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## Maintenance 2001 Project

### 2000-2001: 5<sup>th</sup> Season

Maintenance 2001: "Integrating Technology for Winter Road Maintenance"

The Maintenance 2001 project is being conducted by Owen Sound District and the Maintenance Office. The objective is the introduction of new technology, techniques, and practices that will:

- reduce salt usage and negative impacts on the environment
- maintain a more consistent level of winter maintenance service
- measure the performance of winter maintenance contractors to ensure high standards and safety
- disseminate information on winter road conditions

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## Summary and Results: 1999-2000

## De-icing Anti-icing Response Treatment Program (DART)

- this computer program helps to select optimum application rates for dry, liquid, or pre-wet de-icers, as well as winter sand
- recommendations were made to integrate DART with the ARWIS display, rather than maintaining it as a stand-alone system operating under Windows 95, and to incorporate the final results of pre-wetting and anti-icing trials once they are completed

## High Speed Spreading

- comparisons were completed between different methods of maintaining salt in a windrow near the crown of the road under high speed operation: the Tyler Zero Velocity and Swenson Precise Placements spreaders, as well as pre-wetting were investigated
- test results were presented at the Transportation Research Board International Symposium on Snow and Ice Control at Roanoke, Virginia, September 1999, and will be published in a future issue of Transportation Research Record

## Pre-wetting

- interim analysis of test results from 1996--2000 was completed and showed that salt application rates can be reduced by 20 to 40 percent with no loss in effectiveness if a small quantity of liquid de-icer is applied as salt is spread on the road
- pilot implementation of pre-wetting in cases where application rates were not reduced from dry salt rates showed that the number of required applications over a winter season was reduced by up to 25 percent at one yard
- a recommendation was made to expand the implementation in 2000-2001, and a variable application rates table for pre-wetting salt was developed for pilot implementation

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## 2000-2001 Test Plan: Decision Support Tools

## **DART verification**

- after determining required adjustments, DART will be integrated with ARWIS based on the results of this winter's tests
- the material application recommendations given by DART will be evaluated against ministry test results from last winter and this winter
- program output will be compared with the results of the anti-icing/pre-wetting evaluations, and changed as required

## **Advanced Road Weather Information System (ARWIS)**

- planning will continue for a network expansion in 2000-01-02
- access to ARWIS will be improved by direct link with an internet site operated by Environment Canada, and by display as a component of an AVL system (see below)

## **Infra-red Thermometer**

- an infra-red thermometer will be used to acquire data for thermal mapping on 400-series highways, allowing for future development of a Local Climatological Model to improve road weather forecasts

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## **2000-2001 Test Plan: Performance Standards and Quality Assurance Tools**

### **Snow cover on road surface**

- the use of video as a method of measuring snow coverage will be evaluated in relation to existing performance standards
- evaluation will consider analogue and digital technologies for video imaging and archiving, automated methods of measuring snow cover from video, and sampling requirements in space and time

## Winter friction on road surface

- the use of surface friction measurements as a quality assurance tool will be evaluated in relation to existing performance standards
- evaluation will consider methods and equipment for measuring surface friction, relation between friction and snow cover, and sampling requirements in space and time

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## 2000-2001 Test Plan: Advanced Winter Maintenance Procedures

### Pre-wetting

- **Objectives:** reduce costs of winter maintenance and improve levels of service through better timing of operations, use of liquid and granular anti-icing/de-icing materials, and appropriate variation in application rates

### Anti-Icing

- **Objectives:** Prevent snow and ice from forming a bond with the pavement surface, by applying de-icing chemicals to the road shortly before the onset of a storm, which increases traffic safety and lessens environmental impacts by reducing de-icing chemicals necessary for winter operations.
- Continued anti-icing testing using liquid de-icing chemicals.

### Alternative De-icers

- several de-icing liquids will be compared for use in pre-wetting: sodium chloride brine; magnesium chloride brine; calcium chloride brine; Magic-00 proprietary chemical
- optimum rates of liquid application are also being investigated

### Winter Sand

- **Objective:** improve the level of traction provided by spreading sand on packed snow or ice by retaining it on the surface longer after spreading
- two methods are being investigated: optimizing the size gradation of the sand; pre-wetting the sand with a small quantity of liquid de-icer

## Flexible Snow Plow Blade

- **Objective:** reduce the need for applying salt by improving the effectiveness of plowing
- the flexible plow blade is designed to provide better contact with the pavement, leaving a thinner film of snow behind than a rigid plow blade does
- tests will compare the quantity of snow left behind, as well as the durability and service life of flexible versus rigid plow blades

## Automatic Vehicle Location (AVL)

- **Objective:** track patrolling, spreader, and plow operations in real time, and automatically archive information about plowing, salt, and sand spreading operations for later analysis and mapping
- commercial AVL systems will be installed on maintenance vehicles to demonstrate operational benefits
- an AVL system will also be linked with ARWIS so that road weather data can be viewed on the same screen as vehicle tracking data

## Snow Plow Lighting

- **Objective:** evaluate benefits or drawbacks of strobe lighting for winter operations vehicles

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## Project Test Sites

### Locations

- a 27 km section of Highway 21, between Springmount and Southhampton that includes the communities of Jackson, Albanley, Allenford, Elsinore and Chippewa Hill
- a 14.2 km secondary site on Highway 6, between Springmount and Hepworth that includes the communities of Cruickshank and Shallow Lake

## Site Geography

- subject to weather systems from Lake Huron and Georgian Bay, due to location at the base of the Bruce Peninsula
- experiences the highest snowfall in Ontario (annual average snowfall of 2.5 to 3.5 meters, falling on 45 to 75 days per winter), as well as a shorter winter thaw that allows for optimal test conditions
- experiences a variety of snow and frost conditions that are representative of most severe winter areas of the province, partly due to its diverse topography and land cover (rolling uplands, flat lowlands, forested and open areas, and swamps)
- has moderate traffic levels and highway speeds which provide safer testing conditions than the more densely populated areas of southern Ontario

## Test Sections

- 10 test sections in the main area, 4 test sections in the secondary area
- measurement sites are located at the midpoint of each test section
- changes in snow cover and surface friction over time will be closely monitored in these areas
- surveillance videos and street lights are located at six of the test sites
- recorded images are stored on a computer every 5 minutes
- cameras are focused almost vertically at the surface and are not intended or equipped for traffic surveillance

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## ARWIS Network Map


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