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# 2017-2018 Winter Maintenance Fact Sheet

Photo courtesy of Travis Novitsky.

**MnDOT District 1**, headquartered in Duluth and Virginia, has a time-proven, rapid response plan in place for state highway winter maintenance in Northeastern Minnesota. The goal of this plan is to clear the roadways of snow and ice in a timeframe acceptable to District 1's customers.

This plan is guided by road type and traffic volume.

The backbone of District 1's winter highway maintenance service is its strategically located network of 19 highway maintenance truck stations. Each of these facilities is staffed by MnDOT Maintenance employees, experienced and trained in snow and ice removal techniques. Each truck station has the necessary equipment and materials to allow them to independently mobilize to meet the winter maintenance needs of Northeastern Minnesota. These truck stations are located at:

| South Sub-area | Lakes Sub-area | Duluth Sub-area | Range Sub-area | Border Sub-area | North Shore Sub-area |
|---|---|---|---|---|---|
| Carlton | Grand Rapids | Pike Lake | Ely | I-Falls | Grand Marais |
| Moose Lake | Floodwood | Nopeming | Virginia | Littlefork | Silver Bay |
| Sandstone | McGregor | | Hibbing | Deer Lake | Two Harbors |
| Pine City | | | | Cook | |

MnDOT's response to snow and ice events is based on a communications-centered approach that involves reports from citizens, the Minnesota State Patrol, other law enforcement agencies, emergency service providers and MnDOT personnel. Management of this information is coordinated between MnDOT Maintenance supervisors and the State Patrol Dispatch Centers. MnDOT also provides round-the-clock, Road Patrol services to rapidly respond to localized conditions such as frosty bridge decks or

snow squalls. The Road Patrol units call for additional personnel and heavy equipment support as the weather situation warrants.

There is also extensive use of real-time weather information provided by 20 Road Weather Information Sensing Systems (RWIS) that are strategically located throughout Northeastern Minnesota. These remote weather sensing stations provide continuous district-wide and local weather profiles of Northeastern Minnesota that can be accessed through an Internet connection. District 1 also uses weather forecasting services from the National Weather Service and private professional weather information services.

During significant winter weather situations, District 1 employees can be quickly deployed on a 24/7 basis to remove snow and ice from state highways.

When icing conditions are forecast, maintenance employees apply "anti-icing" chemicals to the roadway. Having this material on the roadway helps prevent snow and ice from sticking to and compacting on the pavement.

MnDOT has 97 snow plow routes in the District's region of responsibility. These routes are staffed with personnel, heavy equipment and material to provide continuous road maintenance coverage until the snow/ice event subsides and is ultimately cleaned up. District 1 has 353 fulltime equivalent employees, of which 194 are trained snow plow operators. The District's equipment assets include 91 snow plow trucks (30 single axle; 61 tandem axle), which are equipped with front-mounted snow plows, wing plows, underbody plows, boxes for carrying dry deicing materials, pre-wetting tanks, high-visibility lighting, road temperature sensors and state-of-the-art communications equipment.

Pre-wetting tanks allow the application of salt or sand that is blended with salt brine, potassium acetate, or magnesium chloride. These liquids cause the salt to go "into solution" rapidly so that the salt begins to work quickly. Pre-wetting also helps the salt or sand stick to the road, rather than being blown off by passing traffic. Additional specialized heavy equipment in the District's fleet includes 6 motor graders, nine industrial-sized snow blowers and 20 front-end loaders.

Although state highway deicing standards are variable, a general rule of thumb is that pure road salt losses its effectiveness as a deicer when roadway pavement temperatures are lower than 15F. Liquid magnesium chloride is effective at roadway pavement temperatures as low as 0 degrees.

If it is sunny, the pavement temperature of asphalt roadways can be much warmer than the temperature of concrete pavements because of asphalt's solar heat-absorbing dark color, as opposed to the more solar-reflective lighter color of concrete.

When treating icy pavements in sub-zero temperatures, pure abrasive sand, pre-wet with liquid magnesium chloride is commonly used. This mixture results in a "sandpaper effect". The sand melts into the ice and compacted snow and creates an abrasive condition which improves traction; however it is not fully-effective in deicing pavements. If the pavement temperature is higher than 15F, the operator will most likely apply pure road salt, moistened with salt brine.

For the 2017-18 season, District 1 is performing research on the expanded use of potassium acetate as an alternative deicing chemical, effective at melting ice at temperatures to -15F and used successfully last

year in a fixed spray system in Duluth. This research includes full-time substitution on 2 plow routes in the Duluth area with experimentation on application methods, timing and rates and performance observation. An added benefit is an associated reduction of chloride introduced into the environment.

The quantities of deicing materials used during the winter of 2016–17 (rounded figures) in MnDOT District 1 were:

1. Road salt – 35,529 tons (current average price is approximately $57 per ton)
2. Sand – 18,509 tons (current average price is approximately $7 per ton)
3. Liquid magnesium chloride – 20,857 gallons (current price is approximately $1.20 per gallon)
4. Salt brine – 319,366 gallons (D1 makes salt brine in-house by mixing water and salt)
5. Liquid calcium chloride – 14,270 gallons
6. Salt brine additive (beet juice) – 1,873 gallons
7. Potassium acetate – 4,139 gallons
8. The average cost per-lane-mile for snow and ice maintenance was $3,503.

MnDOT District 1 maintains 1,600 miles (3,710 lane miles) of state highways and 589 bridges.

During the winter of 2016-17, an average of 80.1 inches of snow fell in Northeastern Minnesota.

District 1's annual operating budget is approximately $42 million (this does not include the district's highway construction program). During the winter of 2016-17, District 1 spent just under $13 million on winter highway maintenance services. These costs were paid for from the operating budget.

Because of the severity of Northeastern Minnesota winters, MnDOT District 1's annual spending plan is greatly influenced by the cost of keeping the district's roadways clear of snow and ice. A particularly harsh winter results in extra expenses for material, equipment and personnel. District 1 balances its operating budget by modifying summertime work such as pothole filling, road crack sealing and other maintenance activities like roadside mowing.

You can learn more about MnDOT District 1 and MnDOT's statewide highway maintenance operations by visiting MnDOT's website at www.mndot.gov.

**Additional information:**
For statewide, real-time road condition and weather information log onto www.511mn.org or dial 511 on your phone.
For winter preparedness information: http://www.winterweather.state.mn.us/.
For National Weather Service information: http://www.crh.noaa.gov/dlh/.

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