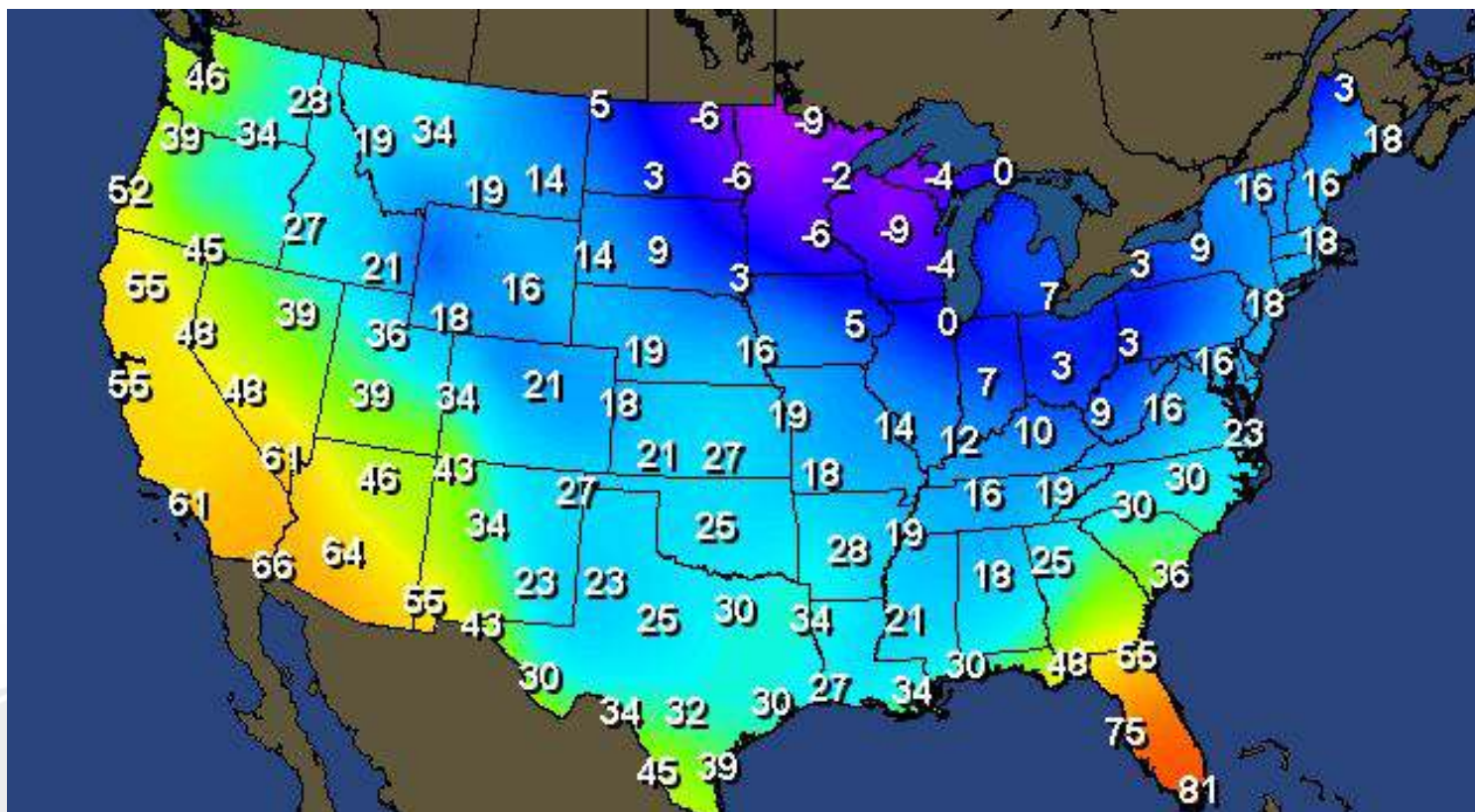
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- Rhode Island Department of Transportation
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1. WEATHER VARIATIONS ACROSS THE UNITED STATES



There is no single climate that defines the United States; temperatures and weather patterns vary greatly from region to region.

