



Transportation Research Division



Technical Report 05-07

*Utilizing a Hot Applied Snowmobile Crossing
Mat to Eliminate HMA Abrasion*

Final Report, October 2009

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Introduction

Maine has 13,200 miles of picturesque snowmobile trails that cover the entire state from Aroostook County in the north to York County in the south. Tourists have been traveling to the state to enjoy the well groomed trails and warm greetings for many years. During the winter season, the number of snowmobile registrations range between 122,000 and 77,000 dependent on the amount of snowfall and length of season. The Interconnected Trail System (ITS) and connecting trails represent roughly 3,000 miles of the states trail system. An additional 10,000+ miles of trails crisscross the ITS connecting the more than 285 snowmobile clubs around the state. The ITS was created by utilizing discontinued rail road beds and timber logging roads and a number of trails follow existing power lines. In addition, many trails are cut through the woods by the more than 30,000 Maine Snowmobile Association members and individual club members who also maintain the entire trail system to ensure that all who use the trails have a safe and enjoyable ride.

Problem Statement

Many snowmobile trails intersect with Maine State Highways. The number of snowmobiles that cross a State Highway is dependent on the type of trail. ITS trails have the majority of snowmobile traffic followed by connecting trails. When a snowmobile crosses the highway the carbide blades on the skis abrade a portion of the pavement. The amount of abrasion is proportional to the number of snowmobiles crossing the highway. A typical Hot Mix Asphalt wearing surface layer is between 1.25 and 1.5 inches in depth and snowmobiles at high traffic intersections can scour thru the wearing surface in as little as three years. In an effort to reduce or eliminate pavement wear the Department of Transportation resurfaced three high volume snowmobile crossings with Norskilt Cleanosol E4190-35 Thermoplastic Snowmobile Crossing Material.

Location

Three snowmobile crossings in Aroostook County were selected to apply the snowmobile crossing material. Figure 1 contains a map of two experimental snowmobile crossing locations, one in the city of Bridgewater at the intersection of US Route 1 and ITS 83 and another in the city of Mars Hill at the intersection of US Route 1 and ITS 83A. The third crossing and a Control Section is displayed in Figure 2 and are located in the city of Presque Isle. The experimental crossing is at the intersection of State Route 167 and Connector 47. The Control Section is located at the intersection of State Street and Connector 47. All three experimental crossings and the Control Section have a high volume of snowmobile traffic.

