Maintenance Decision Support System (MDSS):

Indiana Department of Transportation (INDOT)

Statewide Implementation

Final Report for FY09

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Executive Summary

A Maintenance Decision Support System (MDSS) is a tool that utilizes weather forecasts and observations to assist managers in making appropriate decisions to best utilize resources when planning for and treating snow and ice. Under the direction of Commissioner Karl Browning, the Indiana Department of Transportation (INDOT) progressed from limited use of a MDSS in a Pooled Fund Study (PFS) environment to statewide implementation. The decision to implement statewide during the winter season of 2008-2009 was based on the savings reported by the maintenance units utilizing the program under the PFS and the fact that INDOT was facing declining revenues.

A key part of quickly implementing this large scale plan involved understanding change management strategies and how these changes might affect a large organization like INDOT. Ultimately, the success of the MDSS project depended on demonstrating to all levels of INDOT personnel the value that the MDSS would provide to our business practices and to our financial bottom line. Change management strategies were used throughout the winter season to plan for, combat, and resolve the problems, issues, and resistance that arose to the massive change that MDSS represented.

A project plan was put into place that outlined the equipment purchasing and installation needs, the training packages that would be utilized based on employee's assigned role(s), a detailed support network, the implementation schedule with deadlines, a configuration of the routes, and the designation of which trucks would be utilized with the MDSS routes.

The *2008 INDOT Snow and Ice Conference* was held in early September to initially introduce MDSS to the Districts and get immediate feedback, criticism, ideas, and suggestions out on the table for discussion. Training in the specialized areas began in early October with the

initial training in all six modules complete by late November 2008 for all six Districts and Central Office personnel.

By the end of the 2008-2009 snow and ice season, MDSS had helped INDOT realize savings of $12,108,910 (228,470 tons) in salt usage and $1,359,951 (58,274 hours) in overtime compensation from the previous winter season.

Figure 1

Salt Savings Comparing FY 08 to FY 09				
	FY 08 (Tons)	FY 09 (Tons)	Difference (Tons)	Savings @ $53/Ton
All Districts	558,274	329,804	228,470	$12,108,910
Overtime Savings Comparing FY 08 to FY 09				
	FY 08 (Hours)	FY 09 (Hours)	Difference (Hours)	Savings @ $23.33/hour
All Districts	226,484	168,210	58,274	$1,359,591

When normalized for varying winter conditions, INDOT still realized savings of $9,978,536 (188,274 tons) in salt usage and $979,136 (41,967 hours) in overtime compensation.

Figure 2

Overtime Savings Normalized for Winter Conditions				
	FY 08 (Reduced by 7.2%)	FY 09	Difference (Hours)	Savings @ $23.33/hour
All Districts	210,177	168,210	41,967	$979,136
Salt Savings Normalized for Winter Conditions				
	FY 08 (Reduced by 7.2%)	FY 09	Difference (Tons)	Savings @ $53/Ton
All Districts	518,078	329,804	188,274	$9,978,536

In addition to these realized savings, some unexpected observations emerged. While MDSS was always thought of as a scientific tool, it also proved to be a powerful management tool. Considerable time was spent this snow and ice season communicating with the MDSS vendor, Meridian Environmental, Inc., in order to fine tune forecasts and recommendations to match actual observed conditions. As managers became more accustomed to interpreting their treatment recommendations, they became more comfortable planning instead of reacting to conditions.

Managers reported saving material and man hours by relying on the information that MDSS provided. As INDOT continues to work with Meridian, forecasts and recommendations will improve. This improved science strengthens MDSS as a scientific tool and builds confidence in the managers who use MDSS to help make important treatment decisions.

The acceptance of MDSS as a management and scientific tool has also helped advance the cultural change within INDOT. MDSS went from a nearly unknown system to a way of doing business in an incredibly short time. With improved forecasts by Meridian, follow up trainings on interpreting and using the system, and the significant financial savings, a great deal of the resistance that was heard or anticipated has faded. However, with any change, continued training and exposure will help ensure successful, long term acceptance is achieved.

To continue the use of MDSS, INDOT will need to increase the focus on hands-on training for the various MDSS user groups. A detailed training plan will need to be outlined to ensure maximum exposure to MDSS and its capabilities. In order to ensure that training goals are achieved, it is also recommended that subject matter experts be created in all areas. A communication plan will detail the process for sharing information throughout the organization. The QA/QC program should be finalized and implemented. The route density should be

maintained for the upcoming winter season to gain confidence in the equipment. To determine the final route density needed for the State further study is needed in the upcoming season. There would be increased benefit by finding additional uses for the AVL/MDC equipment. Accident data should be analyzed to look for trends in comparison to winter weather accidents and the implementation of MDSS. Finally, support at INDOT's Executive level is crucial to the continued success of MDSS in Indiana.

Background

A Maintenance Decision Support System (MDSS) is, in its most general terms, an automated tool for providing decision support to winter road maintenance managers. In a broader sense, MDSS is a multi-layered, information system that provides forecasts, predictions, reports on observed weather and road conditions, serves as a training tool, and becomes a management support system that can be utilized year round. In discussing MDSS, it is important to evaluate the system from the beginning, as well as glimpse to the future to see all of the possibilities the system may hold.

In the late 1990's, Indiana Department of Transportation (INDOT) decided to take an aggressive approach utilizing new technologies to more effectively fight snow and ice. As a result, INDOT joined several pooled fund study groups. At the same time, the Federal Highway Administration (FHWA) launched a project under the FHWA's Road Weather Management Program to look at developing an MDSS prototype. While attending the FHWA MDSS stakeholder meeting, INDOT quickly saw potential in the developing project which was in cooperation with other federal labs and contractors. The FHWA MDSS project involved developing a prototype that could be used by the private sector to develop their own MDSS based on the needs of individual clients.

The idea of the MDSS project was to integrate state-of-the-art weather forecasting with road data and maintenance rules to produce a model for optimal treatment. Potential savings and benefits with this type of system could include, but are not limited to:

- materials;
- man hours;
- equipment usage;
- increased safety;

- mobility;
- a consistent and desired level of service;
- effectively train employees;
- develop uniform treatment applications based on the reporting of various storm events.

In late 2002, INDOT had the opportunity to join a new pooled fund study (PFS) group to develop an operational MDSS. This PFS was designed to follow the FHWA plan of developing an operational MDSS that worked on the same principals as the FHWA MDSS prototype. The PFS project began with 5 states and has grown to include 14 states; each in different stages of deployment. By participating in the PFS since its inception, INDOT has helped guide development of the MDSS in order to meet its operational needs for fighting snow and ice. Currently, INDOT has participated in PFS MDSS field trials for the last 3 years. Each of these years, INDOT added routes and improved its communication processes to work with MDSS.

As the field trials were conducted, some surprising results were found. One INDOT Sub-District reported a thirty percent savings in salt usage from its neighbor. Other Subs participating in the field study realized at least ten percent savings from their neighbors. These results were viewed with some skepticism, but INDOT's Commissioner was facing a new issue in early 2008: declining revenues.

After hearing about the significant savings achieved by these groups during field testing, INDOT's Commissioner at the time, Karl Browning, decided that MDSS would be implemented statewide for the 2008-2009 winter. INDOT's budget for salt was in excess of $20 million for FY08 and even a ten percent savings in salt usage would have a significant impact on the State's budget.

Once this decision to implement statewide was made, there was an extremely tight time table. In July 2008, Commissioner Browning selected Tony McClellan P.E., Seymour District Highway Operations Director, to be the MDSS Implementation Project Manager. One large barrier to implementation was while INDOT had been using MDSS since its inception, it had only been used in limited locations. Many parts of the state had heard of MDSS, but hadn't used any part of it or knew how it worked. This issue and many others arose with the implementation process and will be discussed within this paper.

Organizational Change Management

One of the most important aspects of insuring successful implementation of MDSS was overcoming the overwhelming organizational and cultural changes this system presented to INDOT. In preparing to present this new tool, much time was devoted to: learning about the aspects of cultural backgrounds for large organizations, applying that knowledge to the cultural background of DOTs, investigating the change cycle and change management strategies, and utilizing this information to help INDOT head off issues and learn to deal with them appropriately when they occur. The following paragraphs discuss cultural backgrounds of large organizations and DOTs, the change cycle and change management, and INDOT's plan in relation to these changes.

Large organizations are made up of several parts. Executive management, middle management, and labor are all involved in determining the direction of the organization and carrying out that plan. Policies and procedures, incentives, and job security are all factors in control and motivation of individuals within the organization. Relationships between management and labor - even relationships among individual members of the organization - affect the performance and productivity of a company. All of these factors are important to the functioning of a large organization and must be considered and addressed when considering change.

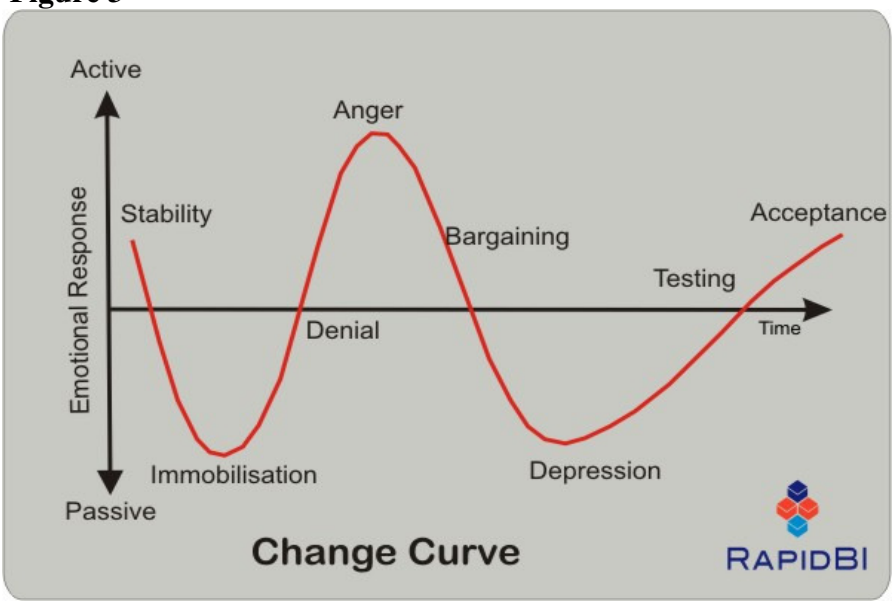
State Departments of Transportation (DOTs) are usually large organizations. As a result, DOTs tend to have the same cultural considerations. Additional cultural considerations must also be evaluated when addressing these organizations that function within state government and serve in a public safety role. State DOTs are not typical businesses in the sense that they are not designed to make a profit and a large part of their responsibilities are tied to public safety.

Until recently, DOTs had reliable revenue streams due to favorable economic times. Although public safety has always been a high priority of the DOT, cost was rarely a consideration because of these revenue levels. This attitude permeated all ranks of DOTs from executive management to labor. Escalated costs for DOTs providing superior public safety resulted from this as well as from executive management's desire for few complaints, labor's desire to perform well, and middle management's attempt to keep from getting caught in the middle.

In trying to please a majority of requests, service across different areas varied with the level of complainants and resulted in inconsistent levels of service. Most individuals within state DOTs take pride in the work they do and believe their decisions are correct. However, without consistency, levels of service vary across geographic boundaries. For a successful organizational change to occur within a state DOT, it must address the level of service it will provide and can support financially.

Once decisions have been made and a plan is ready to be implemented, the organization and the individuals that make up the whole will experience change. The change cycle, or how change is responded to, has been described in great detail by academia. Change affects an individual emotionally and, in turn, affects the individual's performance. As illustrated in Figure 3, a person going through change will typically experience sadness, apprehension, anger, resentment, depression, and, eventually, acceptance and contentment.

Figure 3



The range of feelings and problems resulting from these emotions are compounded when an organization with many individuals attempts to implement change. A successful organizational change requires a systematic approach; one that anticipates and addresses the problems that arise when individuals within an organization are asked to do things differently than they have in the past.

Often times, self-doubt accompanies the change. Employees may ask a variety of questions such as: "What was wrong with the way I used to do it?", "Is there something wrong with me?", and even, "Is my job safe?". These questions represent signs of fear, resentment, and resistance. When several individuals within an organization are experiencing the same doubts, a ground swell of emotions can work against the change. Human factors must be considered and addressed in a timely, sensitive manner when trying to implement change within a large organization. Without a systematic approach to head off problems or a plan to address problems when they arise, the change will fail.

Organizational change management is a systematic method that utilizes specific strategies to address change and the problems that arise when change is implemented in an

organization. One important strategy includes getting acceptance from all levels of the organization early in the organizational change. It is important that the reasons for the change be communicated to all levels in such a way that most individuals see the change being important to their own security, as well as for the betterment of the organization.

It is also important for feedback mechanisms to be in place for all levels within the organization. This allows a greater platform for communicating issues back to the change managers and helps those managers insure that the changes are being implemented as planned. If the changes are not being implemented according to plan, mechanisms are needed that give the change managers details about why there is deviation from the planned change. Often, individuals within the organization have found better or more efficient ways to accomplish the task.