2. RHODE ISLAND AT A GLANCE

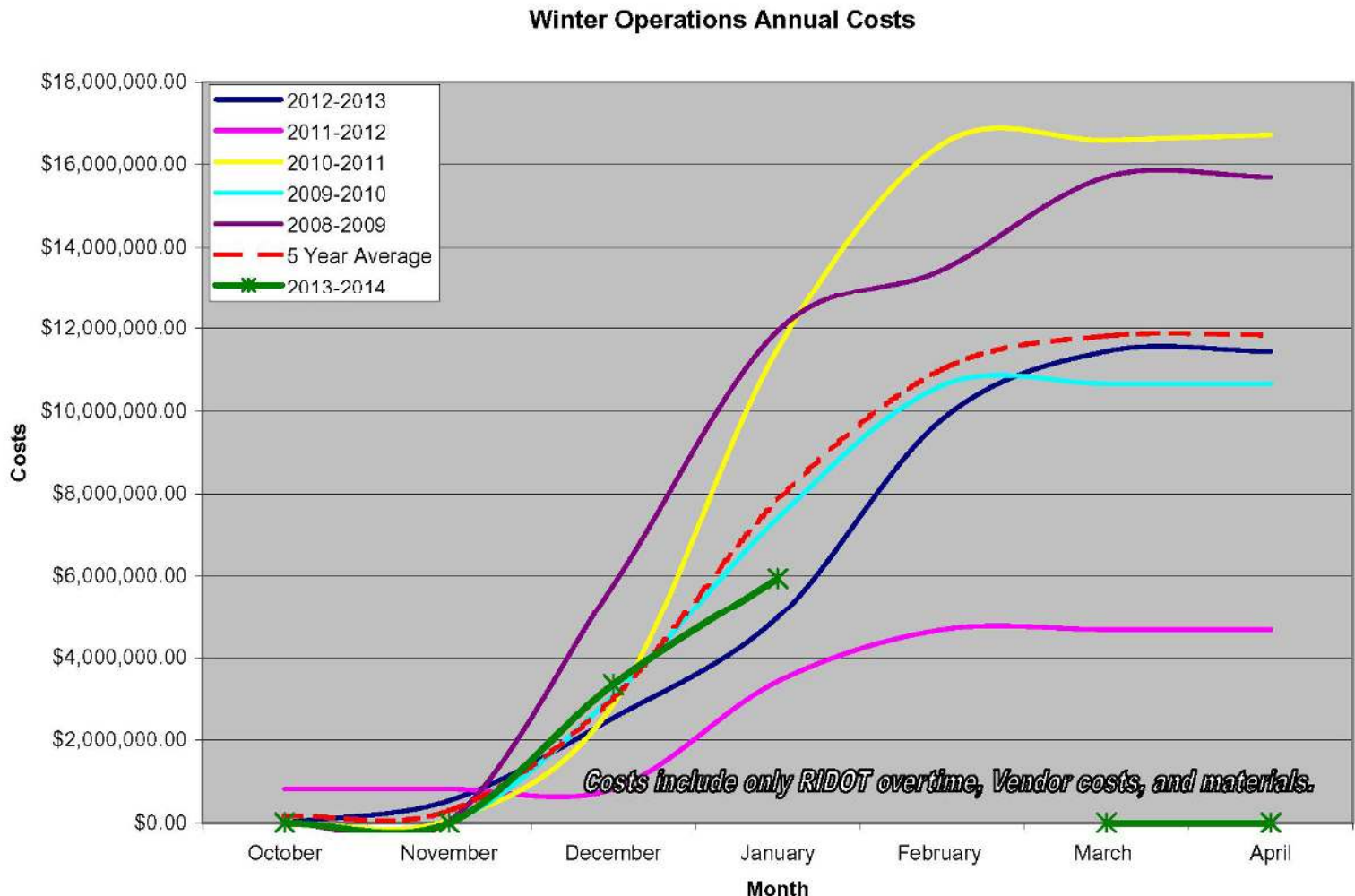


2. RHODE ISLAND AT A GLANCE

Latitude – 42 Deg N
Area – 1200 Sq Miles
Population – 1 million
2nd Most Densely Populated
3000 Lane Miles
7 Maintenance Districts
225 Maintenance Staff
(50 % of 1990 staff level)
< 100 Plow Vehicles
50% > 10 years old
Up to 300 Contract
Vehicles Available



3. Winter Operations Budgeting

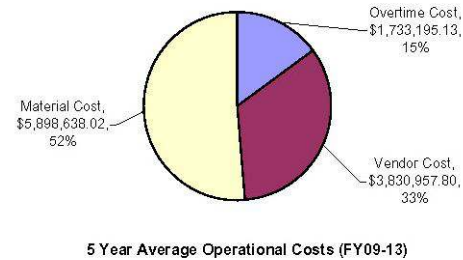
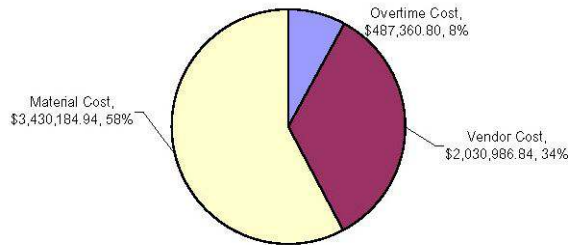


