STATE OF MONTANA

Montana Department of Transportation
Maintenance Division
Helena, Montana 59620

Memorandum

To: D. John Blacker, Maintenance Administrator

From: Dan Williams and Clayton Linebarger
Maintenance Review Section

Date: December 29, 2000

Subject: Winter Maintenance in Thompson Falls

A winter storm event, beginning December 14 in the Thompson Falls area, resulted in numerous complaints regarding driving conditions on MT 200 (P-6) between the Plains section (Missoula Division) and the Thompson Falls section (Kalispell Division). The Plains section had bare road while the Thompson Falls section had snow and ice pack when the storm had passed.
At Stephen Herzog's (Kalispell Area Maintenance Engineer) request, Maintenance Review was assigned the task of finding out why this happened. The Review team went to the area on a fact-finding tour on December 21 and 22 to Plains, Thompson Falls, Swan and Seeley sections.

Observations:

- The storm event was more severe in Thompson Falls area resulting in 15" of snow and 8 hours of freezing rain on Saturday compared to 8" snow and no rain in Plains. Temperatures were comparable between the two sections.
- The difference in surface conditions was defined exactly on the line separating the Plains and Thompson Falls sections meet indicating something other than weather conditions was responsible for the differences. *The attached photos are not the location where the sections meet but correctly illustrate the differences between the sections.*
- There appeared to be no lack of effort from personnel in attacking the event with equipment, personnel and materials available for either section. Thompson Falls' tandem truck was broke down on the 17th. Overtime was a discretionary call made by the section supervisors, in both sections, on an "as needed" basis with support from Division Headquarters.
- Both sections have dedicated the same winter Level of Service, Level II (High Volume >1,000 to < 3,000 ADT) for the piece of road they share. Level II indicates, "17 hours – 5:00 AM till 12:00 AM or until snow packed and/or icy surfaces have been treated with abrasive, abrasive/chemical combinations."

Differences: Interviews with field personnel and management, in both Divisions, and reference to MMS records indicate differences in their approach to winter maintenance.

- **Thompson Falls (12-11) –** Kalispell management closely monitored quantities of salt or magnesium chloride used by each section because of their interpretation and application of the Level of Service Guidelines and their concern over their budget. Quantities of both salt and magnesium chloride are estimated prior to the beginning of winter and the sections are expected to live within those limits during a typical winter. This has resulted in a more conservative chemical content (4% salt to sand) in anti-skid materials in an attempt to ensure adequate supplies for the entire winter. Direct application of liquid magnesium is reserved for PM-10 non-attainment areas only.

    - During the storm, 800 gallons of liquid magnesium chloride was used in saddle tanks of a plow truck for enhancing anti-skid performance (pre-wetting). In addition, 750 gallons was applied directly (anti-icing and de-icing) to the 5-mile stretch of PM-10 non-attainment area in town resulting in a bare road condition.

    - The 4-year average (1997-2000) centerline mile cost (labor, equip, materials) **for winter maintenance on P-6 in this section is $1,750.75.** (See graphs for more details)

P-6 on Thompson Falls Section

- **Plains (11-17) –** Missoula's management approximates the quantity of salt and magnesium chloride needed for an average winter, for bid purposes, but allows additional orders of chemical if needed and determined by the field maintenance

supervisors. This contributes to a relatively higher chemical content (7.5% salt to sand) compared to Kalispell. The higher chemical content will result in faster and more complete snow and ice break-up.