Support networks must be created to quickly solve issues that arise as the change occurs. These networks must permeate the organization through all levels as well. If the individuals in the support network cannot solve an issue, they must be equipped with information to determine where to find the solution. Again, time is of the essence when trying to successfully implement change. Unsolved issues and problems during change can be used by those resisting it as an example that even those in charge do not understand the change being implemented. If these issues are not quickly resolved, the resistance will gather momentum and ultimately result in a failure to change within the organization. Even greater difficulties may be encountered during the next change if failure occurs.

Implementation of an MDSS required a large, organizational change within INDOT. To address this change, organizational change management strategies were employed to insure a successful implementation. The need for change was communicated through two regional snow

conferences where individuals from all levels of the organization were brought together to learn about MDSS and understand why implementation was occurring at that time. At these same meetings, round table discussions were held to discuss the change, get suggestions, increase buy in/ownership, and gather ideas on how to best implement the change.

These meetings were also an opportunity for individuals to express why the changes, or parts of changes, were not needed. Support networks were created to help address these issues and others as they arose during the implementation process. The support networks included support for IT, mechanical, QA/QC, and MDSS problems. Within each of these areas, communication for further improvements and ideas was stressed.

Project Plan

In order to meet the goal of statewide deployment, 120 AVL/MDC units had to be procured and installed into the INDOT fleet across the state. IWAPI, Inc. was selected as the vendor to provide AVL/MDC equipment. Cellular air cards for use in the AVL/MDC systems also had to be procured. To help insure buy-in from managers at the district level, Commissioner Browning directed each District pay for their portion of this equipment with funds budgeted for salt. Salt budgets for FY09 were already lower than past years and moving funds to cover MDSS costs made it imperative that the system be used properly in order to realize the savings that were projected.

Figure 4 shows a breakdown of costs per district for equipment procurement. Operational costs for MDSS are currently supplemented through the Pooled Fund Study (PFS), however, future operational costs will exist.

Figure 4

MDSS Expenditures

	Expenditures to Date	Expected Expenditures	Comments / Status
Crawfordsville			
IWAPI/AVL	$37,710.00	$37,710.00	Received
Air Cards	$5,254.74	$5,254.74	Received
Operations Cost	$0.00	$16,666.67	Payment Date 05/31/2009
Fort Wayne			
IWAPI/AVL	$43,995.00	$43,995.00	Received
Air Cards	$6,130.53	$6,130.53	Received
Operations Cost	$0.00	$16,666.67	Payment Date 05/31/2009
Greenfield			
IWAPI/AVL	$43,995.00	$43,995.00	Received
Air Cards	$6,130.53	$6,130.53	Received
Operations Cost	$0.00	$16,666.67	Payment Date 05/31/2009
LaPorte			
IWAPI/AVL	$43,995.00	$43,995.00	Received
Air Cards	$6,130.53	$6,130.53	Received
Operations Cost	$0.00	$16,666.67	Payment Date 05/31/2009
Seymour			
IWAPI/AVL	$104,750.00	$104,750.00	Received
Air Cards	$17,515.80	$17,515.80	Received
Operations Cost	$0.00	$16,666.67	Payment Date 05/31/2009
Muncie E-Boxes	$0.00	$63,742.50	Payment Date 11/30/2008
Vincennes			
IWAPI/AVL	$43,995.00	$43,995.00	Received
Air Cards	$6,130.53	$6,130.53	Received
Operations Cost	$0.00	$16,666.67	Payment Date 5/31/2009
Total	**$365,732.66**	**$529,475.16**	

Once the equipment was procured, there was a need for installation training as relatively few INDOT personnel were familiar with MDSS equipment. INDOT's Traffic Management Centers (TMC) in Gary and Indianapolis sent technicians to the Seymour District to participate in hands on equipment installation and training. Mechanics from the Vincennes District were also trained in Seymour. Upon completion of the training, the TMC technicians were able to train the mechanics from the Crawfordsville, Fort Wayne, Greenfield, and LaPorte Districts. Each District then finished their respective equipment installation in the remaining MDSS fleet.

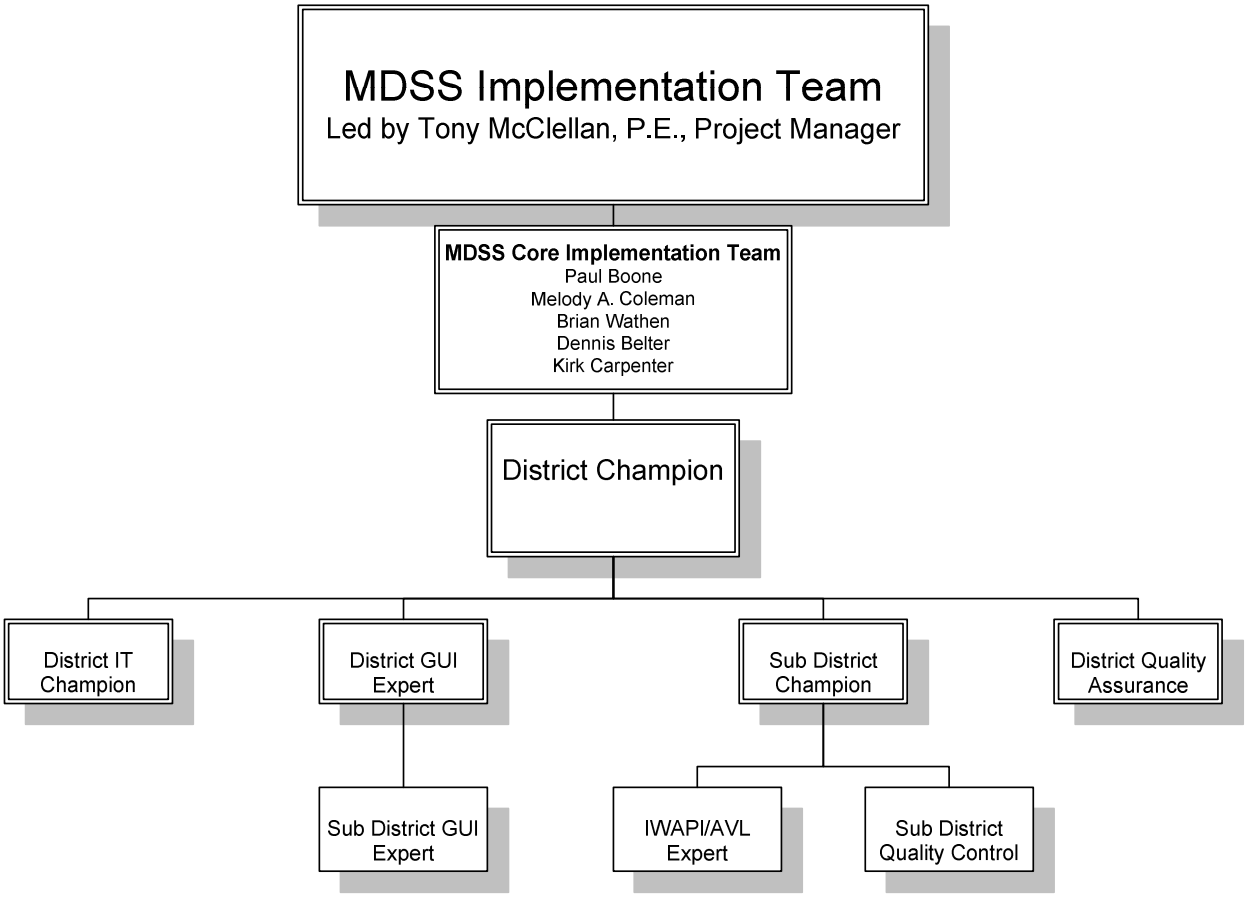
As MDSS equipment was procured and installed it was imperative that a database be developed that accurately tracked the AVL/MDC units with the corresponding trucks. The database, found in Appendix A, shows the INDOT truck number with the AVL/MDC serial number.

It was important to communicate MDSS updates throughout INDOT. To help disperse information and to gather feedback, a support network was established. A District Champion was selected as the first step of developing this support network within the Districts.

The District Champion served as the primary conduit of information from the MDSS Implementation Team to the frontline users. All training, troubleshooting and general correspondence concerning MDSS traveled through the District Champion. Each district also had a District IT Champion, District GUI Expert, and District Quality Assurance Expert.

The MDSS support network further extended to the Sub-Districts, with all MDSS positions at the District level being similarly staffed at the Sub-District level. Each District selected staff to fill the District and Sub-District positions indicated in Figure 5. Descriptions of the responsibilities of each of these positions can be found in Appendix B.

Figure 5



As previously stated, most INDOT personnel had no familiarity with MDSS. In order to meet the established tight timeframes, effective training had to be provided. An introduction to MDSS was presented at the *2008 INDOT Snow and Ice Conference*, but no real hands-on experience was provided at that time. The INDOT implementation team decided that six training packets would be provided in later sessions in order to provide the working knowledge necessary to make the MDSS project successful. The individual training modules are described below:

- Graphical User Interface (GUI) Training: GUI training was conducted at each district. Meridian personnel led this training which provided a hands-on experience for the trainee. Each attendee had access to a computer and was led through the

various parts of the GUI. INDOT MDSS experts moved through the room to help answer questions and insured all trainees were keeping up with the material being covered. The hands-on knowledge gained by this type of training proved very beneficial as the trainees experienced circumstances comparable to those faced in their everyday use of MDSS.

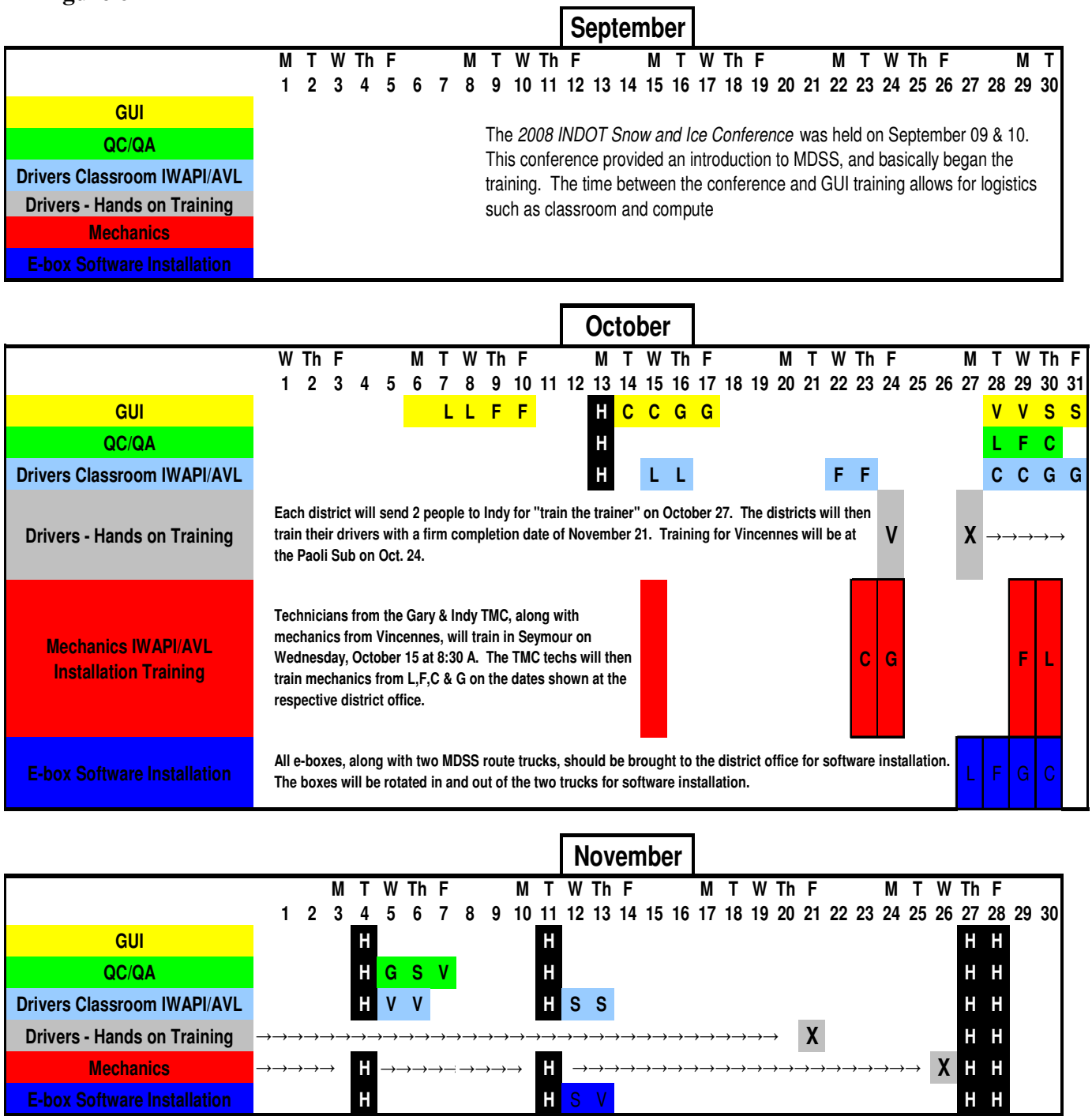
- QA/QC Training: The Quality Assurance/Quality Control plan was developed for several reasons. First, the new system and process needed a set of checks and balances in order to ensure that the system was functioning properly at all times, not just during inclement conditions. It was important to foster a sense of trust in the system so personnel would feel comfortable using the MDSS on a daily basis. QA/QC was also important to ensure that the system was being used, understood, and to achieve buy in. A series of QC and QA forms were developed for different time intervals. A large number of personnel were trained in the QA/QC form completion for QA/QC so that no matter what time of day or who was in the office, these checks could be maintained.
- Drivers Classroom IWAPI/AVL/MDC Training: Each INDOT driver that would potentially be operating a truck with MDSS equipment was given an overview of the system in a classroom setting. This module also allowed drivers the opportunity to use AVL/MDC equipment that was mounted on a portable board for training purposes.
- Drivers Hands-On Training: In order to train the large group of drivers a "train the trainer" session was held with each district. An AVL/MDC unit was placed in a van and personnel from each district were trained on the use of the equipment. The use of the van allowed up to five people to be trained at once. The district personnel then trained the drivers in a similar manner.
- Mechanics Training: INDOT's Traffic Management Centers (TMC) in Gary and Indianapolis sent technicians to Seymour to participate in equipment installation and become trained. Mechanics from the Vincennes district were also trained in Seymour. Upon completion of the training the TMC technicians were able to train the mechanics from the Crawfordsville, Fort Wayne, Greenfield, and La Porte districts. Each district then performed the equipment installation in its fleet. During

the winter season there were unresolved equipment issues. A follow up training was provided via teleconference with each district. IWAPI personnel led the teleconference with INDOT managers and mechanics. A review of the troubleshooting tips document was discussed and much time was devoted to a question and answer session.