4. Storm Event Tracking Metrics

FY2014 Winter Operations Summary

Storm #	Start Date	End Date	Storm Hours	Overtime Cost	Vendor Cost	Material Cost	Total Cost	Snowfall (Inches)	Salt (Tons)	Sand (Tons)	MgCl (Gal)	CaCl (Gal)	Brine (Gal)	Weekday	Weekend	Holiday	Daytime	Overnight	Rain	Snow	Sleet	Mix	Freezing Rain	Blowing Snow	Heavy Tow Plan	
1	12/6/2013	12/7/2013	9	\$30,599.33	\$0.00	\$8,965.30	\$39,564.63	0.0	151.5	37	0	0	0	X			X	X			X					
2	12/8/2013	12/9/2013	15	\$42,500.00	\$77,811.44	\$261,421.02	\$381,532.46	1.0	4517.85	650.25	0	0	0	X			X	X	X	X	X	X	X			
3	12/10/2013	12/10/2013	11	\$17,000.00	\$191,187.41	\$289,677.15	\$497,844.56	1.1	4776	1363	4000	0	300	X			X	X	X	X	X	X	X			
4	12/14/2013	12/15/2013	30	\$94,042.87	\$466,602.31	\$692,266.85	\$1,252,912.03	4.0	11825	2315	0	0	0	X			X	X	X	X	X	X	X			
5	12/17/2013	12/18/2013	22	\$65,875.00	\$271,219.63	\$742,750.42	\$1,079,845.05	1.0	12670	2178	3000	0	0	X			X	X	X	X	X	X	X			
6	12/26/2013	12/26/2013	16	\$34,000.00	\$0.00	\$62,812.00	\$96,812.00	0.1	1,000.00	522	0	0	0	X			X	X	X	X	X	X	X			
7	1/2/2014	1/4/2014	52	\$110,000.00	\$983,585.71	\$1,035,981.15	\$2,129,546.86	7.2	17537	4439	4500	700	1500	X			X	X	X	X	X	X	X	X	X	
8	1/10/2014	1/11/2014	24	\$73,253.00	\$39,971.70	\$231,482.71	\$344,707.41	1.0	3849	1097	500	0	4450	X	X		X	X	X	X	X	X	X			
9	1/18/2014	1/18/2014	4	\$20,090.60	\$828.64	\$104,848.34	\$125,767.58	0.5	1757	489	0	0	500	X			X	X	X	X	X	X	X			
10	1/21/2014	1/22/2014												X			X	X	X	X	X	X	X	X	X	
Season Totals				183.0	\$487,360.80	\$2,030,986.84	\$3,430,184.94	15.9	58083	13090	12000	700	6750													
<i>5 Year Average</i>				<i>366.0</i>	<i>\$1,733,195.13</i>	<i>\$3,030,957.00</i>	<i>\$5,090,630.02</i>	<i>30</i>	<i>02639</i>																	

* all vendor costs are not yet included to this storm; may be eligible for up to 75% reimbursement through FEMA

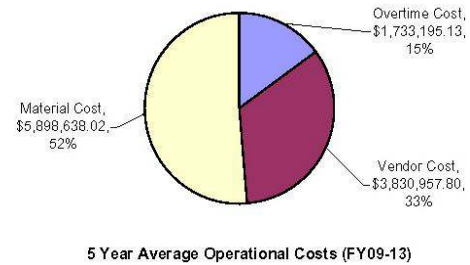
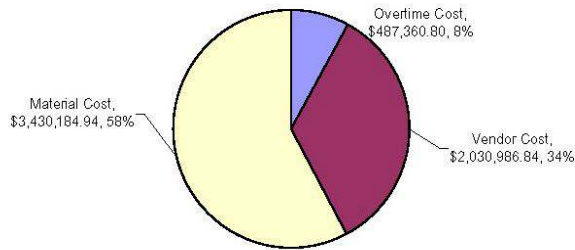