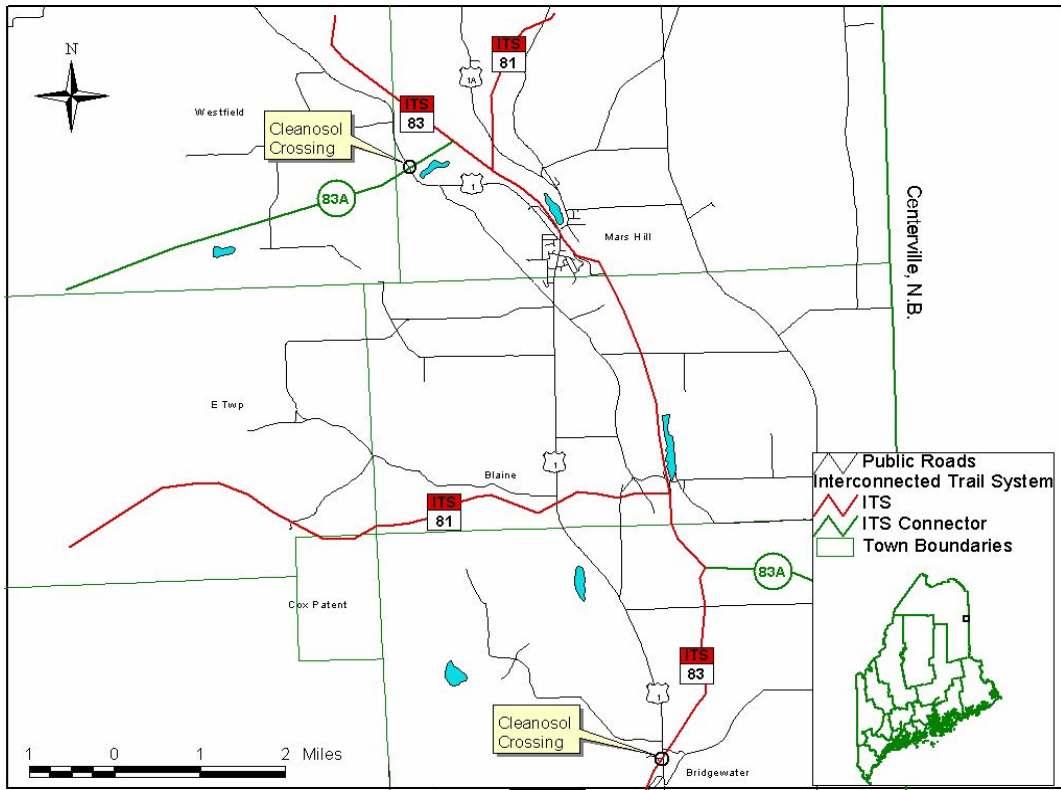


Figure 1. Bridgewater and Mars Hill Snowmobile Crossings

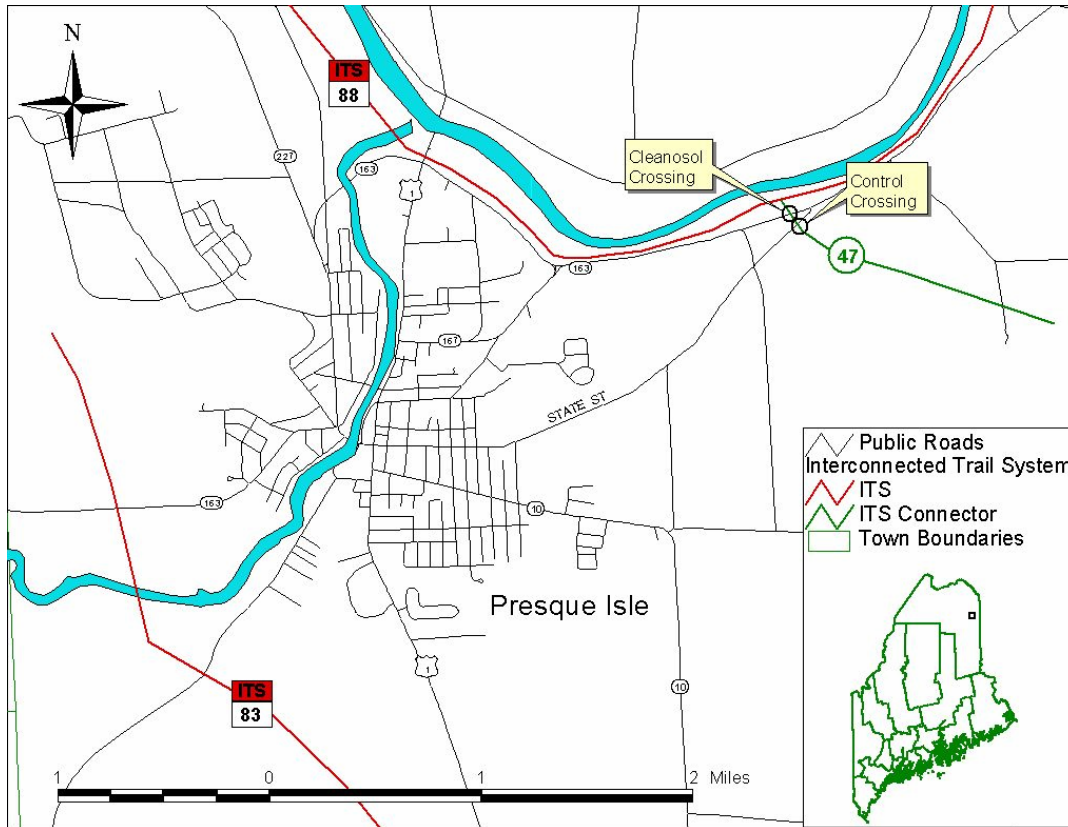


Figure 2. Presque Isle Snowmobile Crossings

Materials

Cleanosol E4190-35 Thermoplastic Snowmobile Crossing Material was utilized to protect the pavement from abrasion. Clark Highway Services from Lake City, Michigan were contracted to place the material. Material Safety Data Sheets state that at normal use E4190-35 is not classified as health hazardous is not combustible and is not considered harmful to the environment. The material is applied in three layers at a minimum depth of 0.09 inches per layer and at a temperature between 380° F and 420° F. Silica sand is spread on the surface of the hot mat to improve traction and bonding between layers. The material is colored gray to blend in with the surrounding pavement.

Construction

For Construction information, please refer to the Construction and First Interim Report dated August, 2007.

The estimated area and cost for all three crossings was 2000 square feet and \$12,000.00. The final measured area was 2169 square feet and a total cost of \$13,014.00 or \$6/s.f.

Evaluation

The experimental snowmobile crossings and control crossing were inspected on September 14, 2009.

Presque Isle, State Route 167 Crossing

The State Route 167 crossing in Presque Isle has reached its useful service life. Photos 1 thru 3 show that most of the material has worn away in the center of the mat, exposing the pavement. It is interesting to note that the shoulder area, see Photo 2, is wearing much better.



Photo 1 – Looking South



Photo 2 – Looking South



Photo 3 – Looking North

As mentioned in a previous report, anecdotal information gathered from area residents indicates this crossing may be subjected to significantly higher snowmobile traffic volumes than the other two crossings.

Presque Isle, State Street Control Crossing

As stated in the Construction and First year Interim report; it is unfortunate this control section was not provided a new wearing surface at the inception of this research.