- Refresher GUI Training: Refresher training on the use of the GUI was provided in January. Meridian and the INDOT MDSS implementation team directed this effort. The training helped to reinforce major elements of the initial GUI training and also provide the user the opportunity to learn new features of the system**.** Probabilities in weather forecasting were reviewed and specific saved storms were used to illustrate how the system should be used. This was also an opportunity to answer other questions and address problems that arose during the first months of operation. The refresher training was part of the change management strategy used for MDSS implementation.

Along with a support network, a training calendar was developed to insure that all the training packets could be provided to each District's appropriate personnel by the required deadline. The northern Districts were targeted for training first as their winter season typically begins before the rest of the state. The training calendar that was utilized can be found in Figure 6. In several instances, it was necessary for the implementation team to provide training in multiple Districts on the same day due to the short timeframe.

Figure 6


September
M T W Th F M T W Th F M T W Th F M T W Th F M T
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
GUI
QC/QA
Drivers Classroom IWAPI/AVL
Drivers - Hands on Training
Mechanics
E-box Software Installation
The 2008 INDOT Snow and Ice Conference was held on September 09 & 10. This conference provided an introduction to MDSS, and basically began the training. The time between the conference and GUI training allows for logistics such as classroom and compute
October
W Th F M T W Th F M T W Th F M T W Th F M T W Th F
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
GUI
QC/QA
Drivers Classroom IWAPI/AVL
Drivers - Hands on Training
Each district will send 2 people to Indy for "train the trainer" on October 27. The districts will then train their drivers with a firm completion date of November 21. Training for Vincennes will be at the Paoli Sub on Oct. 24.
Mechanics IWAPI/AVL Installation Training
Technicians from the Gary & Indy TMC, along with mechanics from Vincennes, will train in Seymour on Wednesday, October 15 at 8:30 A. The TMC techs will then train mechanics from L,F,C & G on the dates shown at the respective district office.
E-box Software Installation
All e-boxes, along with two MDSS route trucks, should be brought to the district office for software installation. The boxes will be rotated in and out of the two trucks for software installation.
November
M T W Th F M T W Th F M T W Th F M T W Th F
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
GUI
QC/QA
Drivers Classroom IWAPI/AVL
Drivers - Hands on Training
Mechanics
E-box Software Installation

Training was provided to specific MDSS personnel according to Figure 7.

Figure 7

Classification	GUI Training	IWAPI/AVL Training	QC/QA Training	Driver Training
District Champion	2	2	2	2
District IT Champion	1			
Sub District Champion	10	10		10
IWAPI/AVL Expert	10	10		
District GUI Expert	1		1	
Sub District GUI Experts	5			
District Quality Assurance	1	1	1	1
Sub District Quality Control	5	5	5	5
Sub District Manager	5	5	5	
Unit Foreman	40	40	20	40
Drivers		40		40
Additional Personnel	5	5	5	
Total Trainees per District	**85**	**118**	**39**	**98**
Total Trainees for State	**510**	**708**	**234**	**588**
Trainees per Session	**20**	**20**	**20**	**20**
Number of Sessions	**26**	**35**	**12**	**29**
Sessions per Day	**2**	**2**	**2**	**2**
Training Days	**13**	**18**	**6**	**15**

As important as it was to communicate throughout INDOT, it was also important to communicate with Meridian. Very specific information for each MDSS route was provided by District personnel to Meridian Environmental. This information was then fed into the computer model by Meridian in order to drive specific recommendations for each of INDOT's routes. The following pieces of information for each MDSS route were provided:

- Geographic limits of the route (i.e. from SR XX to SR YY)
- Pavement & Sub base Structure
- Route Cycle & Traversal Times
- Desired Level of Service
- Material, Rates & Cost
- Hours Available for Operations
- Anti-Icing Policy

- Degree of sheltering (shade)

Finally, because of tight timeframes and in order to track progress of items on the critical path, the project plan was placed on Microsoft Project. The software was used to track everything from training schedules to equipment procurement. Fixed completion dates were given to each District for the assignment of MDSS personnel, training, and equipment installation.

Implementation

In preparing for MDSS deployment, it was hoped that the 2008-2009 winter season would start late. As is often the case in these matters, it started early and severely. As the season progressed, there were many complaints about MDSS including bad forecasts and equipment failures. Some were valid complaints, while others stemmed from resistance; which comes with any large scale change.

Refresher courses were planned as part of the change management strategy. The intent of this training was two-fold: items that were not received well during the initial training could be covered again and the movement to resist change could be addressed. The MDSS refresher training did not occur until the end of January and this was almost too late. Negative feelings toward the systems were beginning to saturate the workforce. The refresher training was successful in dealing with the user's concerns, therefore complaints about the system dropped off dramatically.

One valid complaint regarded AVL/MDC equipment failure. It was discovered in the middle of December that this equipment was not consistently communicating correctly. Once the problem was discovered, IWAPI and Verizon, the cellular vendor, worked together to troubleshoot the problem. This troubleshooting was successful, but the solution did not present itself for at least six weeks: well into the winter season.

Another concern was the use and interpretation of weather forecasts. Early in the season, many new users were reporting that the MDSS was not accurately predicting start times for storms as well as the precipitation types and amounts. During this same time, the few experienced users within INDOT were reporting high quality forecasts from the system. In review, the issue seemed to stem from misinterpretation and inexperience with probabilities

given in the forecast. This may have been caused by too little focus on event probabilities or too much information for one training session. This problem was corrected by additional training and focus on using and interpreting probabilities.

The QA/QC program also presented an obstacle during implementation. As statewide MDSS implementation was unprecedented, no good benchmark existed that outlined the proper data to collect and at what frequencies. As a starting point, the QA/QC program focused on the proper functioning of components of the GUI, the IWAPI website, and Muncie boxes on the AVL/MDC equipped trucks. Because of the issues with the AVL/MDC units, the reports that were generated for QA/QC were not producing pertinent data. In retrospect, reaching a functional level with all equipment should be attained before implementing a comprehensive QA/QC plan.

Status reports were provided to the Commissioner throughout the season to track the progress of the bottom line. A second report was generated which showed snow hours recorded by the National Weather Service (NWS) at various reporting stations. A three (3) year average was plotted along with last year's numbers. A combined report was then generated which showed the salt used per snow hour. These reports along with overtime and fuel usage were tracked to see what affects MDSS was having on INDOT's snow and ice removal efforts.

Results

MDSS is scientific in nature; forecasting weather and chemical and mechanical treatment of the road surface to remove snow and ice. Significant research and time have been invested in the scientific parameters of MDSS. However, when INDOT implemented MDSS on a statewide basis, one of the unexpected and important findings was not based on the science at all. Surprisingly, MDSS also became a management tool with far reaching impact. Improved consistency across Unit, Sub-District, and District boundaries, the ability to specify a desired level of service, and the ability to plan instead of simply reacting are just a few examples of how overall performance improved with the use of MDSS.

By using AVL/MDC, all levels of INDOT management were provided consistent and timely information about the activity of individual trucks. These devices make it possible for management to know where each truck is located and what each truck is doing (i.e. spread rate, speed, plowing). When cameras are installed with the AVL/MDC units, as they were in Indiana, road conditions can be viewed in almost real time conditions. Drivers, foreman, and other levels of management can all see the conditions as they exist on the road. These tools help insure the specified rates are applied as desired and that every snow and ice decision maker is aware of the resulting conditions.

INDOT chose to equip ten percent (10%) of its fleet with AVL/MDC units and to use these trucks and their respective routes as a representative sample of all INDOT routes. This number equates to approximately one (1) representative route per unit within INDOT. The Graphical User Interface was used throughout all levels of management to view the recommendations made for these routes. Because all managers were able to share the same

information, a much more consistent product or level of service existed. As an end result, in most cases, the traveling public no longer saw jurisdictional boundary lines.

The QA/QC plan was designed as a management and communication tool for INDOT. Unit foremen and Sub-District managers were not forced to follow MDSS recommendations. However, when a decision was made that differed from the recommendations, the manager was asked to detail why that decision was the best option. Foremen and Sub-District managers were asked to certify when they were following the recommendations, which should have assured consistent treatments and given upper management a better feel for the system. With this year's time constraints and some uncertainty about its direction, the QA/QC portion of the program became a lower priority compared with other items in MDSS implementation. The QA/QC program was not in the critical path of implementation for this season. However, the reporting and measurements that the redesigned QA/QC program will produce will be critical for continued success of MDSS.

In addition to this reporting, biweekly and monthly status reports were generated to update the executive staff of INDOT. Year to date status compared with FY08 and the five (5) year average were used as benchmarks to measure the performance of MDSS. An attempt to normalize the data was made by tracking and comparing this season's hours of snow and freezing rain to FY08 and the three (3) year average. The data was obtained from five representative NWS sites across the state. Freezing rain/snow hours were not available for the selected sites for a five (5) year comparison.

These reports were shared throughout INDOT so each District could review implementation progress. Initially, the reports included salt usage for each District and Sub-District. Overtime and fuel usage were later added to the reports and also tracked for each

District and Sub-District. The reports included tables and graphs for quick review. Exposing management to the same information regarding usage of resources allowed MDSS to become a powerful management and comparison tool.

Most of the initial reduction in salt usage for the season can be attributed to MDSS as a management tool, but future savings with the use of MDSS will rely more heavily on the science of MDSS. Treatment recommendations were viewed with skepticism by many early in the implementation; rates were seen as too high or too low. As the season progressed, comfort levels with MDSS recommendations increased. Treatment recommendations will be more accepted as INDOT personnel become fully acclimated to the system. Constant improvements, which will be in part based on INDOT's experiences, will increase trust in the system, continue to create ownership throughout the organization, and result in more efficient use of materials over time.

Another anticipated improvement in the science side of MDSS should be INDOT personnel's better use and understanding of the probabilities of weather forecasts. Opportunities were missed this past season due to a lack of understanding how weather forecasts and their probabilities affect MDSS recommendations.

Road weather forecasting will also improve and lead to increased reliability in the MDSS. For example, lake effect snows experienced by states next to the Great Lakes posed a scientific challenge to MDSS. Often lake effect snows are narrow bands of heavy snow that occur below the radar. It is anticipated that future NWS equipment upgrades around the lakes and more experience will improve MDSS' ability to handle these special snow storms.

Issues were also encountered with the AVL/MDC units which resulted in a lack of trust in the reliability of these units. In most cases, an unforeseen communication issue between the

specific firmware version on INDOT's air card and the Verizon wireless system in Indiana was identified as the problem. Unfortunately, this issue was not resolved until almost the end of the FY09 winter season.

One aspect of the system INDOT decided to implement this year involved providing recommendations and radar views back to the driver. It was anticipated that the availability of these items would improve driver acceptance and create better usage of the MDSS recommended rates. Due to the AVL/MDC communication failure, these benefits were not fully realized for last season. It is anticipated that this information will be improved and should result in better use of the system at the driver level.

Even with a few difficulties, INDOT finished a very successful year of MDSS implementation. Results shown later in this section demonstrate salt usage, fuel usage, and overtime were all significantly reduced this winter season; in part due to the implementation of MDSS. It is important to note that the reductions in these resources would not have occurred without the commitment and hard work of management and labor. MDSS was a tool to help reach that goal.

While the savings in resources and the dollars associated are large, not everyone within INDOT is convinced that MDSS is necessary; putting MDSS implementation at a critical point. While the first year was incredibly successful, many in the organization are resistant to change and would gladly go back to an old way of doing business.

Issues with the AVL/MDC units caused credibility concerns for some and added fuel to the cause of reverting back to previous practices. It will likely take three years of success to transition MDSS into the INDOT culture. Over the next two seasons, INDOT will need to provide significant support for equipment and training issues to ensure MDSS is successfully

integrated into the organization. Luckily, there are many within INDOT who have seen improvements after this first year of MDSS implementation. It will be crucial to prove to those that are uncertain exactly how MDSS can benefit INDOT's core business and finances without lowering levels of service to our customers.