4. Storm Event Tracking Metrics

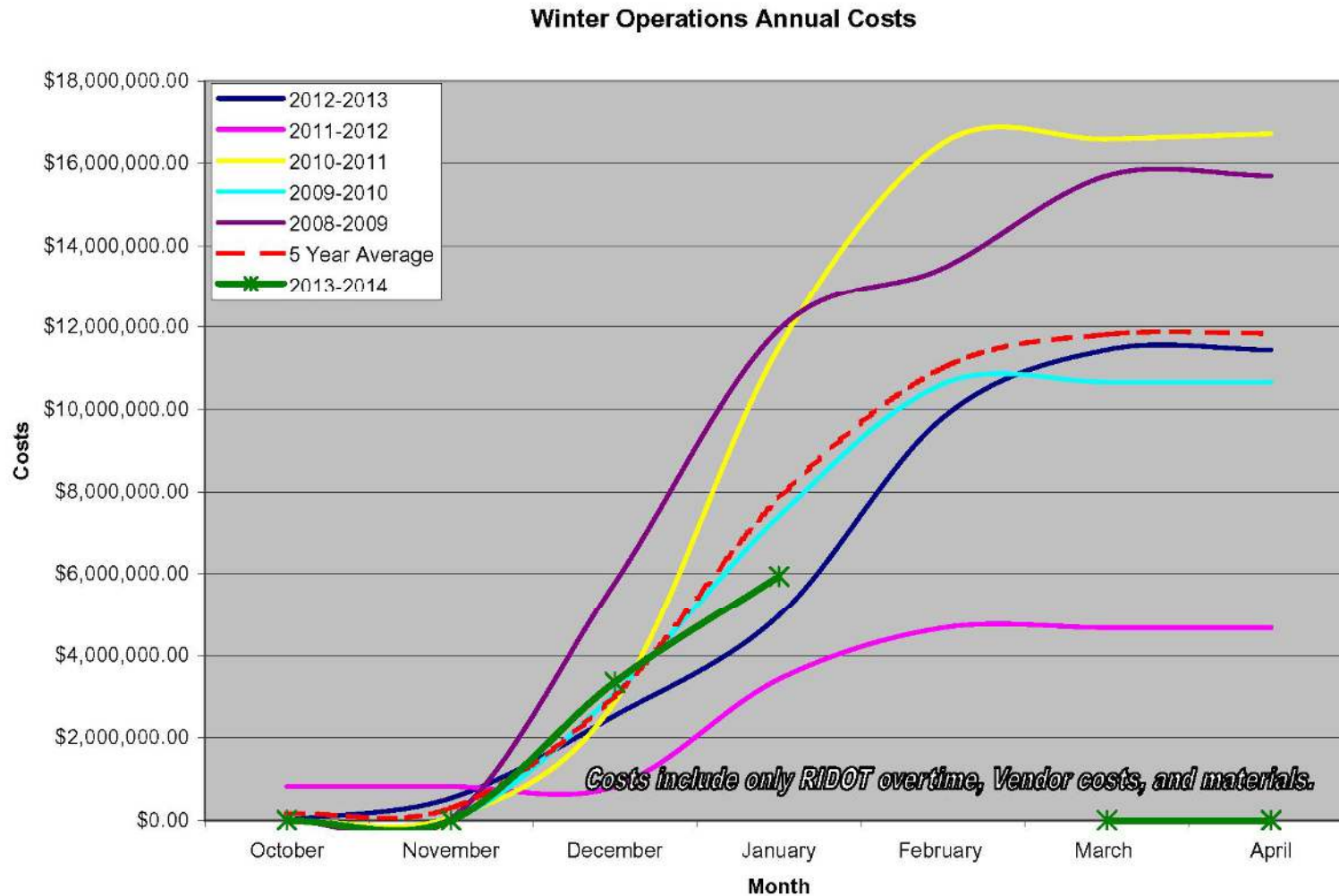
FY2014 Winter Operations Summary

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10	1/21/2014	1/22/2014												X			X	X	X	X	X	X	X	X	X	
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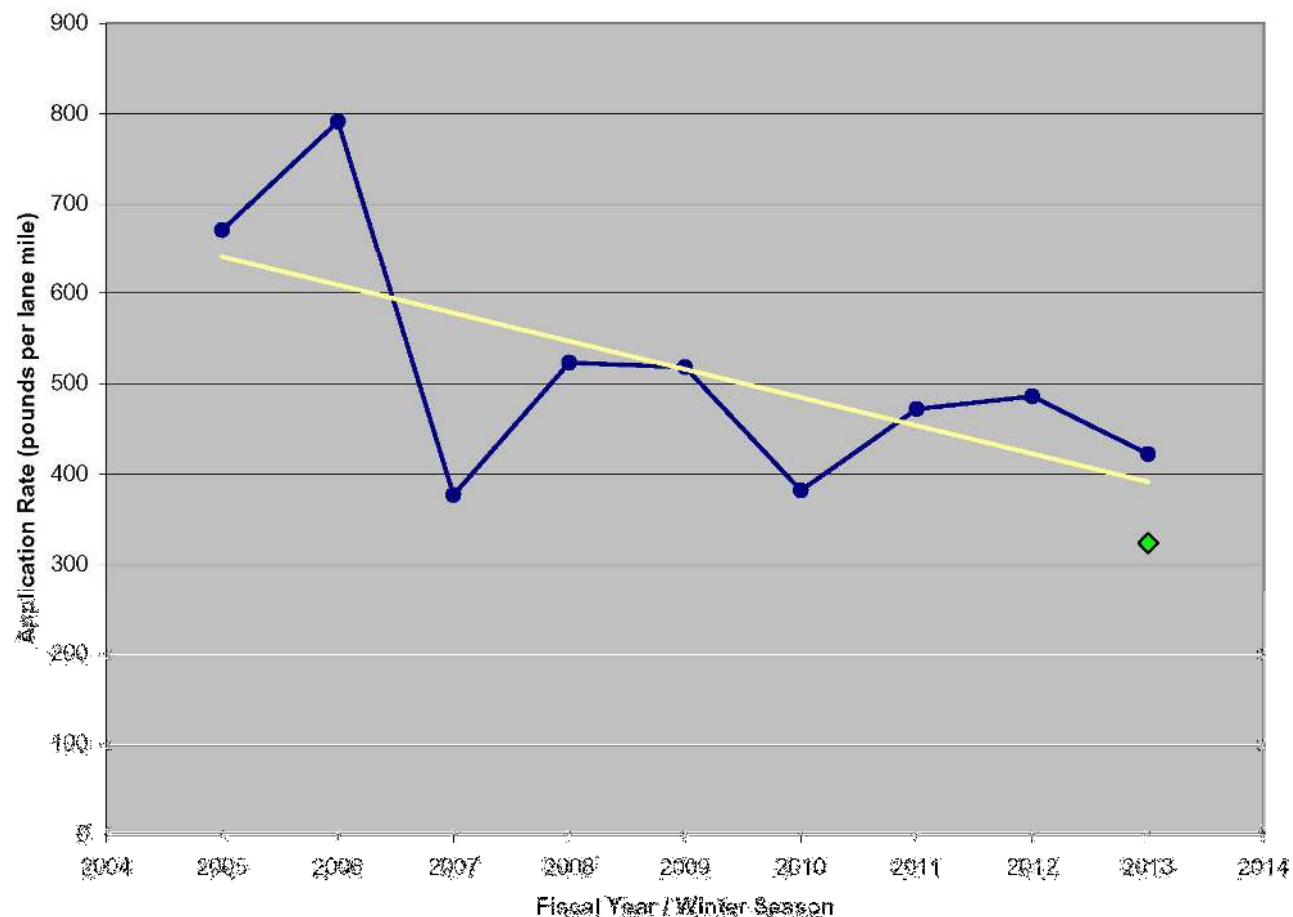
4. Storm Event Tracking Metrics