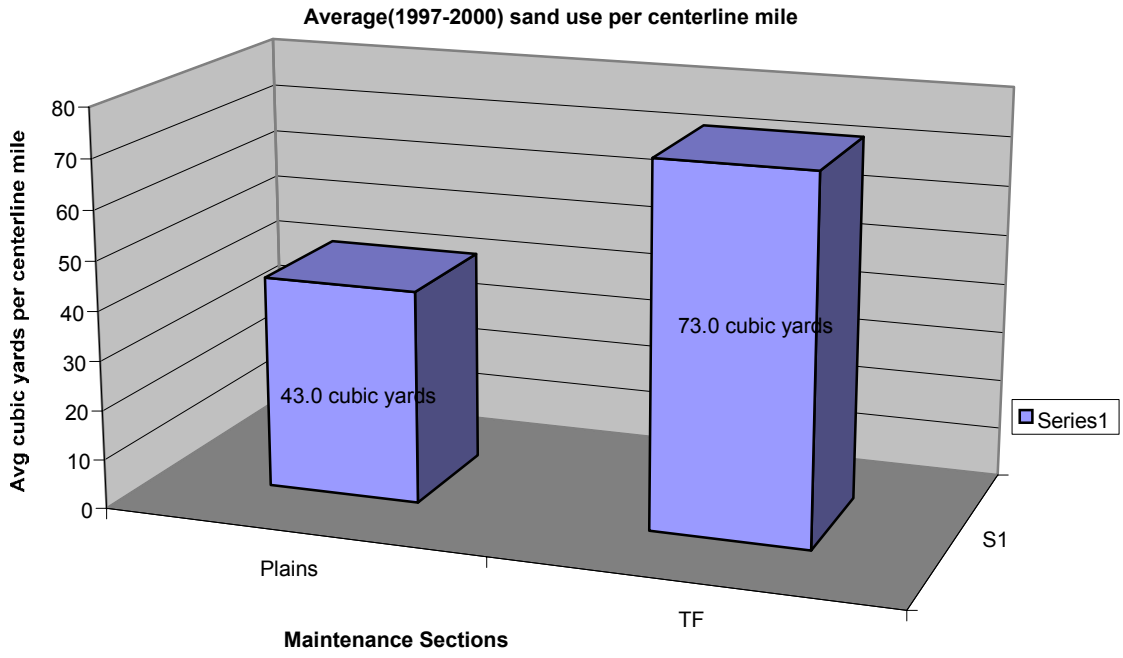
- During the storm, 3,000 gallons of liquid magnesium chloride was applied anti-icing and after the storm de-icing. The majority of chemical used is through the town of Plains and south (P-35, P-36 and P-6). This is about twice the chemical used by Thompson Falls and resulted in bare roads throughout most of the section.

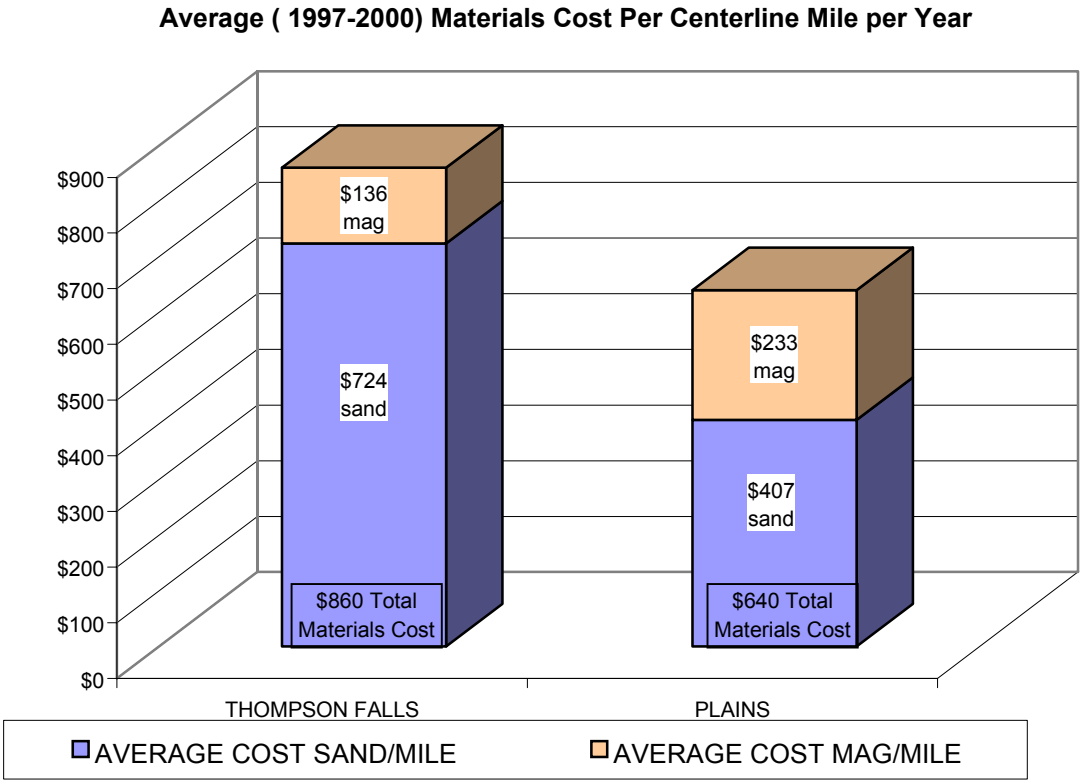
- The 4-year average centerline mile cost (labor, equip, materials) **for winter maintenance on P-6 in this section is $1,095.70.** (See graphs for more details)

