PERCEPTIONS OF HIGHWAY MAINTENANCE IN MONTANA: THE RESULTS OF A TELEPHONE SURVEY

FINAL REPORT

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16. Abstract Trained interviewers at the Computer Assisted Telephone Interviewing Laboratory at Montana State University, Billings completed 1,005 interviews with randomly selected adult residents of Montana between September 7 and September 15, 1996 for the purpose of obtaining the perceptions the respondents held about the maintenance of interstate and state highways in Montana.

For the purposes of the survey, highway maintenance was divided into eight categories: winter maintenance, maintaining a smooth highway surface, maintenance of roadsides, maintenance of signs, debris removal, rest stop maintenance, striping maintenance, and winter road conditions reports.

When respondents were asked to rate the current state of each of these activities on a 1 to 4 scale where 1 = poor, 2 = fair, 3 =good and 4 = excellent, signage was rated highest with a mean of 3.04, winter roadway information was rated second at 2.89, debris removal, winter maintenance, rest stop maintenance, striping maintenance and roadside maintenance received ratings from 2.78 to 2.73 and surface smoothness was rated last with a mean of 2.40.

When respondents were asked how important each of these activities were to them on a scale of 1 to 4 where 1 = not important, 2 = somewhat important, 3 = important, and 4 = very important, winter maintenance was rated most important with a mean importance rating of 3.72, followed by winter roadway information (3.53), striping maintenance (3.50), debris removal (3.44), surface smoothness (3.35), signage (3.29), rest stop maintenance (3.22) and roadside maintenance (2.90).

When respondents were asked to think about the allocation of MDT resources and assign a resource priority of low (1), medium (2), moderately high (3), or very high (4) to each activity, winter maintenance received the highest resource priority rating (3.56) followed by winter roadway information (3.32), striping, (3.22), debris removal (3.06), surface smoothness (3.05), rest stop maintenance (2.97), signage (2.90) and roadside maintenance (2.51).

Finally, these ratings were combined into a composite variable for each of the maintenance activities. The composite variable provides an indication of the level of attention and resources the respondents believed each maintenance activity should receive from MDT. According to the respondents, MDT should now pay attention and provide resources to maintenance activities on interstates and state highways in Montana in the following order: winter maintenance, surface smoothness and highway striping, debris removal, winter roadway information and highway signage, rest stop maintenance and roadside maintenance.

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ABSTRACT

Trained interviewers at the Computer Assisted Telephone Interviewing Laboratory at Montana State University, Billings completed 1,005 interviews with randomly selected adult residents of Montana between September 7 and September 15, 1996 for the purpose of obtaining the perceptions the respondents held about the maintenance of interstate and state highways in Montana.

For the purposes of the survey, highway maintenance was divided into eight categories: winter maintenance, maintaining a smooth highway surface, maintenance of roadsides, maintenance of signs, debris removal, rest stop maintenance, striping maintenance, and winter road conditions reports.

When respondents were asked to rate the current state of each of these activities on a 1 to 4 scale where 1 = poor, 2 = fair, 3 =good and 4 = excellent, signage was rated highest with a mean of 3.04, winter roadway information was rated second at 2.89, debris removal, winter maintenance, rest stop maintenance, striping maintenance and roadside maintenance received ratings from 2.78 to 2.73 and surface smoothness was rated last with a mean of 2.40.

When respondents were asked how important each of these activities were to them on a scale of 1 to 4 where 1 = not important, 2 = somewhat important, 3 = important, and 4 = very important, winter maintenance was rated most important with a mean importance rating of 3.72, followed by winter roadway information (3.53), striping maintenance (3.50), debris removal (3.44), surface smoothness (3.35), signage (3.29), rest stop maintenance (3.22) and roadside maintenance (2.90).

When respondents were asked to think about the allocation of MDT resources and assign a resource priority of low (1), medium (2), moderately high (3), or very high (4) to each activity, winter maintenance received the highest resource priority rating (3.56) followed by winter roadway information (3.32), striping, (3.22), debris removal (3.06), surface smoothness (3.05), rest stop maintenance (2.97), signage (2.90) and roadside maintenance (2.51).