4. Results of Efficiencies and Tracking

As a result of using performance metrics, we have modified operating protocols reducing chemical application rates by 25 percent

Calculated Salt Application Rate for FY2005-FY2013

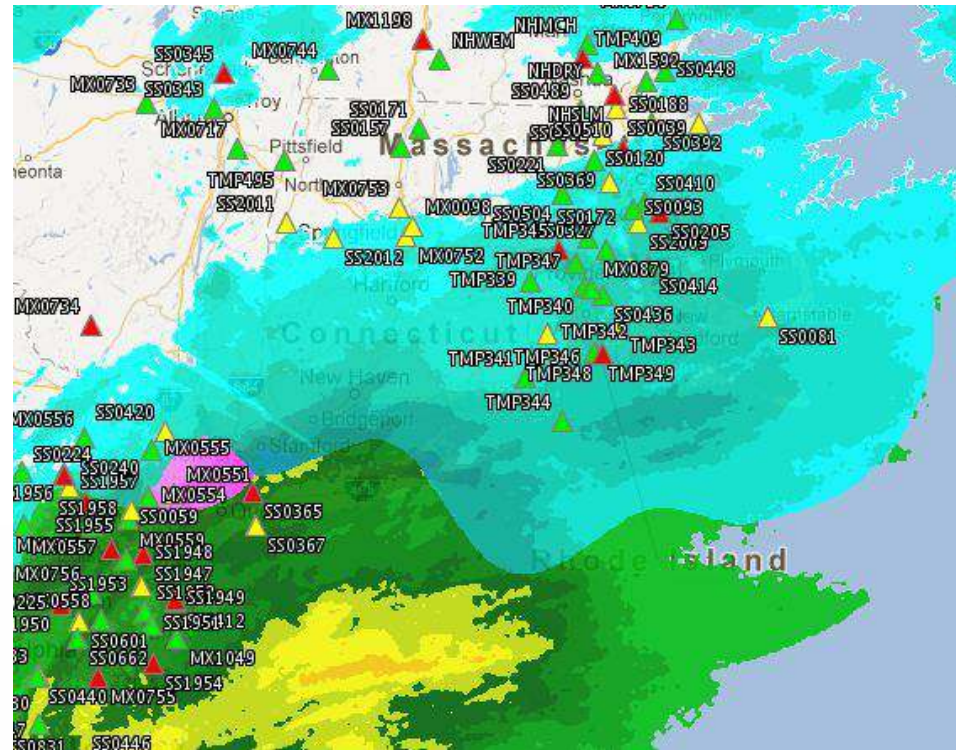


5. WINTER OPERATIONS STRATEGIES

- Pre-Winter Planning
- Pre-Storm Planning
- Training
- Technology
- Materials
- Equipment
- Post Storm Review
- Post Winter Review

5. WINTER OPERATIONS STRATEGIES - Planning

- Strategic Plans for the Winter Season
- Tactical Plans for Individual Storms
 - Prioritized Routes
 - Coordinate application of material with forecasts for best use
 - Involvement with stakeholders
- Public Information