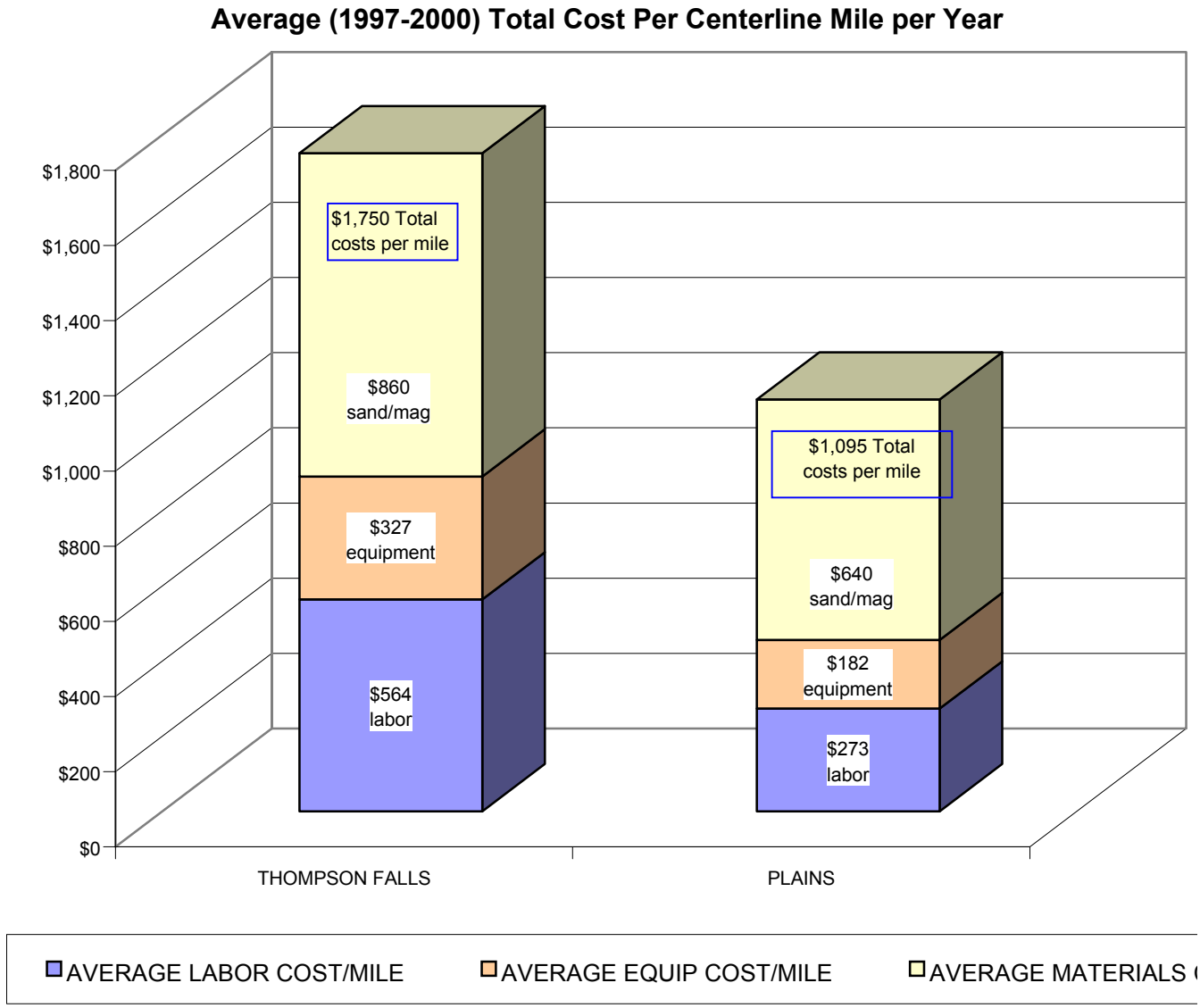
P-6 on Plains Section

The following are graphs indicating average MMS costs for years 1997 through 2000 for activity 7205.

This first graph indicates the difference in the quantity of sand used by both sections per centerline mile per year.


Average(1997-2000) sand use per centerline mile
Avg cubic yards per centerline mile
80
70
60
50
40
30
20
10
0
43.0 cubic yards
73.0 cubic yards
Series1
S1
Plains
TF
Maintenance Sections


Average (1997-2000) Materials Cost Per Centerline Mile per Year
$900
$800
$700
$600
$500
$400
$300
$200
$100
$0
$136
mag
$724
sand
$860 Total
Materials Cost
$233
mag
$407
sand
$640 Total
Materials Cost
THOMPSON FALLS
PLAINS
AVERAGE COST SAND/MILE
AVERAGE COST MAG/MILE



Perspective:

Winter Maintenance Guidelines for Level II roads indicate treatment of snow pack with abrasives or abrasives/chemical combination. There is no mention of how much chemical or which kind can be mixed with abrasives. To quote the last line of the guidelines, "anti-icing strategies and techniques will not be implemented on Level II routes unless it can be documented to be cost effective to do so". This review appears to show that it is more cost effective in this area of the state.