Finally, these ratings were combined into a composite variable for each of the maintenance activities. The composite variable provides an indication of the level of attention and resources the respondents believed each maintenance activity should receive from MDT. According to the respondents, MDT should now pay attention and provide resources to maintenance activities on interstates and state highways in Montana in the following order: winter maintenance, surface smoothness and highway striping, debris removal, winter roadway information and highway signage, rest stop maintenance and roadside maintenance.

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INTRODUCTION

This report summarizes the procedures and findings of a telephone survey conducted for the Montana Department of Transportation (MDT) by the Computer Assisted Telephone Interviewing Laboratory at Montana State University, Billings. The purpose of the survey was to determine the perceptions of the maintenance of state highways and interstates in Montana held by adult Montanans. The survey was conducted from September 7 to September 15, 1996.

METHODOLOGY

In preparation for the development of the survey instrument, Dr. Joe Floyd and Dr. John Mounce met with Montana Department of Transportation (MDT) personnel. At this meeting, an eight part typology of maintenance activities was constructed for the purposes of the survey: winter maintenance, smooth pavement, roadside management, sign replacement, removal of road debris, rest area maintenance, and highway striping and delineation. The complete results of this meeting were summarized in "Customer Opinion Survey of Highway Maintenance Services, Phase One Report: Survey Needs" (Floyd, 1996a).

In addition, Dr. Floyd collected survey research materials from transportation departments in other states and provinces which had recently undertaken customer satisfaction surveys. Questionnaires from the states of Washington, Wyoming, Virginia, Minnesota and the province of Saskatchewan were examined. The complete results of this examination are contained in "Customer Opinion Survey of Highway Maintenance Services, Phase Two Report: Survey Research in Other States" (Floyd, 1996b).

A draft questionnaire was prepared on the basis of information received from MDT personnel and questionnaires used in other states. This instrument was submitted to MDT personnel for comment and then modified by MDT personnel. A complete copy of the final questionnaire is contained in Appendix Two of this report.

The survey was conducted by trained interviewers from the Computer Assisted Telephone Interviewing Laboratory (CATI Lab) at Montana State University, Billings. A random digit dialing sample was purchased from Genesys Sampling Systems (Ft. Washington, PA.) Telephone numbers were called back up to five times in an attempt to complete interviews. A total of 1005 interviews were completed, in an average of 12 minutes, requiring 6,350 telephone calls to 4,467 telephone numbers. Interviewers actually spoke to 1,689 eligible potential respondents and 1,005 or 59.5% of these potential respondents were successfully interviewed. Table One summarizes the disposition of each of all calls.

Upon completion of all interviewing, the data was electronically transferred from the CATI computer system to the VAX 4000 computer system at Montana State University, Billings. The computer program Statistical Package for the Social Sciences (SPSS) was used to analyze the data.

TABLE ONE
DISPOSITION OF ALL TELEPHONE CALLS

No Answer	1,432	22.5%
Non Working Number	1,208	19.0%
Complete	1,005	15.9%
Answering Machine	929	14.6%
Refused	649	10.2%
Busy	440	6.9%
Call Back	262	4.1%
Non Residential Number	219	3.4%
Fax or Computer	137	2.2%
Wrong Category	34	0.6%
Hearing Problem	16	0.3%
Language Problem	3	0.1%
Incompetent Respondent	6	0.1%
Hung Up or Argumentative	10	0.1%
TOTAL	6,350	100.0%

The results of the survey have a margin of error of about $\pm$ 3% when generalized to the entire state. The MDT has divided the state in five administrative districts, and the margins of error within these districts vary from $\pm$ 6% in the Missoula District to $\pm$ 10% in the Glendive District (see Appendix One for map of districts).

FINDINGS

Who Are the Respondents

Demographic Characteristics

Table Two summarizes the basic characteristics of the 1,005 respondents. In Table Two as well as all of the tables summarizing responses, the frequency column may not always total 1,005 because not all respondents answered each question and "don't know" or "no response" answers are not reported until they reach at least 5% of the entire sample. Table Two shows that half the respondents were male and half were female. Notice that interviewers were not able to ascertain the sex of two of the respondents. The mean age of the respondents was 45.4; 30.8% of the respondents were thirty five years old or less, 26.4% were 56 or over and the remainder of 42.8% were between 36 and 55.