5. WINTER OPERATIONS STRATEGIES - Training

Training

AASHTO THE VOICE OF TRANSPORTATION
Winter Roadway Computer-Based Training
For information contact Lee Smithson

Anti-Icing/RWIS CBT
AASHTO'S ROADMAP

FEATURES

- 2D and 3D animation
- Adobe Acrobat (PDF) document viewer
- Animated speaking guide
- Audio controls
- Bookmarking
- Certificate of Completion
- Digital video
- Employee Performance Support System (EPSS) mode
- Facts-on-Demand knowledge base
- Fun Facts
- Glossary
- Hot Terms
- Instructional dialog available as narration and text
- Interim review questions and interactive exercises
- Log-in with the ability to resume where last left off
- Notepad
- Pre-assessment and Post-assessment
- Printing of screen shots and various documents
- Progress indicators
- Scenarios presented in simulated maintenance facility
- Separate reporting and tracking tool for administrators
- Website links

ADVANTAGES OF COMPUTER-BASED TRAINING

- Self-paced
- Accommodates multiple learning styles
- Convenient delivery mechanism
- Doesn't interrupt work schedules
- Consistent training, both within the organization and across agencies
- Research suggests interactive multimedia training provides better results
- Lower cost compared to classroom training, workshops, and seminars
- Available any time as a refresher
- Easily updated

Development of the AASHTO Winter Maintenance Computer-Based Training programs would not have been possible without the participation of numerous state transportation agencies, the Clear Roads Consortium, the American Public Works Association (APWA), the National Association of County Engineers (NACE), and winter maintenance professionals across North America.

AASHTO THE VOICE OF TRANSPORTATION
Winter Roadway Maintenance Computer-Based Training (CBT)
For information contact Lee Smithson: 515-239-1515, Leland.Smithson@dot.iowa.gov

AASHTO's suite of eight CBTs provides comprehensive training in all aspects of winter roadway maintenance.

Anti-icing / RWIS (Version 2, Sept. 2008) (24 hours)	<ul style="list-style-type: none"> Lesson 1: Introduction to Anti-icing and Winter Maintenance Lesson 2: Winter Road Maintenance Management Lesson 3: Winter Roadway Hazards and the Principles of Overcoming Them Lesson 4: Weather Basics Lesson 5: Weather and Roadway Monitoring for Anti-icing Decisions Lesson 6: Computer Access to Road Weather Information Lesson 7: Anti-icing Practices in Winter Maintenance Operations
Selecting Snow & Ice Control Materials to Mitigate Environmental Impacts (Version 1.5, April 2009) (2 hours)	<ul style="list-style-type: none"> Unit 1: Formulating a Material Selection Process Unit 2: Potential Impacts to the Natural Environment Unit 3: Ranking Potential Natural Environment Impacts Unit 4: Potential Infrastructure Impacts Unit 5: Ranking Potential Infrastructure Impacts Unit 6: Determining Comparative Material Prices Unit 7: Comparative Performance Measures Unit 8: Material Purchase Specifications and Quality Assurance
Equipment Maintenance (Version 1.3, Sept. 2006) (2 hours)	<ul style="list-style-type: none"> Unit 1: Pre-season Preparation Unit 2: Common Types of Winter Maintenance Equipment Unit 3: Mounting and Inspecting Snow Removal Equipment Unit 4: Preparing for Each Event Unit 5: Within-event Maintenance Unit 6: Post-event Maintenance Unit 7: Periodic Maintenance Unit 8: End-of-Season Tasks
Proper Plowing Techniques (Version 1.2, Sept. 2006) (2 hours)	<ul style="list-style-type: none"> Unit 1: Pre-season Preparation Unit 2: Pre-trip Preparation Unit 3: Safety Unit 4: Common Types of Snow Removal Equipment Unit 5: Roadway Plowing Techniques Unit 6: Plowing Special Areas Unit 7: Using Specialty Equipment Unit 8: Clean-up
Deicing (Version 1.3, April 2009) (4 hours)	<ul style="list-style-type: none"> Unit 1: Introduction to Deicing and Common Deicing Materials Unit 2: Material Selection and Ordering Unit 3: Material Manufacturing, Handling and Storage Unit 4: Deicing Equipment Unit 5: Application Guidelines Unit 6: Application Techniques Unit 7: Periodic Activities and Equipment Maintenance
Blowing Snow Mitigation (Version 1.3, Sept. 2006) (3 hours)	<ul style="list-style-type: none"> Unit 1: The Problem of Blowing Snow Unit 2: How Snow Fences Work Unit 3: Identifying and Analyzing Problem Areas Unit 4: Structural Snow Fence Designs Unit 5: Lining Snow Fences Unit 6: Road Design to Mitigate Blowing Snow Unit 7: Working with Landowners
Winter Maintenance Management (Version 1.2, April 2006) (2 hours)	<ul style="list-style-type: none"> Unit 1: Snow and Ice Operational Plan Unit 2: Establishing Levels of Service Unit 3: Operational Methods Unit 4: Selecting Snow and Ice Control Materials Unit 5: Material Management Unit 6: Budgeting Unit 7: Staffing
Performance Measures for Snow and Ice Control Operations (Version 1.0, April 2010) (4 hours)	<ul style="list-style-type: none"> Unit 1: The Importance of Performance Measures Unit 2: Input and Output Measures Unit 3: Outcome Measures Unit 4: PSIC and Winter Severity Index Unit 5: Technologies to Help Measure and Report Performance Unit 6: Developing a Performance Measures System Unit 7: Developing a Field Test Plan