In discussing savings, the initial winter season of statewide MDSS implementation shows significant differences when compared to FY08. Salt usage, diesel fuel usage, and overtime hours all show substantial drops from the prior year.

Statewide salt usage for FY09 dropped by 40.9% when compared to the FY08 winter season. Figure 8 compares FY09 salt usage with FY08 and the three (3) and five (5) year averages for each District and for the State as a whole.

Figure 8

	Salt Usage (Nov - Apr)					
	3 Year Ave.	5 Year Ave.	FY 08	FY 09	Variation 3 yr ave to 09	Variation from 08 to 09
Crawfordsville	58,313	58,324	95,318	41,402	-29.0%	-56.6%
Fort Wayne	70,389	71,946	100,762	71,674	1.8%	-28.9%
Greenfield	74,067	74,886	110,670	60,686	-18.1%	-45.2%
LaPorte	86,387	98,830	132,039	89,546	3.7%	-32.2%
Seymour	62,212	53,174	66,726	40,250	-35.3%	-39.7%
Vincennes	35,355	32,997	52,759	26,246	-25.8%	-50.3%
All Districts	**386,723**	**390,157**	**558,274**	**329,804**	**-14.7%**	**-40.9%**

Since no two winter seasons are the same, an effort to normalize the data was made. The hours of snow and freezing rain, as measured at five different NWS sites throughout the region, have been used to compare the winter seasons of FY08 and FY09. It is important to note that Indiana's fiscal year runs from July 1 to June 30 and snow and ice season is generally considered

to run from November through April. Figure 9 shows the number of snow and freezing rain hours for each district for FY08 and FY09.

Figure 9

	Observed Hours of Snow/Fz Rain (Nov - Apr)				
	3 Year Ave.	FY 08	FY 09	Variation from 3 yr ave to 09	Variation from 08 to 09
Crawfordsville	304	390	334	9.9%	-14.4%
Fort Wayne	420	501	496	18.1%	-1.0%
Greenfield	304	390	334	9.9%	-14.4%
LaPorte	263	329	396	50.6%	20.4%
Seymour	119	162	128	7.6%	-21.0%
Vincennes	78	121	69	-11.5%	-43.0%
All Districts	**1,488**	**1,893**	**1,757**	**18.1%**	**-7.2%**

The FY09 winter season had 7.2% fewer hours of snow and freezing rain than did FY08; yet salt usage was reduced by 40.9%. Snow and freezing rain hours for FY09 were 18.1% higher than the three year average, with salt usage down 14.7%. Salt usage numbers are taken from INDOT's Work Management System and the final report and a graphical summary for each District are included in Appendix C and Appendix D respectively.

Statewide diesel fuel usage also showed a significant decrease between the winter seasons of FY08 and FY 09. The numbers for diesel fuel usage are taken directly from the *Fuel Report* on INDOT's Y:/drive and are summarized in Figure 10. Since diesel fuel usage is not directly charged to any specific activity, it is difficult to determine how much of the reduction is attributable to MDSS.

Figure 10

	Diesel Fuel Usage (Nov - Apr)		
	FY 08	FY 09	Variation from 08 to 09
Crawfordsville	348,252	257,265	-26.1%
Fort Wayne	374,262	325,324	-13.1%
Greenfield	441,017	338,783	-23.2%
LaPorte	422,230	388,931	-7.9%
Seymour	248,040	237,950	-4.1%
Vincennes	156,679	170,089	8.6%
All Districts	**1,990,480**	**1,718,342**	**-13.7%**

Unlike diesel fuel usage, overtime is charged directly to a specific task. The reduction in overtime charged to snow and ice operations from FY08 to FY09 is illustrated below in Figure 11. Statewide overtime charged to snow and ice activities for FY09 was 25.7% less than for FY08. Overtime numbers are taken from INDOT's Work Management System (WMS).

Figure 11

	OVT Hours - Snow and Ice (Nov - Apr)		
	FY 08	FY 09	Variation from 08 to 09
Crawfordsville	38,240	17,971	-53.0%
Fort Wayne	44,896	35,603	-20.7%
Greenfield	36,614	32,074	-12.4%
LaPorte	50,961	51,743	1.5%
Seymour	33,240	19,027	-42.8%
Vincennes	22,533	11,792	-47.7%
All Districts	**226,484**	**168,210**	**-25.7%**

The dollars associated with the salt and overtime savings are illustrated in Figure 12. Although diesel fuel usage showed a significant decline from FY08 to FY09 because it is not

directly correlated with an activity, it cannot be determined exactly how many dollars were saved due to MDSS implementation.

Figure 12

Salt Savings Comparing FY 08 to FY 09				
	FY 08 (Tons)	FY 09 (Tons)	Difference (Tons)	Savings @ $53/Ton
All Districts	558,274	329,804	228,470	$12,108,910
Overtime Savings Comparing FY 08 to FY 09				
	FY 08 (Hours)	FY 09 (Hours)	Difference (Hours)	Savings @ $23.33/hour
All Districts	226,484	168,210	58,274	$1,359,591

In comparison with the approximately $529,000 (shown in Figure 4) spent on equipment and vendor provided training, the net savings easily justified the expense for statewide implementation. Expenses that were not captured include INDOT personnel's travel and regular work time associated with MDSS implementation. This may be an area to examine in the future to determine ongoing operational expense.

Recommendations

MDSS implementation was a resounding success this year. More consistent levels of service were provided across the state because a tool was provided to management that allowed them to set the desired level of service. With MDSS, managers can now assess road conditions in a near real-time environment. INDOT's environmental impacts were lessened as salt usage was reduced compared to normalized data. In addition to these benefits, INDOT realized remarkable savings of around $11 million (normalized) in salt usage and overtime. While the MDSS implementation at INDOT was successful, there are several items which will improve the overall product.

The first major improvement should be completed during the off season and involves creating true subject matter experts for the following areas: GUI, AVL/MDC, QA/QC, and weather forecasts. Ideally, a core group of experts from each District would be trained and become proficient in the use of these areas of MDSS. This group could then provide local level support during the winter season.

- GUI training and weather probability interpretation would include hands on training utilizing storms that were saved in the MDSS system from the FY09 winter season.
- AVL/MDC expert instruction would include hands on training as well. This training would involve disabling several units so each expert could troubleshoot and repair. Experts would become proficient in diagnosing issues, installation of the AVL/MDC units, and learn to cover all available documentation on the units.
- QA/QC training would involve form review and revision of forms in order to ensure that the proper information is being tracked. Training would also demonstrate how to appropriately complete forms and prepare individuals to instruct others in form completion.

- As stated earlier, misinterpretations of weather forecasts caused some confusion and mistrust of the system. Creating additional experts to correctly comprehend the forecasting information produced by MDSS will be integral for building acceptance and providing troubleshooting help at the District level.

Along with creating experts, a general training plan should be developed for sustained use of MDSS. The plan would detail the appropriate personnel to attend each type of training, as well as timing and locations for the trainings. Consideration should be given to utilizing the experts developed in the off season to assist with the training. Refresher and supplemental trainings should also be considered throughout the season as merely one exposure to the information will not be sufficient to grasp all the concepts. Training developed by the MDSS vendor should also be used whenever possible. When online and self tutorials are developed by the vendor, personnel should be trained on using these modules.

User account management will need to be discussed with the MDSS vendor. If INDOT maintains the user list, it is suggested that the Snow and Ice Section, located in Central Office, act as the designated authority. This authority would also extend to maintaining the list of INDOT trucks equipped with the AVL/MDC and their associated access card numbers.

The MDSS QA/QC program should be a primary focus of next year's work. Electronic forms are currently being developed and a training environment has been slated for October 2009. It is imperative that users follow the QA/QC program to get increased, consistent feedback from the field in a timely manner.

Another area for consideration will be reviewing accident data to determine if there is a correlation between winter weather accident rates and MDSS deployment. This data can be compared statewide and utilized to ensure that consistent levels of service are maintained.

It is recommended that the maintenance unit route density employing MDSS be maintained at the current level for FY10. Ten percent (10%) of the fleet is currently outfitted with MDSS equipment which is equivalent to the number of MDSS representative routes. Proper functioning of the current AVL/MDC units should be achieved prior to expanding the density of this equipment in the fleet. One Sub-District has one hundred percent (100%) of its fleet equipped with AVL/MDC. This Sub-District's results should be examined in comparison to other locations in order to determine the appropriate fleet density for MDSS equipment.

One challenge will be to develop uses for the AVL/MDC units outside of snow and ice removal. Additional vendors are currently providing AVL/MDC equipment as test products for MDSS, vehicle tracking, idling time studies, and other uses within INDOT. It will be necessary for INDOT to communicate effectively to insure that the systems are compatible. When it is discovered they are not, all groups within the organization should work together for a resolution or be made aware of the other uses for the incompatible equipment.

Communication within an organization can always be improved and this would apply to the MDSS implementation as well. Champions will need to be confirmed for the Districts and Sub-Districts prior to the beginning of next season. In most cases, the Champions will remain the same. However, due to retirement or altered responsibilities within the Districts, it may be necessary to select different staff to fill these positions.

A communication plan should be developed for next year that schedules periodic meetings with the District and Sub-District AVL/MDC Experts. Periodic meetings should also be scheduled with those involved in the QA/QC program. Discussion of the continued plan for MDSS should be presented at the next annual INDOT snow and ice conferences. A pre-season press release detailing the FY09's winter season success with MDSS should also be considered.

It will also be important to communicate desired levels of service to all levels of management before the beginning of next winter season. Monthly status reports for the executive office should continue.

As MDSS implementation resulted in significant savings, the final recommendation is that MDSS be utilized again next season. This will require continued support from INDOT's Commissioner and his Executive staff. This support will be especially crucial during the next two years to ensure the integration of the MDSS program into INDOT's culture and core business practices. INDOT is in the process of change with the ultimate goal being the eventual acceptance of MDSS as standard practice.

Appendix A

Indiana Department of Transportation

IWAPI Serial Number	Truck	Sub-District	District	Commission Number	Card Type
070556	61579	Terre Haute	Crawfordsville	160413	V620
070557	61593	Terre Haute	Crawfordsville	160412	V620
070555	61701	Terre Haute	Crawfordsville	160411	V620
070559	61590	Crawfordsville	Crawfordsville	160416	V620
070560	61591	Crawfordsville	Crawfordsville	160417	V620
070563	61748	Crawfordsville	Crawfordsville	160415	V620
070558	61751	Crawfordsville	Crawfordsville	160414	V620
070562	61752	Fowler	Crawfordsville	160418	V620
070603	61331	Fowler	Crawfordsville	160421	V620
070561	61683	Fowler	Crawfordsville	160419	V620
070604	61746	Frankfort	Crawfordsville	160422	V620
070600	61573	Frankfort	Crawfordsville	160424	V620
070599	61684	Frankfort	Crawfordsville	160423	V620
070566	61334	Cloverdale	Crawfordsville	160427	V620
070565	61682	Cloverdale	Crawfordsville	160428	V620
070590	61574	Cloverdale	Crawfordsville	160426	V620
070589	61290	Cloverdale	Crawfordsville	160425	V620
070584	Trainer	Not Assigned	Crawfordsville	160429	V620
070591	62346	261	Fort Wayne	160442	V620
070574	62410	262	Fort Wayne	160443	V620
070583	62413	263	Fort Wayne	160444	V620
070613	62682	264	Fort Wayne	160450	V620
070588	62397	233	Fort Wayne	160447	V620
070612	62398	234	Fort Wayne	160449	V620
070587	62258	234	Fort Wayne	160448	V620
070573	62424	253	Fort Wayne	160438	V620
070564	62683	254	Fort Wayne	160437	V620
070576	62422	252	Fort Wayne	160439	V620
070592	62638	251	Fort Wayne	160441	V620
070575	62338	251	Fort Wayne	160440	V620
070605	62613	242	Fort Wayne	160436	V620
070594	62275	243	Fort Wayne	160435	V620
070570	62339	241	Fort Wayne	160434	V620
070610	62601	232	Fort Wayne	160446	V620
070569	62628	223	Fort Wayne	160433	V620
070609	62203	2HM	Fort Wayne	160451	V620
070567	62341	222	Fort Wayne	160432	V620
070611	62403	231	Fort Wayne	160445	V620
070568	62323	221	Fort Wayne	160431	V620
070596	63962	Albany	Greenfield	160461	V620
070572	63954	Indianapolis	Greenfield	160454	V620
070595	63616	Albany	Greenfield	160462	V620
070602	63948	Indianapolis	Greenfield	160457	V620
070601	63238	Indianapolis	Greenfield	160458	V620