The mean educational attainment of the respondents was 13.8 years of education; 5.2% had not completed high school while 37.1% had completed just high school, 26.1% had completed some college and 31.6% had at least a college degree.

The mean length of time respondents had been in Montana was 31 years; 46.9% of the respondents reported they had lived in Montana over 30 years while 11.8% indicated they had been in Montana for 5 or less years.

TABLE TWO
DEMOGRAPHIC CHARACTERISTICS OF THE RESPONDENTS

Sex

Male	502	50.0%
Female	501	50.0%

Age

18 - 25	101	10.1%
26 - 35	207	20.7%
36 - 45	243	24.3%
46 - 55	185	18.5%
56 - 65	122	12.1%
65 - 75	99	9.9%
Over 75	44	4.4%

Mean Age = 45.4

Educational Attainment

8th Grade or Less	21	2.1%
Some High School	31	3.1%
High School Graduate	371	37.1%
Some College	261	26.1%
College Graduate	221	22.1%
Post Graduate Education	95	9.5%

Mean Educational Level = 13.8

Length of Montana Residence

1 - 5 Years	118	11.8%
6 - 10 Years	88	8.8%
11 - 20 Years	143	14.3%
21 - 30 Years	184	18.4%
Over 30 Years	469	46.9%

Mean Length of Montana Residence = 31.0 Years

County and Administrative District of Residence

Table Three summarizes the respondents' county of residence, which was obtained by converting telephone prefixes. It was not possible to place 7 telephone numbers into counties. The first part of Table Three shows that respondents lived in 53 of Montana's 56 counties. About 13% of the respondents lived in Yellowstone County while10.8% lived in Flathead County, 10.3% lived in Missoula County, 8.4% lived in Cascade County, 7% lived in Gallatin County and 6.2% lived in Lewis and Clark County. Discrepancies

between the percentages of the sample that reside in each county as compared with the percentage of the population of Montana in that county can be explained by a number of factors such as: differences in percentages of households with telephones, self selection biases that differ by county, and changes in actual population figures since the last measurement of such figures.

Table Three also shows nearly 33% of the respondents lived in District 1, Missoula; 15.7% lived in 2, Butte; 21.8% in District 3, Great Falls; 9.4% in District 4, Glendive; and 20.3% District 5, Billings. A map showing the MDT Administrative Districts is included in this report as Appendix One.

This survey was conducted was conducted by county line, as close to the Administrative Districts as possible. However, some counties are split between administrative districts, refer to Appendix One.

TABLE THREE
LOCATION OF RESPONDENTS' RESIDENCES

County of Location		
Beaverhead	10	1.0%
Big Horn	14	1.4%
Blaine	5	0.5%
Broadwater	5	0.5%
Carbon	9	0.9%
Cascade	84	8.4%
Chouteau	6	0.6%
Custer	11	1.1%
Daniels	3	0.3%
Dawson	10	1.0%
Deer Lodge	16	1.6%
Fallon	5	0.5%
Fergus	16	1.6%
Flathead	108	10.8%
Gallatin	70	7.0%
Garfield	3	0.3%
Glacier	11	1.1%
Golden Valley	2	0.2%
Granite	4	0.4%
Hill	19	1.9%
Jefferson	8	0.8%
Judith Basin	3	0.3%
Lake	35	3.5%
Lewis and Clark	62	6.2%
Liberty	1	0.1%
Lincoln	15	1.5%
McCone	2	0.2%
Madison	5	0.5%

Meagher	4	0.4%
Mineral	5	0.5%
Missoula	103	10.3%
Musselshell	5	0.5%
Park	7	0.7%
Petroleum	2	0.2%
Phillips	6	0.6%
Pondera	12	10.2%
Powell	6	0.6%
Prairie	1	0.1%
Ravalli	43	4.3%
Richland	11	1.1%
Roosevelt	13	1.3%
Rosebud	8	0.8%
Sanders	7	0.7%
Sheridan	7	0.7%
Silver Bow	32	3.2%
Stillwater	14	1.4%
Sweetgrass	4	0.4%
Teton	12	1.2%
Toole	6	0.6%
Treasure	2	0.2%
Valley	14	1.4%
Wheatland	3	0.3%
Yellowstone	129	12.9%
TOTAL	998	100.0%