5. WINTER OPERATIONS STRATEGIES - Technology



**Route Specific
Radio & TV
Broadcasts of
Travel Conditions**



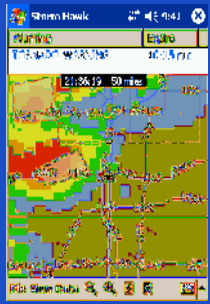
**Credible &
Precise Travel**




**In-vehicle
Information**



**Add Detail to
HAR & VMS**

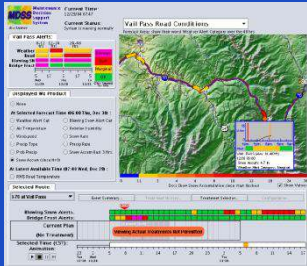


**Spawn New
Technologies
(PDA, cell)**



More Effective Websites

**Anytime, Anywhere
Road Weather
Information**



**Enhanced decision
making tools**

5. WINTER OPERATIONS STRATEGIES - Communications

- Interoperable communications within and between emergency response agencies



5. WINTER OPERATIOIS STRATEGIES - Materials

- Tailored Chemicals for conditions
- Blended Chemicals for longevity
- Environmental considerations





5. WINTER OPERATIONS STRATEGIES - Equipment


- Condition
- Properly Calibrated Equipment
- Properly Sized Equipment
- Technology (eg.closed loop)



6. SHARING BEST PRACTICES

Fact Sheet



TOWFLOW

ANTI-ICING

Clearing The Way To Keep America Safe

What are winter storm conditions?

The North Dakota anti-icing process. The process conditions are:

What is an anti-icing process?

Anti-icing is winter road maintenance. It is the application of liquid materials (also known as pre-treatments) to the pavement surface before a winter storm. It prevents snow and ice from bonding to the pavement surface. It is applied to the pavement surface before a winter storm. It prevents snow and ice from bonding to the pavement surface. It is applied to the pavement surface before a winter storm.


Case State	Scenario
New Hampshire	Same Condition Same Resources
Minnesota	Same Condition Same Resources
Colorado	Same Condition Same Resources

6. The intangible benefits we present in MDSS. Example

- Use of the MDSS "forces"
- MDSS provides insight at
- Outcomes of changes in F
- Successful application of
- Quality recommendations and reliable Environment

7. Intangible benefits can also users), including the follow

- Less tonnage of chemical infrastructure, motor vehicle
- Use of MDSS suggests a historical level of service.
- Use of MDSS will generate and result in more seamless



Winter Maintenance Cost Analysis

Log in

Select the State

Cost-Benefit Analysis


After you select a state, you can view the results and analysis.

Glossary

User Manual

Resources

Contact Us



AASHIO Winter Road Computer-Based Training (CBT)


THE VOICE OF TRANSPORTATION

Features:

- 2D and 3D animation
- Audio narration, PDF document viewer
- Animated speaking guide
- Audio controls
- Spelling
- Certificate of Completion
- Digital video
- Developed Performance Support System (EPSS) mode
- Full-on-demand knowledge base
- Full-Flex
- History
- Objectivity
- Hot topics
- Interactive dialog available on narration and text
- Integrated online questions and interactive scenarios
- Log in and the ability to resume where you left off
- Help
- Pre-assessment and Post-assessment
- Printing of scores, PDF and video documents
- Progress indicators
- Scenarios presented in simulated maintenance facility
- Separate reporting and tracking tool for administrators
- Website links

Advantages of Computer-Based Training:

- Self-paced
- Access to training anytime, anywhere
- Consistent delivery mechanism
- Direct assessment and feedback
- Contextual training, both within the application and across the application
- Research suggests interactive multimedia training provides better learning outcomes
- Lower cost compared to classroom training, workshops and seminars
- Available any time, any place
- Easily updated



AASHIO Winter Roadway Maintenance Computer-Based Training (CBT)

THE VOICE OF TRANSPORTATION

AASHIO's series of eight CBTs provides comprehensive training in all aspects of winter roadway maintenance.