IWAPI Serial Number	Truck	Sub-District	District	Commission Number	Card Type
070571	63429	Indianapolis	Greenfield	160453	V620
070580	63964	Albany	Greenfield	160463	V620
070579	63554	Albany	Greenfield	160464	V620
070586	63575	Centerville	Greenfield	160459	V620
070585	63941	Centerville	Greenfield	160460	V620
070578	63707	Centerville	Greenfield	160455	V620
070577	63406	Centerville	Greenfield	160456	V620
070607	63537	Tipton	Greenfield	160467	V620
070597	63677	Tipton	Greenfield	160466	V620
070606	63971	Tipton	Greenfield	160468	V620
070598	63176	Tipton	Greenfield	160465	V620
070582	63751	Greenfield	Greenfield	160469	V620
070680	63530	Greenfield	Greenfield	160472	V620
070581	63970	Greenfield	Greenfield	160470	V620
070688	63690	Greenfield	Greenfield	160471	V620
			Greenfield		5750
			Greenfield		5750
070692	Spare	Gary	LaPorte	160485	V620
070690	64469	Rensselaer	LaPorte	160486	V620
070696	64767	Winnamac	LaPorte	161904	V620
070697	64548	Rensselaer	LaPorte	161903	V620
070685	64676	Winnamac	LaPorte	161906	V620
070694	64673	Winnamac	LaPorte	161905	V620
070698	64474	Rensselaer	LaPorte	160491	V620
070699	64049	Laporte	LaPorte	160492	V620
070693	64602	Monticello	LaPorte	160487	V620
070704	64772	Laporte	LaPorte	160475	V620
070691	64755	Monticello	LaPorte	160488	V620
070705	64775	Laporte	LaPorte	160476	V620
070709	60423	Laporte(Van)	LaPorte	160494	V620
070695	64634	Laporte	LaPorte	161902	V620
070711	64611	Laporte	LaPorte	160493	V620
070717	64043	Plymouth	LaPorte	160477	V620
070716	64400	Plymouth	LaPorte	160478	V620
070681	64406	Gary	LaPorte	160473	V620
070692	64675	Gary	LaPorte	160497	V620
070679	64574	Gary	LaPorte	160474	V620
070672	64398	Gary	LaPorte	160498	V620
070631	65745	Columbus	Seymour	161952	V620
070634	65318	Columbus	Seymour	161960	V620
070651	65038	Columbus	Seymour	161961	V620
070637	65804	Columbus	Seymour	161973	V620
070647	65289	Columbus	Seymour	161953	V620
070660	65956	Columbus	Seymour	161972	V620
070689	65836	Columbus	Seymour	161945	V620
070635	65739	Columbus	Seymour	161955	V620
070628	65896	Columbus	Seymour	161958	V620
070626	65092	Columbus	Seymour	161954	V620

IWAPI Serial Number	Truck	Sub-District	District	Commission Number	Card Type
070684	65068	Columbus	Seymour	161944	V620
070624	65448	Bloomington	Seymour	161941	V620
070668	65807	Bloomington	Seymour	161937	V620
070708	65161	Martinsville	Seymour	160490	V620
070703	65594	Bloomington	Seymour	160482	V620
070652	65451	Columbus	Seymour	161970	V620
070640	65292	Bloomington	Seymour	161964	V620
070710	65596	Amity	Seymour	160489	V620
070657	65597	Columbus	Seymour	161932	V620
070678	65837	Greensburg	Seymour	161962	V620
070658	65291	Columbus	Seymour	161971	V620
070713	65595	16 Acres	Seymour	160484	V620
070644	65023	Greensburg	Seymour	161965	V620
070650	65022	Columbus	Seymour	161969	V620
070639	65902	Columbus	Seymour	161968	V620
070667	65599	Falls City	Seymour	161933	V620
070715	65397	New Albany	Seymour	160483	V620
070714	65601	Falls City	Seymour	160479	V620
070686	65339	Aberdeen	Seymour	160495	V620
070702	65400	North Vernon	Seymour	160481	V620
070654	65322	Madison	Seymour	161950	V620
070712	65605	Scottsburg	Seymour	160480	V620
070666	65036	Aurora	Seymour	161936	V620
070661	65408	Aurora	Seymour	161951	V620
070682	65333	Aberdeen	Seymour	160496	V620
070593	65329	Training Van	Seymour	160430	V620
070544	Board	Training Board	Seymour	160420	V620
070638	65900	Brownstown	Seymour	161943	V620
070659	65893	Brownstown	Seymour	161956	V620
070619	65093	Columbus	Seymour	161931	V620
070649	65813	Columbus	Seymour	161942	V620
070627	65957	Columbus	Seymour	161966	V620
070629	65835	Columbus	Seymour	161967	V620
070656	65608	Columbus	Seymour	161957	V620
070625	65449	Columbus	Seymour	161948	V620
070641	65042	Columbus	Seymour	161930	V620
070683	65171	Columbus	Seymour	161935	V620
070662	65163	Columbus	Seymour	161946	V620
070646	65833	Columbus	Seymour	161949	V620
070669	65308	Columbus	Seymour	161947	V620
070334	65313	Columbus	Seymour	151710	V620
070335	65903	Columbus	Seymour	151709	V620
070337	65948	Columbus	Seymour	151708	V620
070338	65072	Madison	Seymour	151707	V620
070331	65311	Madison	Seymour	151706	V620
070336	65907	Columbus	Seymour	151711	V620
070339	65168	Columbus	Seymour	151712	V620
060115	65301	Columbus	Seymour	143717	V620

IWAPI Serial Number	Truck	Sub-District	District	Commission Number	Card Type
070333	65193	Traffic	Seymour	151704	V620
070687	Spare Unit	Vincennes	Vincennes	161907	V620
070701	66764	Vincennes	Vincennes	161908	V620
070645	66384	Vincennes	Vincennes	161912	V620
070700	66422	Vincennes	Vincennes	191909	V620
070706	66395	Vincennes	Vincennes	161901	V620
070630	66385	Vincennes	Vincennes	161913	V620
070665	66630	Vincennes	Vincennes	161924	V620
070674	66265	Vincennes	Vincennes	161916	V620
070643	66967	Vincennes	Vincennes	161918	V620
070664	66414	Vincennes	Vincennes	161925	V620
070648	66481	Vincennes	Vincennes	161919	V620
070670	66281	Vincennes	Vincennes	161917	V620
070677	66639	Vincennes	Vincennes	161922	V620
070673	66408	Vincennes	Vincennes	161923	V620
070707	66316	Vincennes	Vincennes	161900	V620
070623	66628	Vincennes	Vincennes	161914	V620
070621	66512	Vincennes	Vincennes	191915	V620
070622	66810	Vincennes	Vincennes	161921	V620
070618	66518	Vincennes	Vincennes	161920	V620
070671	66421	Vincennes	Vincennes	161911	V620
070653	66023	Vincennes	Vincennes	161910	V620

Appendix B

District Champion

The District Champion will serve as the primary conduit of information from the MDSS Implementation Team to the frontline users. All training, troubleshooting, and general correspondence concerning MDSS will travel through the District Champion. This position will be the lead individual for the MDSS project implementation in the District. This individual will be responsible for coordinating all support staff within the District, including the Sub-Districts. It will be necessary for the District Champion to have a basic understanding of all components of MDSS including the GUI, AVL/MDC, driver requirements, and forecasting and recommendation interpretation.

District IT Champion

The IT Champion's main responsibility is to insure that IT support is provided to the District, Sub-Districts, and Units for MDSS hardware and software support.

Sub District Champion

The Sub-District Champion will serve as the liaison between Sub-District and Unit personnel and the District. It will be necessary for the Sub-District Champion to have a basic understanding of all components of MDSS including the GUI, AVL/MDC, driver requirements, and forecasting and recommendation interpretation.

IWAPI/AVL Expert

The AVL/MDC Expert will serve as the support mechanism for problems associated with the AVL/MDC systems. This individual should be available during all callouts. It may be necessary for the AVL/MDC Expert to repair and troubleshoot the units or work with a mechanic to ensure repairs to the units.

District and Sub-District Graphical User Interface (GUI) Expert

The GUI Experts will serve as the first point of contact for District, Sub-District, and Unit personnel when questions arise in regard to the GUI. These individuals will receive extensive training on the use of the GUI and how it relates to the overall MDSS implementation. Familiarity with road attributes and levels of service will be essential. Understanding forecasting, recommendations, and how to run what-if scenarios will also be an expectation. The GUI Experts will learn to troubleshoot the GUI and will serve as the first line troubleshooters when GUI problems arise.

District Quality Assurance and Sub-District Quality Control

District QA and Sub-District QC will be responsible for completing the required QA/QC forms and maintaining these records. Multiple individuals will be required for these positions as certain QA/QC forms will be required around the clock and at increased frequencies depending upon weather conditions. QA/QC areas will include the GUI, IWAPI website, and the MDSS equipped trucks.

Appendix C

Indiana Department of Transportation
FY 2009
From: 10/15/2008
To: 04/30/2009

WINTER MATERIALS REPORT
(1000) - CRAWFORDSVILLE DISTRICT

Page: 1 of 6
Date:05/13/2009
Time:8.45 AM

Sodium Chloride/Road Salt Usage History (STN)

Unit #	Name	On Hand as of 04/30/2009	Rec'd 10/15/2008 04/30/2009	Rec'd to Date	Used 10/15/2008 04/30/2009	Used to Date	Trans. In 10/15/2008 04/30/2009	Trans. Out 10/15/2008 04/30/2009	Capacity	% Full
CRAWFORDSVILLE DISTRICT										
1000	CRAWFORDSVILLE DISTRICT (PS065120)	0	60,000	60,000	0	0	0	34,723	60,000	0.0 %
	Subdistrict Totals:	**0**	**60,000**	**60,000**	**0**	**0**	**0**	**34,723**		
TERRE HAUTE SUBDISTRICT										
1100	TERRE HAUTE SUBDISTRICT (PS065128)	0	0	0	0	0	0	0	0	0.0 %
1101	TERRE HAUTE UNIT 2 (PS065409)	1,229	512	512	2,685	2,685	3,069	0	3,400	36.1 %
1102	ASHBORO UNIT 3 (PS065407)	574	0	0	1,203	1,203	1,494	0	1,700	33.7 %
1103	FORT HARRISON UNIT (PS065408)	518	502	502	2,333	2,333	799	0	1,800	28.8 %
	Subdistrict Totals:	**2,321**	**1,014**	**1,014**	**6,221**	**6,221**	**5,363**	**0**		
CRAWFORDSVILLE SUBDISTRICT										
1200	CRAWFORDSVILLE SUBDISTRICT (PS065129)	0	0	0	0	0	0	0	0	0.0 %
1201	CRAWFORDVILLE UNIT 1 (PS065390)	800	0	0	3,487	3,487	3,012	0	4,000	20.0 %
1202	BLOOMINGDALE UNIT 2 (PS065389)	502	8	8	1,951	1,951	1,666	0	2,700	18.6 %
1203	NEWPORT UNIT 3 (PS065391)	271	0	0	1,826	1,826	1,746	0	1,700	15.9 %
1204	VEEDERSBURG UNIT 4 (PS065392)	706	538	538	2,179	2,179	1,446	0	4,000	17.6 %
	Subdistrict Totals:	**2,278**	**546**	**546**	**9,444**	**9,444**	**7,871**	**0**		
FOWLER SUBDISTRICT										
1300	FOWLER SUBDISTRICT (PS065130)	0	0	0	0	0	0	0	0	0.0 %
1301	FOWLER UNIT 1 (PS065395)	1,107	0	0	2,200	2,200	3,194	0	3,400	32.6 %
1302	CARBONDALE UNIT 2 (PS065394)	1,230	0	0	2,133	2,133	3,122	0	1,700	72.3 %
1303	LAFAYETTE UNIT 3 (PS065396)	639	0	0	4,739	4,739	4,887	0	3,400	18.8 %
	Subdistrict Totals:	**2,976**	**0**	**0**	**9,072**	**9,072**	**11,203**	**0**		
FRANKFORT SUBDISTRICT										
1400	FRANKFORT SUBDISTRICT (PS065131)	0	0	0	0	0	0	0	0	0.0 %
1401	FRANKFORT UNIT 1 (PS065398)	1,611	3,353	4,543	4,089	4,089	0	0	5,300	30.4 %
1402	LEBANON UNIT 2 (PS065399)	819	2,609	2,609	2,528	2,528	0	0	2,300	35.6 %
1403	ROMNEY UNIT 3 (PS065400)	657	1,149	1,149	1,366	1,366	0	0	1,700	38.7 %
	Subdistrict Totals:	**3,088**	**7,111**	**8,301**	**7,983**	**7,983**	**0**	**0**		
CLOVERDALE SUBDISTRICT										
1500	CLOVERDALE SUBDISTRICT (PS065132)	0	0	0	0	0	0	0	0	0.0 %
1501	CLOVERDALE UNIT 1 (PS065403)	957	469	469	1,742	1,742	1,730	0	1,700	56.3 %
1502	BAINBRIDGE UNIT2 (PS065402)	2,656	0	0	2,094	2,094	3,951	0	5,300	50.1 %
1503	LIZTON UNIT 3 (PS065404)	492	510	510	2,340	2,340	801	0	1,700	28.9 %
1504	PLAINFIELD UNIT 4 (PS065405)	493	0	0	2,505	2,505	1,998	0	3,400	14.5 %
	Subdistrict Totals:	**4,598**	**979**	**979**	**8,682**	**8,682**	**8,479**	**0**		
	District Totals:	**15,260**	**69,650**	**70,840**	**41,402**	**41,402**	**32,916**	**34,723**		

PO #	PO Amount	Remaining	Minimum	AC Tons		AC Recvd	AC Remain.