Administrative District

1 Missoula	326	32.7%
2 Butte	157	15.7%
3 Great Falls	218	21.8%
4 Glendive	94	9.4%
5 Billings	203	20.3%
TOTAL	998	100.0%

Travel Characteristics

The respondents were asked several questions about their vehicle travel patterns. Table Four summarizes the results of these questions. Table Four shows that 54.4% of the respondents indicated they drive more than 15,000 miles per year while 45.6% drove less than 15,000 miles. The most common trips made by respondents were personal or family errands (44.6%), followed by commuting (24.4%) and then work related trips (16.1%).

TABLE FOUR
RESPONDENTS' TRAVEL CHARACTERISTICS

Drive More or Less Than 15,000 Miles Per Year

More	539	54.4%
Less	452	45.6%
TOTAL	991	100.0%

Typical Trip

Personal/Family	444	44.6%
Commuting	243	24.4%
Work Related Trips	160	16.1%
Professional Driver	50	5.0%
Other Combinations	44	4.4%
Agriculture	25	2.5%
Work and Personal/Family	21	2.1%
Commute and Personal/Family	8	0.8%
TOTAL	995	100.0%

Driven in Other States In Last Twelve Months

Yes	733	73.3%
No	267	26.7%
TOTAL	1,000	100.0%

Nearly three quarters of the respondents indicated they had driven in other states within the last 12 months.

General Perception of Montana Highways and Interstates

Rating of Montana Highway Maintenance

The respondents were asked to rate overall interstate and state highway maintenance in Montana using the responses poor, fair, good and excellent. Table Five shows that 5.6% of the respondents rated overall maintenance as poor while 35.6% rated maintenance fair, 53.1% rated maintenance good and 5.8% rated maintenance excellent. The mean overall rating of maintenance on a 1 to 4 scale where 1 is poor, 2 is fair, 3 is good and 4 is excellent was 2.59.

The respondents were also asked how important highway maintenance was to them. Table Five shows that 62.2% indicate that highway maintenance is very important to them while another 29.4% think maintenance is important.

The respondents who had driven within other states within the last 12 months were asked to compare Montana interstates and highways with highways and interstates in the other states in which they had driven. Table Five shows that 45.7% of these respondents thought interstates and highways in Montana were about the same as interstates and

highways in the other states in which they had driven. Nearly one third of the respondents who had driven in other states believed interstates and highways in Montana were worse than interstates and highways in those states, while 22.6% believed interstates and highways in Montana were better than those in the other states.

TABLE FIVE
GENERAL PERCEPTIONS OF MONTANA ROADWAYS

General Rating

Poor	56	5.6%
Fair	357	35.6%
Good	531	53.1%
Excellent	58	5.8%
TOTAL	1,002	100.0%

Mean Rating = 2.59

Importance of Highway Maintenance

Not important	7	0.7%
Somewhat Important	77	7.7%
Important	295	29.4%
Very Important	623	62.2%
TOTAL	1,002	100.0%

Mean Importance = 3.53

Comparison Of Montana Highways with Highways in Others States

Montana Worse	232	31.7%
Same	334	45.7%
Montana Better	165	22.6%
TOTAL	731	100.0%

Note: Only asked of the 733 people who said they had driven in other states in last 12 months

Comparison of Montana Winter Maintenance with Winter Maintenance in Others States

Montana Worse	104	21.1%
Same	213	43.2%
Montana Better	176	35.7%
TOTAL	493	100.0%

Note: Only asked of the 733 people who said they had driven in other states in last 12 months. Of those, 240 respondents did not have an opinion.

Comparison of Rest Area Maintenance in Montana with Rest Area Maintenance in Other States

Montana Worse	189	32.5%
Same	281	48.4%
Montana Better	111	19.1%
TOTAL	581	100.0%

Note: Only asked of the 733 people who said they had driven in other states in last 12 months. Of those, 152 had no opinion.