- Anti-icing / RWIS** (Version 3.0, Sept. 2009) (4 hours)
 - Level 1: Introduction to Anti-icing and RWIS Maintenance
 - Level 2: Liquid Brine Maintenance Management
 - Level 3: Liquid Brine Storage and the Principles of Overwintering Them
 - Level 4: Liquid Brine
 - Level 5: Training and Safety Monitoring for Anti-icing Decisions
 - Level 6: Computer Access to Brine Volume Information
 - Level 7: Anti-icing Process in Winter Maintenance Operations
- Selecting Snow and Ice Control Materials to Mitigate Environmental Impacts** (Version 1.0, June 2009) (2 hours)
 - Unit 1: Formulating a Smart Selection Process
 - Unit 2: Personal Safety in the Field Environment
 - Unit 3: Evaluating Materials, Storage Environment Impacts
 - Unit 4: Personal Maintenance Issues
 - Unit 5: Evaluating Personal Safety Issues
 - Unit 6: Environmental Impacts of Snow Control Materials
 - Unit 7: Concrete Performance Maintenance
 - Unit 8: Summary, Practice Operations and Safety Assurance
- Equipment Maintenance** (Version 1.3, Sept. 2008) (2 hours)
 - Unit 1: Pre-trip Inspections
 - Unit 2: Common Types of Winter Maintenance Equipment
 - Unit 3: Maintaining and Inspecting Snow Removal Equipment
 - Unit 4: Preparing for Bad Weather
 - Unit 5: Winter-weather Maintenance
 - Unit 6: Post-trip Maintenance
 - Unit 7: Personal Maintenance
 - Unit 8: End of Season Talk
- Proper Plowing Techniques** (Version 1.0, Sept. 2009) (2 hours)
 - Unit 1: Pre-trip Inspections
 - Unit 2: Safety
 - Unit 3: Common Types of Snow Removal Equipment
 - Unit 4: Seasonal Planning and Maintenance
 - Unit 5: Personal Safety Issues
 - Unit 6: Plowing
- Deicing** (Version 1.0, April 2009) (4 hours)
 - Unit 1: Introduction to Deicing and Concrete Deicing Materials
 - Unit 2: Material Selection and Testing
 - Unit 3: Material Maintenance, Handling and Storage
 - Unit 4: Liquid Deicing
 - Unit 5: Application Guidelines
 - Unit 6: Application Guidelines
 - Unit 7: Personal Safety and Equipment Maintenance
- Blowing Snow Mitigation** (Version 1.0, Sept. 2009) (3 hours)
 - Unit 1: The Problem of Blowing Snow
 - Unit 2: Snow Storm Facts
 - Unit 3: Identification and Assessment Problems Areas
 - Unit 4: Snow Control
 - Unit 5: Snow Control
 - Unit 6: Snow Control
 - Unit 7: Working with Landowners
- Winter Maintenance Management** (Version 1.0, Sept. 2009) (2 hours)
 - Unit 1: Snow and Ice Operations Plan
 - Unit 2: Establishing Levels of Service
 - Unit 3: Operations Manual
 - Unit 4: Safety, Snow and Ice Control Materials
 - Unit 5: Material Management
 - Unit 6: Blowing Snow
 - Unit 7: Deicing
- Performance Measures for Snow and Ice Control Operations** (Version 1.0, Sept. 2009) (4 hours)
 - Unit 1: The Importance of Performance Measures
 - Unit 2: Equal and Organizational
 - Unit 3: Organizational
 - Unit 4: Organizational
 - Unit 5: Organizational
 - Unit 6: Organizational
 - Unit 7: Organizational
 - Unit 8: Organizational

Figure 3-1: Anti-icing selection

7. CONTINUED RESEARCH

Clear Roads

- Ongoing research project composed of 26 member states
- Funds practical, usable winter maintenance research
- Delivers useful data and recommendations on winter operations technologies



8. Conclusions- Managing in Tight Budgets

- Plan Your Work – Work your Plan
- Establish Achievable Goals (Perfection is not Reasonable)
- Measure Performance
- Adjust as Needed
- Learn (Share) Best Practices
- Communicate, Communicate, Communicate

13. RESOURCES

- http://environment.transportation.org/environmental_issues/construct_maint_prac/compendium/manual/8_0.aspx
- http://www.ops.fhwa.dot.gov/weather/best_practices/1024x768/transform_param2.aspx?xslname=Category_search.xsl&xmlname=casestudies.xml&keyname=Advisory
- http://www.ops.fhwa.dot.gov/weather/best_practices/1024x768/transform_param2.aspx?xslname=Category_search.xsl&xmlname=casestudies.xml&keyname=Treatment
- http://www.ops.fhwa.dot.gov/weather/best_practices/1024x768/transform_param2.aspx?xslname=Category_search.xsl&xmlname=casestudies.xml&keyname=Control
- http://www.ops.fhwa.dot.gov/weather/mitigating_impacts/infodissem.htm