Indiana Department of Transportation
FY 2009
From: 10/15/2008
To: 04/30/2009

WINTER MATERIALS REPORT
(2000) - FORT WAYNE DISTRICT (PS065134)

Date:05/13/2009
Time:8.49 AM

Sodium Chloride/Road Salt Usage History (STN)

Unit #	Name	On Hand as of 04/30/2009	Rec'd 10/15/2008 04/30/2009	Rec'd to Date	Used 10/15/2008 04/30/2009	Used to Date	Trans. In 10/15/2008 04/30/2009	Trans. Out 10/15/2008 04/30/2009	Capacity	% Full
FORT WAYNE DISTRICT										
2000	FORT WAYNE DISTRICT (PS065134)	1	52,758	59,599	0	0	0	52,617	42,000	0.0 %
	Subdistrict Totals:	**1**	**52,758**	**59,599**	**0**	**0**	**0**	**52,617**		
ELKHART SUBDISTRICT										
2200	ELKHART SUBDISTRICT (PS065144)	0	0	0	0	0	0	0	0	0.0 %
2201	ELKHART UNIT 1 (PS065431)	1,734	0	0	5,748	5,748	5,366	100	5,400	32.1 %
2202	NEW PARIS UNIT 2 (PS065432)	434	924	924	4,955	4,955	3,433	0	1,700	25.5 %
2204	SHIPSHEWANA UNIT (PS065419)	741	214	214	4,346	4,346	3,369	0	2,200	33.7 %
	Subdistrict Totals:	**2,909**	**1,137**	**1,137**	**15,049**	**15,049**	**12,169**	**100**		
FORT WAYNE SUBDISTRICT										
2300	FORT WAYNE SUBDISTRICT (PS065145)	0	0	0	0	0	0	0	0	0.0 %
2301	FORT WAYNE UNIT 1 (PS065415)	2,703	494	494	7,236	7,236	4,694	0	6,000	45.0 %
2302	US 27 SOUTH UNIT 2 (PS065417)	1,437	305	305	1,236	1,574	1,462	0	3,400	42.3 %
2303	NEW HAVEN UNIT 3 (PS065416)	1,250	422	422	3,649	3,649	2,605	0	1,800	69.4 %
2304	LAUD UNIT (PS065424)	960	331	331	3,805	3,805	2,581	0	2,500	38.4 %
	Subdistrict Totals:	**6,349**	**1,551**	**1,551**	**15,926**	**16,264**	**11,343**	**0**		
ANGOLA SUBDISTRICT										
2400	ANGOLA SUBDISTRICT (PS065146)	800	0	0	0	0	0	0	0	0.0 %
2401	ANGOLA UNIT 1 (PS065418)	1,388	2,606	2,606	5,498	5,498	3,780	6	3,400	40.8 %
2403	WATERLOO UNIT 3 (PS065420)	1,169	516	516	2,910	2,910	2,481	0	1,800	64.9 %
2404	BRIMFIELD UNIT (PS065430)	1,715	495	495	3,576	3,576	2,895	0	3,000	57.2 %
	Subdistrict Totals:	**5,071**	**3,618**	**3,618**	**11,984**	**11,984**	**9,156**	**6**		
WABASH SUBDISTRICT										
2500	WABASH SUBDISTRICT (PS065147)	0	0	0	0	0	0	0	0	0.0 %
2501	WABASH UNIT 1 (PS065429)	815	753	753	4,190	4,190	4,247	0	1,800	45.3 %
2502	PERU UNIT 2 (PS065428)	1,367	508	508	3,148	3,148	2,313	0	3,400	40.2 %
2504	WARSAW UNIT (PS065426)	807	416	416	3,133	3,133	1,725	0	2,500	32.3 %
2505	N. MANCHESTER UNIT (PS065425)	1,091	322	322	2,682	2,682	2,251	0	2,000	54.5 %
	Subdistrict Totals:	**4,080**	**1,998**	**1,998**	**13,154**	**13,154**	**10,536**	**0**		
BLUFFTON SUBDISTRICT										
2600	BLUFFTON SUBDISTRICT (PS065148)	0	0	0	0	0	0	0	0	0.0 %
2601	BLUFFTON UNIT 1 (PS065421)	876	2	2	4,659	4,659	1,587	0	5,000	17.6 %
2602	MARKLE UNIT 2 (PS065422)	850	303	303	3,522	3,522	2,920	0	1,100	77.3 %
2603	MONROE UNIT 3 (PS065423)	1,350	1,058	1,058	3,226	3,226	2,598	0	3,100	43.5 %
2604	GAS CITY UNIT 4 (PS065427)	2,057	514	514	4,154	4,154	2,414	0	3,600	57.1 %
	Subdistrict Totals:	**5,135**	**1,877**	**1,877**	**15,561**	**15,561**	**9,519**	**0**		
	District Totals:	**23,545**	**62,940**	**69,780**	**71,674**	**72,012**	**52,723**	**52,723**		

PO #	PO Amount	Remaining	Minimum	AC Tons		AC Recvd	AC Remain.

Indiana Department of Transportation
FY 2009
From: 10/15/2008
To: 04/30/2009

WINTER MATERIALS REPORT

(3000) - GREENFIELD DISTRICT (PS065149)

Date:05/13/2009
Time:8.51 AM

Sodium Chloride/Road Salt Usage History (STN)

Unit #	Name	On Hand as of 04/30/2009	Rec'd 10/15/2008 04/30/2009	Rec'd to Date	Used 10/15/2008 04/30/2009	Used to Date	Trans. In 10/15/2008 04/30/2009	Trans. Out 10/15/2008 04/30/2009	Capacity	% Full
GREENFIELD DISTRICT										
3000	GREENFIELD DISTRICT (PS065149)	0	0	0	0	0	0	0	0	0.0 %
	Subdistrict Totals:	**0**	**0**	**0**	**0**	**0**	**0**	**0**		
INDIANAPOLIS SUBDISTRICT										
3100	INDIANAPOLIS SUBDISTRICT (PS065158)	0	0	0	0	0	0	0	0	0.0 %
3101	BROOKVILLE RD UNIT 1 (PS065452)	2,128	2,400	3,900	3,459	3,463	0	0	1,500	141.9 %
3102	TIBBS AVE UNIT 2 (PS065454)	1,522	4,872	4,872	4,062	4,062	0	0	0	0.0 %
3103	71ST ST. UNIT 3 (PS065451)	1,138	6,006	6,506	5,369	5,369	0	0	0	0.0 %
3104	65TH ST. UNIT 4 (PS065450)	1,606	2,526	2,526	2,652	2,652	0	0	0	0.0 %
3105	MADISON ST. UNIT 5 (PS065453)	2,037	3,837	5,837	3,096	3,096	0	0	5,400	37.7 %
3106	MAINTENANCE CREW	0	0	0	0	0	0	0	0	0.0 %
	Subdistrict Totals:	**8,432**	**19,641**	**23,641**	**18,638**	**18,642**	**0**	**0**		
GREENFIELD SUBDISTRICT										
3200	GREENFIELD SUBDISTRICT (PS065159)	0	0	0	0	0	0	0	0	0.0 %
3201	GREENFIELD UNIT 1 (PS065439)	1,131	4,973	4,973	3,646	3,646	0	0	2,800	40.4 %
3202	ANDERSON UNIT 2 (PS065438)	2,348	3,414	3,414	2,710	2,710	0	0	5,500	42.7 %
3203	RUSHVILLE UNIT 3 (PS065440)	879	1,914	1,914	2,230	2,230	0	0	1,800	48.8 %
3204	SHELBYVILLE UNIT 4 (PS065441)	790	1,177	1,177	981	981	0	0	1,700	46.5 %
	Subdistrict Totals:	**5,148**	**11,478**	**11,478**	**9,566**	**9,566**	**0**	**0**		
CENTERVILLE SUBDISTRICT										
3300	CENTERVILLE SUBDISTRICT (PS065160)	0	0	0	0	0	0	0	0	0.0 %
3301	SALISBURY UNIT 1 (PS065458)	495	3,326	3,326	3,498	3,498	0	0	3,400	14.6 %
3302	CAMBRIDGE UNIT 2 (PS065455)	647	3,004	3,715	3,956	3,956	0	0	2,100	30.8 %
3303	NEW CASTLE UNIT 3 (PS065457)	656	3,668	3,668	3,545	3,545	0	0	2,100	31.2 %
3304	LIBERTY UNIT 4 (PS065456)	315	1,510	1,510	1,875	1,875	0	0	1,100	28.7 %
	Subdistrict Totals:	**2,113**	**11,508**	**12,219**	**12,873**	**12,873**	**0**	**0**		
TIPTON SUBDISTRICT										
3500	TIPTON SUBDISTRICT (PS065162)	0	0	0	0	0	0	0	0	0.0 %
3501	TIPTON UNIT 1 (PS065444)	2,307	2,365	4,358	2,207	2,207	0	0	0	0.0 %
3502	KOKOMO UNIT 2 (PS065443)	667	2,124	2,124	2,465	2,465	0	0	1,100	60.6 %
3503	WESTFIELD UNIT 3 (PS065445)	609	1,753	1,753	1,910	1,910	0	0	0	0.0 %
3504	FORTVILLE UNIT 4 (PS065442)	1,870	1,482	2,480	1,667	1,667	0	0	0	0.0 %
	Subdistrict Totals:	**5,453**	**7,723**	**10,715**	**8,248**	**8,248**	**0**	**0**		
ALBANY SUBDISTRICT										
3600	ALBANY SUBDISTRICT (PS065163)	4,370	4,962	5,048	0	0	0	0	6,000	72.8 %
3601	MUNCIE UNIT 1 (PS065447)	939	3,270	4,285	4,089	4,089	0	0	3,400	27.6 %
3603	PORTLAND UNIT 3 (PS065448)	568	1,053	1,563	2,239	2,239	0	0	2,000	28.4 %
3604	WINCHESTER UNIT 4 (PS065449)	2,942	3,696	4,695	2,267	2,267	0	0	5,000	58.8 %
3605	ALEXANDRIA UNIT 5 (PS065446)	841	2,200	2,431	2,766	2,766	0	0	2,000	42.1 %
	Subdistrict Totals:	**9,661**	**15,180**	**18,022**	**11,361**	**11,361**	**0**	**0**		
	District Totals:	**30,806**	**65,530**	**76,074**	**60,687**	**60,691**	**0**	**0**		

PO #	PO Amount	Remaining	Minimum	AC Tons		AC Recvd	AC Remain.

Indiana Department of Transportation
FY 2009
From: 10/15/2008
To: 04/30/2009

WINTER MATERIALS REPORT
(4000) - LAPORTE DISTRICT (PS065164)

Date:05/13/2009
Time:8.54 AM

Sodium Chloride/Road Salt Usage History (STN)

Unit #	Name	On Hand as of 04/30/2009	Rec'd 10/15/2008 04/30/2009	Rec'd to Date	Used 10/15/2008 04/30/2009	Used to Date	Trans. In 10/15/2008 04/30/2009	Trans. Out 10/15/2008 04/30/2009	Capacity	% Full
LAPORTE DISTRICT										
4000	LAPORTE DISTRICT (PS065164)	0	0	0	0	0	0	0	0	0.0 %
	Subdistrict Totals:	**0**	**0**	**0**	**0**	**0**	**0**	**0**		
LAPORTE SUBDISTRICT										
4100	LAPORTE SUBDISTRICT (PS065174)	0	0	0	0	0	0	0	10,000	0.0 %
4101	LAPORTE UNIT 1 (PS065465)	1,500	4,291	4,291	7,982	7,982	0	0	4,700	31.9 %
4103	MICH CITY UNIT 3 (PS065466)	1,000	1,483	1,483	5,616	5,616	0	0	2,900	34.5 %
4104	WANATAH UNIT 2 (PS065467)	1,181	1,582	1,582	5,282	5,282	0	0	7,500	15.7 %
4106	CHESTERTON UNIT 4 (PS065464)	1,210	3,239	3,239	7,430	7,430	0	0	4,700	25.7 %
	Subdistrict Totals:	**4,891**	**10,595**	**10,595**	**26,309**	**26,309**	**0**	**0**		
MONTICELLO SUBDISTRICT										
4200	MONTICELLO SUBDISTRICT (PS065175)	0	2,954	5,650	0	0	0	2,954	1,000	0.0 %
4201	MONTICELLO UNIT 1 (PS065474)	996	0	0	1,178	1,178	1,088	0	2,100	47.4 %
4202	LOGANSPORT UNIT 2 (PS065473)	1,717	140	140	1,516	1,516	1,038	0	3,100	55.4 %
4203	FLORA UNIT 3 (PS065472)	595	0	0	1,121	1,121	827	0	1,800	33.1 %
	Subdistrict Totals:	**3,309**	**3,094**	**5,790**	**3,815**	**3,815**	**2,954**	**2,954**		
PLYMOUTH SUBDISTRICT										
4300	PLYMOUTH SUBDISTRICT (PS065176)	0	0	0	0	0	0	0	0	0.0 %
4301	PLYMOUTH UNIT 1 (PS065471)	1,141	9,349	10,077	10,374	10,374	0	0	3,100	36.8 %
4302	MISHAWAKA UNIT 2 (PS065470)	1,651	8,364	9,487	12,515	12,515	0	0	3,300	50.0 %
	Subdistrict Totals:	**2,792**	**17,714**	**19,564**	**22,889**	**22,889**	**0**	**0**		
RENSSELAER SUBDISTRICT										
4400	RENSSELAER SUBDISTRICT (PS065177)	238	0	0	0	0	2,123	316	10,000	2.4 %
4401	KENTLAND UNIT 1 (PS065475)	1,351	1,911	1,911	2,822	2,822	0	0	2,500	54.0 %
4402	RENSSELAER UNIT 2 (PS065476)	2,118	4,991	4,991	3,426	3,426	0	0	10,000	21.2 %
4403	ROSELAWN UNIT 3 (PS065477)	2,086	4,499	4,499	3,822	3,822	0	0	4,000	52.2 %
	Subdistrict Totals:	**5,793**	**11,401**	**11,401**	**10,070**	**10,070**	**2,123**	**316**		
WINAMAC SUBDISTRICT										
4600	WINAMAC SUBDISTRICT (PS065179)	0	4,243	4,448	0	0	0	4,243	1,000	0.0 %
4601	WINAMAC UNIT 1 (PS065480)	1,223	0	0	2,433	2,433	1,924	0	4,400	27.8 %
4602	ROCHESTER UNIT 2 (PS065479)	629	50	50	1,932	1,932	1,165	0	2,500	25.2 %
4603	MEDARYVILLE UNIT 3 (PS065478)	324	126	126	1,793	1,793	1,154	0	1,200	27.0 %
	Subdistrict Totals:	**2,177**	**4,420**	**4,625**	**6,157**	**6,157**	**4,243**	**4,243**		
GARY SUBDISTRICT										
4700	GARY SUBDISTRICT (PS065180)	0	0	0	19	19	0	0	0	0.0 %
4701	CROWN POINT UNIT 1 (PS065468)	1,504	6,164	6,164	6,177	6,177	0	0	4,500	33.4 %
4702	MILLER-2 UNIT 2 (PS065557)	1,917	3,882	3,882	5,221	5,221	0	0	6,000	31.9 %
4703	GARY UNIT 3 (PS065469)	1,268	7,981	7,981	3,792	3,792	0	0	4,000	31.7 %
4704	FREEWAY UNIT 4 (PS065558)	0	0	0	5,097	5,097	0	0	0	0.0 %
	Subdistrict Totals:	**4,689**	**18,027**	**18,027**	**20,306**	**20,306**	**0**	**0**		
	District Totals:	**23,649**	**65,251**	**70,002**	**89,547**	**89,547**	**9,320**	**7,512**		