MDT's Maintenance Administrator, John Blacker, pointed out that our Level of Service Guidelines imply that bare roads are our goal but with Level II roads we will settle for plowed and sanded roads if that's all we can get in the allotted work time. Then

readdress the condition the next day.
It became evident during this review that MDT should re-visit our Winter Maintenance Guidelines from a statewide perspective in the near future.

As with the asphalt Pavement Management System (PvMS), this review appears to point out the benefits of **preventive** versus **reactive** winter maintenance.

- **Preventive =** Early application of liquids prevent snow pack and/or help ensure early break–up of snow pack.

- **Reactive =** Repeated application of salt/sand materials to provide temporary traction on a snow packed roadway.

Preventive, in this case, is cost effective because achieving or maintaining a "bare road" during a storm or soon after does not require follow up applications of abrasives on snow pack which requires labor and equipment. The end result of this method is a safer road that more reflects the intent of MDT's Mission Statement.

It's important to point out that these results and comparisons are appropriate for this climatic region only. Colder regions with other variables must be evaluated independently to determine if direct liquid application in rural areas is a benefit over traditional methods.

Current and future action items in the Kalispell Area

Stephen Herzog took these review findings one or two steps further. Stephen researched, developed and provided cost comparison charts to each section in the Kalispell Area. These comparisons are on an annual lane mile cost instead of annual centerline costs. Lane mile costs allow comparison between sections with multi-lane roads to those with two lane roads. It is apparent that there are savings to be realized in sand, labor and perhaps equipment. In addition to savings and of great importance, is the improved level of service to the driving public which translates into safety and reduced negative impact to water and air quality. The result of these findings encouraged Stephen to develop an area wide program that incorporates preventive winter maintenance techniques into existing reactive maintenance. This program will take several years to fully implement and will be done in stages.

Staff from Helena's Maintenance office met with Kalispell's field and office management to discuss current conditions and help develop plans for the future. Maintenance Review and Kalispell's Maintenance Superintendents visited every section and talked with personnel about winter maintenance.

Immediate Changes

- Increase the quantity of salt and magnesium chloride available to the field

sections
- Identify and expand areas where direct liquid could be used
- Identify equipment needs to efficiently use chemical
- Identify storage sites and quantities for salt/sand and liquid chemical
- Discuss perspectives, goals and objectives with employees regarding winter maintenance and develop plans
- Track changes in results of winter maintenance efforts with more chemical use

Near Future

- Purchase liquid storage tanks for sections
- Calibrate and install existing ground speed control systems
- Purchase saddle tanks for pre-wet systems on tandem axle trucks
- Purchase direct liquid distribution systems to expand areas of anti and deicing (possible use of air quality funds through Planning for these purchases)
- All sand crushing contracts will have at least 5% by weight of salt blended into the first year's use
- Use a new sand gradation specification to improve storage and performance
- Develop a winter maintenance seminar to address training needs in the Area for the Fall of 2001
- Develop individual section plans for winter maintenance
- Build sand storage facility at Libby and prioritize other sites
- Develop communications with neighboring winter maintenance providers
- Develop cost and benefit driven managed transition temperatures for switching from liquid chemical use to abrasive use
- Fleet size analysis for the Area and eventually the District and statewide

Longer Range

- 10,000 gallon minimum storage for all direct liquid application sites
- Have liquid distribution trucks with computer controls at all appropriate sites
- Use infra red thermometers on direct liquid trucks to thermal map sections
- Cover all salt/sand piles where appropriate
- Identify all appropriate areas for use of direct liquid; develop plans and timing for application and track costs and benefits.
- Look into weather forecast sources and methods of distributing to the field
- Look into the possibility of providing more sunlight to the roadway through thinning trees on the right of way

Expected Benefits

1. Provide a seamless winter level of service for the driving public as they travel through or between communities, areas, states or countries.
2. Reduce the use and dependency of abrasives for winter maintenance

3. Improve safety to the traveling public
4. Reduce the costs associated with winter maintenance for equipment, materials and labor.
5. By reducing our use of abrasives we can reduce the negative impacts caused by abrasives such as, but not limited to;
    - Damage to windshields and headlights
    - Wear and coverage of paint stripes
    - Contributing to poor air quality (PM10)
    - Accumulation of abrasives in streams (Endangered Species Act concerns)
    - Expense and damage related to poor drainage or cleaning drainage facilities.

Statewide

The lessons learned in Kalispell should be considered and appropriately applied on a statewide basis. We should in the immediate future;

- Develop communications with neighboring winter maintenance providers
- Attempt to provide a seamless level of service for the driving public
- Develop and use better sand gradations to meet our current needs
- Re-visit Level of Service Guidelines for definition and clarification of terms, objectives and conditions.
- Develop a means of measuring out comes of winter maintenance activities.