The 2007 inspection indicated that most, if not all of the crossing appeared to have been patched with Hot Mix Asphalt (HMA). A small, softball size area was identified as being worn down to the HMA binder layer. Rutting, throughout the center of the crossing and in the direction of snowmobile travel had been patched. Additional slices, cut into the surface by snowmobile skis were visible.

The 2008 evaluation found several patched areas and areas in need of patch. As with the Route 167 experimental crossing, the north end of this crossing has an uphill approach and appears to be sustaining the most damage.

Photos 4 and 5 were taken during this 2009 inspection.



Photo 4 – State Street Control



Photo 5 – State Street Control

The Control section continues to sustain damage from snowmobile traffic. Each year, more and more wearing surface is eroded requiring additional patch material. Damage near the pavement edge, caused by accelerating snowmobiles is an on-going problem. To date, it appears maintenance crews patch this section at least once annually.

The Control section was last paved in 2001 according to the Presque Isle Public Works Dept. It is in need of re-paving at this time.

Mars Hill, US Route 1 Crossing

The 2009 evaluation found this section to be in generally good condition compared to the Presque Isle crossing. Plow wear is evident at high spots in the roadway. Both photos below show that the roadway shoulder area is wearing much better than the travel lanes. Obviously the combination of plowing and snowmobile traffic has a significant impact on the durability of this material.



Photo 6 – Mars Hill



Photo 7 – Mars Hill

After four years of exposure, this section continues to perform quite well. The Cleanosol product remains mostly intact in the areas of primary snowmobile travel. It is uncertain how the snowmobile traffic volume of this section compares to the other sections.

Bridgewater, US Route 1 Crossing

For the 2007 and 2008 inspections, this section was found to be in good condition. However the 2009 inspection shows significant wear in the center of the mat and more pronounced leading edge wear from snow plows. This crossing is very near the end of its service life. Snowmobile traffic volumes on this section are believed to be the second highest of the three under evaluation, with the Presque Isle crossing seeing more traffic.



Photo 8 – Bridgewater



Photo 9 – Bridgewater



Photo 10 - Bridgewater

Summary

After four years the crossings at Presque Isle and Bridgewater have reached the end of their service life. The experimental crossing mat in Mars Hill is performing better. However it does not experience the same volume of snowmobile traffic as Presque Isle and Bridgewater.

As part of the 2009 evaluation two additional crossings were inspected. The first located at the junction of Rt. 1 and ITS 88 in Presque Isle and the second located near the Presque Isle Hotel and Conference Center were both installed in 2007.



Photo 11 – Near Convention Center



Photo 12 – Rt. 1 / ITS 88 Junction

The Rt. 1/ITS 88 crossing has basically reached its service life after only two winters. This crossing experiences roughly the same amount of snowmobile traffic as the Rt. 167 crossing. The Convention Center crossing is in good condition but does not have much traffic.

A very rough cost analysis was completed to compare the experimental material to a conventional hot mix asphalt pavement repair. Three snowmobile crossings in Region 5 were repaired with hot mix asphalt in 2007. The costs for these repairs varied from \$1684 to \$4054. The Rt. 164 crossing in Crouseville (Washburn) cost \$4054 and had last been paved in 1998. Assuming a 60 ft. length and 12 ft. wide crossing at \$6/s.f., a Cleanosol installation would have cost about \$4320 at this location. The Cleanosol will last approximately 4 years under heavy snowmobile traffic. Based on our experience in Region 5, a hot mix asphalt crossing repair will last between 6 to 8 years before a similar pavement treatment is applied. The crossing will be maintained in the interim with patching. In other words the pavement will be allowed to deteriorate longer with occasional patches applied to fill potholes, etc. The same can be said of the Cleanosol crossing. Once it has deteriorated there will be a period that the pavement continues to

deteriorate before any other treatment is applied. For these reasons, this type of treatment is not cost effective when compared to a typical pavement repair.

There are other intangibles worth mentioning that could make this material more attractive to use. For example a number of snowmobilers that use the crossings were interviewed. All comments were favorable. The users said there is less drag when crossing making it less stressful crossing busy routes. Also at least during the service life of the material there is no pavement deterioration such as potholes or wearing that could create a potential safety hazard for highway traffic. The typical pavement repair will begin to deteriorate immediately. There is no doubt that the Cleanosol product will provide a safer crossing for both snowmobilers and motorists.

Any future decisions to install Cleanosol should consider the initial cost with plans to re-install within 4 to 6 years, long term maintenance repairs of the site if untreated, as well as the improved safety of the snowmobilers and the traveling public.

Prepared by:
Dale Peabody
Transportation Research Division Director
Maine Department of Transportation
16 State House Station
Augusta, Maine 04333-0016
Tel. 207-624-3305
e-mail: dale.peabody@maine.gov

With Assistance from:
Brent Bubar
Region 5 – Maintenance & Operations
Maine Department of Transportation