PO #	PO Amount	Remaining	Minimum	AC Tons		AC Recvd	AC Remain.

Indiana Department of Transportation
FY 2009
From: 10/15/2008
To: 04/30/2009

WINTER MATERIALS REPORT
(5000) - SEYMOUR DISTRICT (PS065181)

Date:05/13/2009
Time:8.56 AM

Sodium Chloride/Road Salt Usage History (STN)

Unit #	Name	On Hand as of 04/30/2009	Rec'd 10/15/2008 04/30/2009	Rec'd to Date	Used 10/15/2008 04/30/2009	Used to Date	Trans. In 10/15/2008 04/30/2009	Trans. Out 10/15/2008 04/30/2009	Capacity	% Full
SEYMOUR DISTRICT										
5000	SEYMOUR DISTRICT (PS065181)	569	31,599	36,113	0	0	0	34,343	1,500	37.9 %
	Subdistrict Totals:	**569**	**31,599**	**36,113**	**0**	**0**	**0**	**34,343**		
AURORA SUBDISTRICT										
5100	AURORA SUBDISTRICT (PS065190)	0	0	0	0	0	0	0	0	0.0 %
5101	PENNTOWN UNIT 1 (PS065489)	580	0	0	2,186	2,186	2,520	195	1,000	58.0 %
5102	ABERDEEN UNIT 2 (PS065486)	907	195	195	1,327	1,327	1,481	0	1,000	90.7 %
5103	AURORA UNIT 3 (PS065487)	3,360	0	0	2,369	2,369	3,299	0	5,600	60.0 %
5104	BROOKVILLE UNIT 4 (PS065488)	2,033	391	391	1,845	1,845	702	0	2,500	81.3 %
	Subdistrict Totals:	**6,880**	**587**	**587**	**7,728**	**7,728**	**8,002**	**195**		
BLOOMINGTON SUBDISTRICT										
5200	BLOOMINGTON SUBDISTRICT (PS065191)	0	0	0	0	0	0	0	0	0.0 %
5201	SPENCER UNIT 1 (PS065493)	962	492	492	1,538	1,538	253	0	3,400	28.3 %
5202	MARTINSVILLE UNIT 2 (PS065492)	871	659	659	1,585	1,585	1,263	6	1,200	72.6 %
5203	BLOOMINGTON UNIT 3 (PS065491)	1,084	688	688	2,721	2,721	2,117	247	3,500	31.0 %
5204	BEAN BLOSSOM UNIT 4 (PS065490)	976	26	26	1,069	1,069	1,240	0	2,000	48.8 %
	Subdistrict Totals:	**3,892**	**1,865**	**1,865**	**6,914**	**6,914**	**4,873**	**253**		
COLUMBUS SUBDISTRICT										
5300	COLUMBUS SUBDISTRICT (PS065192)	0	0	0	0	0	0	0	0	0.0 %
5301	GREENSBURG UNIT 1 (PS065497)	2,432	0	0	2,589	2,589	3,974	105	2,000	121.6 %
5302	AMITY UNIT 2 (PS065494)	1,024	499	499	3,328	3,328	2,706	0	3,000	34.1 %
5303	COLUMBUS UNIT 3 (PS065496)	1,009	0	0	2,908	2,908	3,098	0	2,000	50.4 %
5304	BROWNSTOWN UNIT 4 (PS065495)	385	0	0	2,296	2,296	1,648	0	1,000	38.5 %
	Subdistrict Totals:	**4,851**	**499**	**499**	**11,121**	**11,121**	**11,426**	**105**		
FALL CITY SUBDISTRICT										
5400	FALL CITY SUBDISTRICT (PS065193)	0	0	0	0	0	0	0	0	0.0 %
5401	NEW ALBANY UNIT 1 (PS065499)	1,388	499	499	2,122	2,122	1,824	32	2,000	69.4 %
5402	SELLERSBURG UNIT 2 (PS065502)	992	0	0	1,522	1,522	1,192	18	1,600	62.0 %
5403	CORYDON UNIT 3 (PS065498)	940	495	495	2,179	2,179	1,497	0	2,100	44.8 %
5404	SALEM UNIT 4 (PS065501)	617	300	300	1,598	1,598	1,457	0	1,400	44.1 %
	Subdistrict Totals:	**3,937**	**1,294**	**1,294**	**7,421**	**7,421**	**5,969**	**51**		
MADISON SUBDISTRICT										
5500	MADISON SUBDISTRICT (PS065503)	0	0	0	0	0	0	0	0	0.0 %
5501	MADISON UNIT 1 (PS065194)	700	191	191	2,392	2,392	1,608	58	2,000	35.0 %
5502	NORTH VERNON UNIT 2 (PS065504)	828	391	391	1,021	1,021	1,458	0	600	138.0 %
5503	VERSAILLES UNIT 3 (PS065506)	431	295	295	1,855	2,019	1,062	0	1,500	28.7 %
5504	SCOTTSBURG UNIT 4 (PS065505)	922	819	819	1,798	1,798	607	0	1,000	92.2 %
	Subdistrict Totals:	**2,881**	**1,695**	**1,695**	**7,066**	**7,230**	**4,735**	**58**		
	District Totals:	**23,009**	**37,539**	**42,052**	**40,250**	**40,414**	**35,005**	**35,005**		

PO #	PO Amount	Remaining	Minimum	AC Tons		AC Recvd	AC Remain.

Indiana Department of Transportation
FY 2009
From: 10/15/2008
To: 05/13/2009

WINTER MATERIALS REPORT
(6000) - VINCENNES DISTRICT (PS065196)

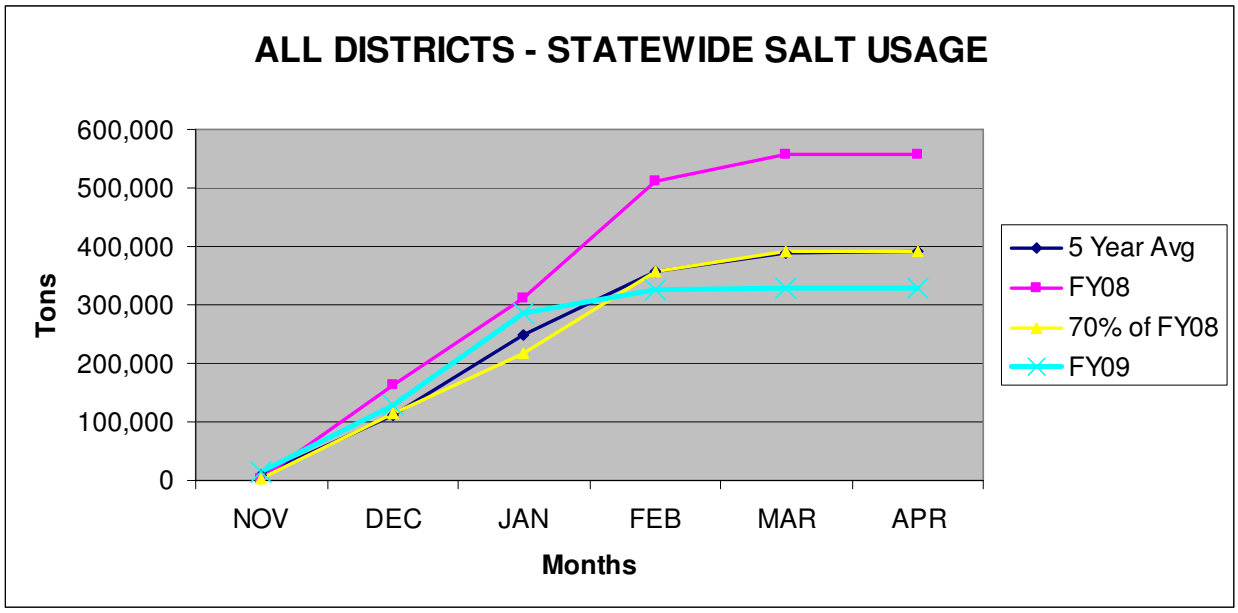
Date:05/13/2009
Time:8.58 AM

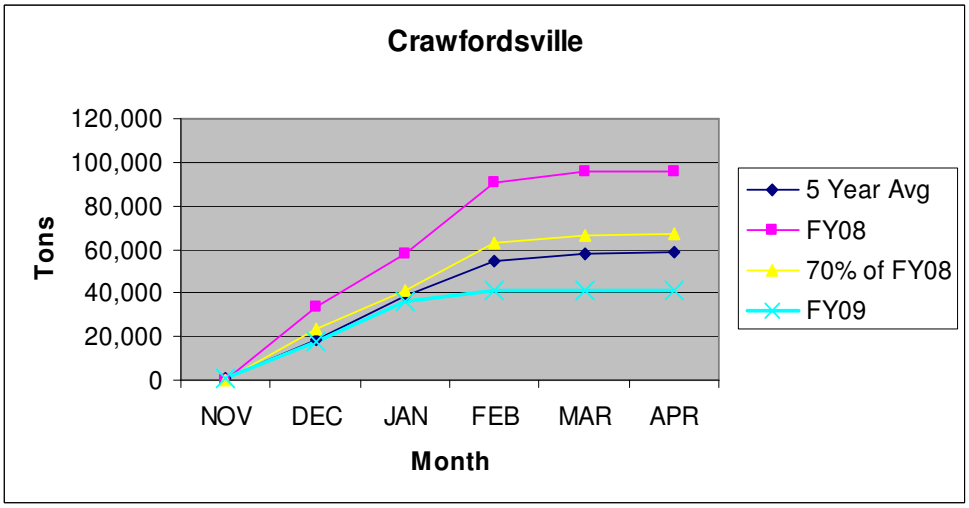
Sodium Chloride/Road Salt Usage History (STN)

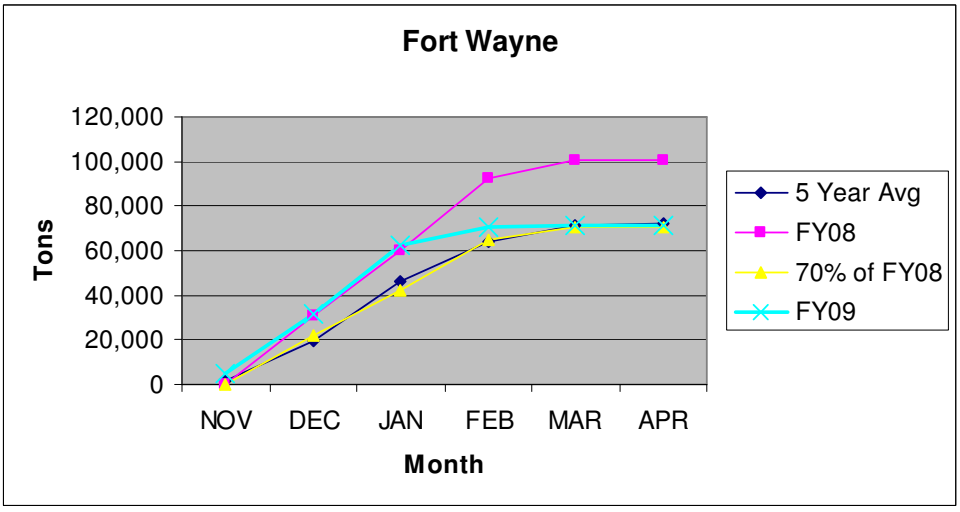
Unit #	Name	On Hand as of 05/13/2009	Rec'd 10/15/2008 05/13/2009	Rec'd to Date	Used 10/15/2008 05/13/2009	Used to Date	Trans. In 10/15/2008 05/13/2009	Trans. Out 10/15/2008 05/13/2009	Capacity	% Full
VINCENNES DISTRICT										
6000	VINCENNES DISTRICT (PS065196)	0	0	0	0	0	0	0	0	0.0 %
	Subdistrict Totals:	**0**	**0**	**0**	**0**	**0**	**0**	**0**		
LINTON SUBDISTRICT										
6100	LINTON SUBDISTRICT (PS065205)	0	0	0	0	0	0	0	0	0.0 %
6101	LINTON UNIT 1 (PS065513)	3,270	429	429	1,176	1,176	783	86	4,800	68.1 %
6102	BLOOMFIELD UNIT 2 (PS065512)	1,017	0	0	1,611	1,611	2,470	0	3,400	29.9 %
6103	PAXTON UNIT 3 (PS065514)	480	353	353	2,288	2,288	2,900	596	400	120.0 %
	Subdistrict Totals:	**4,767**	**782**	**782**	**5,075**	**5,075**	**6,153**	**682**		
EVANSVILLE SUBDISTRICT										
6300	EVANSVILLE SUBDISTRICT (PS065207)	163	0	0	0	0	0	0	0	0.0 %
6301	EVANSVILLE UNIT 1 (PS065517)	1,276	0	0	820	820	696	0	1,700	75.1 %
6302	BOYLE LANE UNIT 2 (PS065515)	506	0	0	1,223	1,223	647	0	2,100	24.1 %
6303	POSEYVILLE UNIT 3 (PS065518)	672	0	0	853	853	396	50	1,100	61.1 %
6304	CHANDLER UNIT 4 (PS065516)	428	0	0	865	865	399	0	1,400	30.6 %
6305	MT VERNON UNIT	161	0	0	0	0	44	0	200	80.6 %
	Subdistrict Totals:	**3,207**	**0**	**0**	**3,761**	**3,761**	**2,183**	**50**		
PAOLI SUBDISTRICT										
6400	PAOLI SUBDISTRICT (PS065208)	0	0	0	0	0	0	0	0	0.0 %
6401	PAOLI UNIT 1 (PS065521)	2,028	0	0	1,949	1,949	843	98	5,800	35.0 %
6402	SHOALS UNIT 2 (PS065522)	359	0	0	1,273	1,273	1,216	8	400	89.8 %
6403	BEDFORD UNIT 3 (PS065519)	875	905	905	2,316	2,316	395	0	3,400	25.7 %
6404	JASPER UNIT 4 (PS065520)	723	0	0	915	915	725	11	1,400	51.6 %
	Subdistrict Totals:	**3,985**	**905**	**905**	**6,454**	**6,454**	**3,180**	**117**		
TELL CITY SUBDISTRICT										
6500	TELL CITY SUBDISTRICT (PS065209)	0	0	0	0	0	0	0	0	0.0 %
6501	GRANTSBURG UNIT 1 (PS065527)	567	771	771	759	759	503	771	1,200	47.2 %
6502	DERBY UNIT 2 (PS065526)	484	0	0	974	974	791	0	1,700	28.5 %
6503	BIRDSEYE UNIT 3 (PS065523)	3,693	843	843	1,089	1,089	771	104	5,200	71.0 %
6504	DALE UNIT 5 (PS065525)	3,221	1,760	1,760	1,705	1,705	78	32	4,800	67.1 %
6505	CHRISNEY UNIT 4 (PS065524)	1,294	0	0	1,003	1,003	820	28	3,300	39.2 %
	Subdistrict Totals:	**9,258**	**3,374**	**3,374**	**5,531**	**5,531**	**2,963**	**934**		
VINCENNES SUBDISTRICT										
6600	VINCENNES SUBDISTRICT (PS065210)	0	0	0	0	0	0	0	0	0.0 %
6601	PETERSBURG UNIT 1 (PS065528)	379	0	0	1,032	1,032	894	0	500	75.9 %
6602	VINCENNES UNIT 2 (PS065530)	2,621	703	1,298	1,617	1,617	917	159	5,000	52.4 %
6603	WASHINGTON UNIT 3 (PS065531)	663	0	0	1,213	1,213	0	100	3,400	19.5 %
6604	PRINCETON UNIT 4 (PS065529)	368	0	0	1,563	1,563	960	0	1,400	26.3 %
	Subdistrict Totals:	**4,031**	**703**	**1,298**	**5,425**	**5,425**	**2,772**	**259**		
	District Totals:	**25,249**	**5,765**	**6,359**	**26,245**	**26,245**	**17,250**	**2,043**		

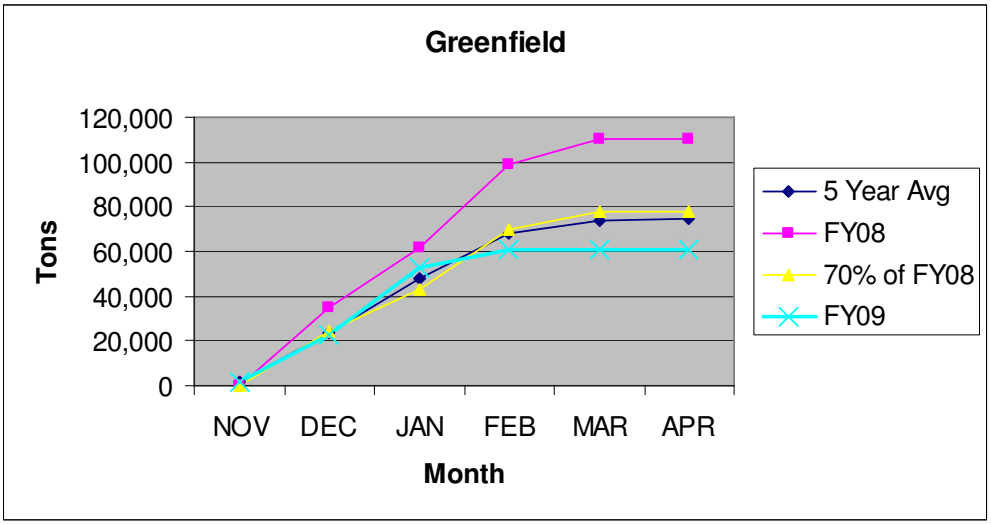
PO #	PO Amount	Remaining	Minimum	AC Tons		AC Recvd	AC Remain.

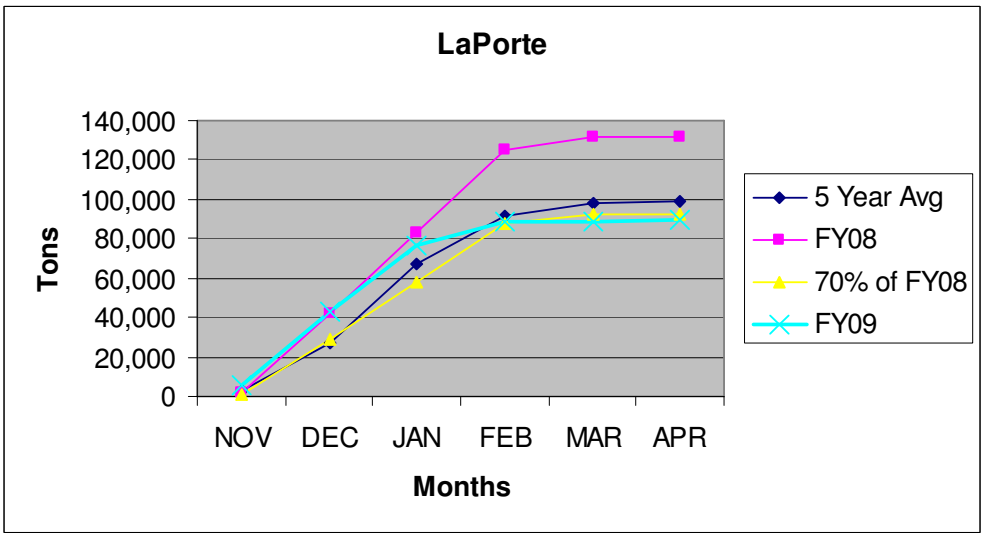
Appendix D

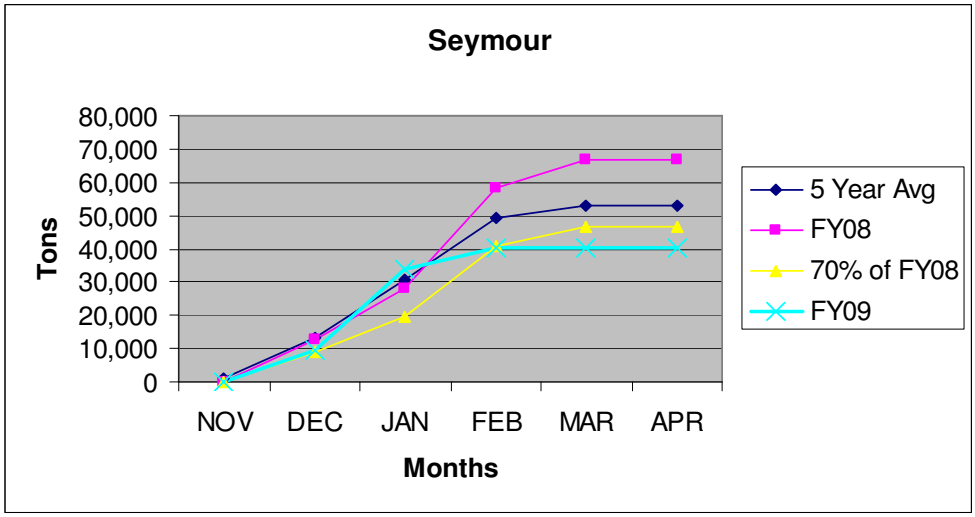

ALL DISTRICTS - STATEWIDE SALT USAGE
600,000
500,000
400,000
300,000
200,000
100,000
0
Tons
NOV
DEC
JAN
FEB
MAR
APR
Months
5 Year Avg
FY08
70% of FY08
FY09

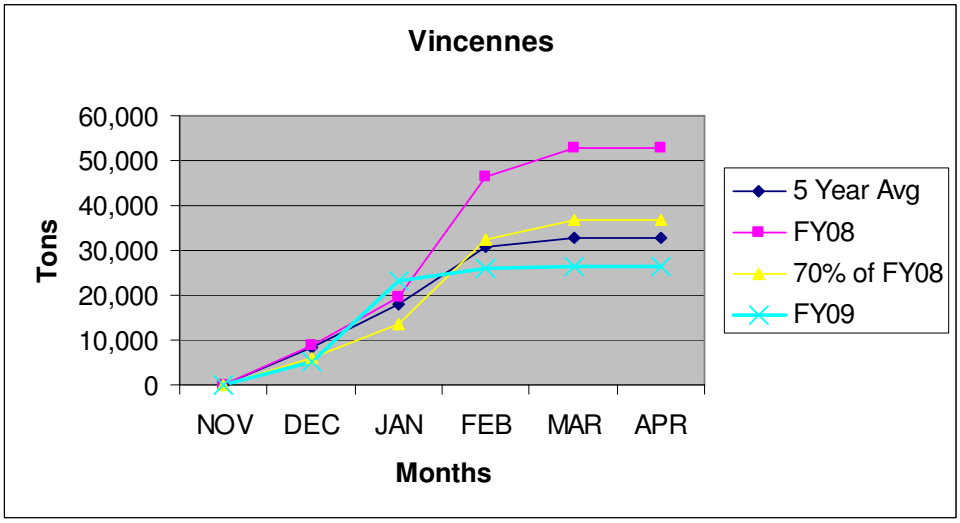

Crawfordsville
120,000
100,000
80,000
60,000
40,000
20,000
0
Tons
NOV
DEC
JAN
FEB
MAR
APR
Month
5 Year Avg
FY08
70% of FY08
FY09


Fort Wayne
120,000
100,000
80,000
60,000
40,000
20,000
0
Tons
NOV
DEC
JAN
FEB
MAR
APR
Month
5 Year Avg
FY08
70% of FY08
FY09


Greenfield
120,000
100,000
80,000
60,000
40,000
20,000
0
Tons
NOV
DEC
JAN
FEB
MAR
APR
Month
5 Year Avg
FY08
70% of FY08
FY09


LaPorte
140,000
120,000
100,000
80,000
60,000
40,000
20,000
0
Tons
NOV
DEC
JAN
FEB
MAR
APR
Months
5 Year Avg
FY08
70% of FY08
FY09


Seymour
80,000
70,000
60,000
50,000
40,000
30,000
20,000
10,000
0
Tons
NOV
DEC
JAN
FEB
MAR
APR
Months
5 Year Avg
FY08
70% of FY08
FY09


Vincennes
60,000
50,000
40,000
30,000
20,000
10,000
0
Tons
NOV
DEC
JAN
FEB
MAR
APR
Months
5 Year Avg
FY08
70% of FY08
FY09