Forty-three percent of the respondents who had driven in other states in the last 12 months and who had an opinion believed winter maintenance in Montana and other states was about the same, while 35.7% believed winter maintenance in Montana was better and 21.1% believed that winter maintenance was better in other states.

Forty-eight percent of the respondents who had driven in other states in the last 12 months and who had an opinion believed that rest stop maintenance in Montana and other states was about the same while 32.5% believed rest stop maintenance was worse in Montana and 19.1% believed rest stop maintenance was better in Montana.

Statistically Significant Relationships Between General Rating of Montana Highway Maintenance and Demographic/Travel Variables

To further investigate the perceptions of the respondents, all rating questions were crosstabulated with Administrative District, sex, age, educational attainment, length of Montana residence, the respondent's typical trip, whether the respondent had driven more or less than 15,000 miles, and whether or not the respondent had driven in other states within the last 12 months. A statistically significant relationship was deemed to exist when the probability of getting the observed outcome by chance was less than 5%. Only statistically significant relationships are reported in this report.

Statistically significant relationships were found between the respondents general rating of highway maintenance and educational attainment, typical trip, and whether or not the respondent drove over 15,000 miles per year. Generally, the more highly educated the respondent the better they rated highway maintenance. Respondents who reported they were professional drivers rated maintenance the lowest while those who said their typical trip was family or personal errands rated maintenance the highest. Finally, respondents driving less than 15,000 miles per year rated general maintenance higher than did respondents driving over 15,000 miles per year.

Respondents' Opinion of the Personal Importance of Highway Maintenance

The respondents were also asked generally how important highway maintenance was to them and asked to answer with not important, somewhat important, important or very important. Table Five shows that 62.2% of the respondents said very important, 29.4% said important, 7.7% said somewhat important, and only 0.7% said not important.

Statistically Significant Relationships Between Importance of Highway Maintenance and Demographic/Travel Variables

General highway maintenance was more important to women than to men. Highway maintenance was also generally more important to respondents who had driven in other states than to respondents who had not, and it was more important to respondents who drove more than 15,000 miles per year than it was to respondents who reported they drove less than 15,000 miles per year.

General Comparison of Montana Highways with Highways in Other States

The respondents who had driven in other states in the last 12 months were asked to compare the general condition of Montana highways and interstates to those in the states they had driven. Table Five shows that 45.7% of these respondents said the highways and interstates of Montana were about the same as those in the other states in which they had driven, 31.7% felt the roads in Montana were worse and 22.6% felt the roads in Montana were better.

Statistically Significant Relationships Between Comparison of Montana Highway Maintenance with Highway Maintenance in Other States and Demographic/Travel Variables

Respondents who lived in the Butte District were more likely than respondents living elsewhere to say the Montana roads were generally better. Respondents who said they had lived in Montana from 6 to 10 years were more likely than other respondents to say Montana roads were better while respondents who had lived in Montana for 21 to 30 years were more likely than other respondents to say that Montana roads were worse.

Comparison of Montana Winter Maintenance with Winter Maintenance in Other States

The respondents who had driven in other states in the last 12 months were also asked to compare winter maintenance in Montana to winter maintenance in other states. Table Five shows 43.2% of these respondents, who had an opinion, believed winter maintenance was about the same in Montana as in other states while 35.7% believed winter maintenance was better in Montana and 21.1% believed winter maintenance was worse in Montana.

Statistically Significant Relationships Between Comparison of Winter Maintenance and Demographic/Travel Variables

Respondents living in the Butte District were more likely to think winter maintenance was better in Montana than in others states while respondents living in the Glendive District were more likely than other respondents to think winter maintenance was worse in Montana than in other states. Respondents with a college degree were more likely than other respondents to think that winter maintenance was worse in Montana than in other states, while respondents with post graduate education and respondents with less than a

high school diploma were the most likely to think winter maintenance was better in Montana. Finally, respondents who had only been in Montana for 1 to 5 years were more likely to think winter maintenance was better in Montana.

Comparison of Montana Rest Area Maintenance and Rest Area Maintenance in Other States

The respondents who had driven in other states within the last 12 months were also asked to compare rest area maintenance in Montana with rest area maintenance in the other states in which they had driven. Table Five shows that almost half these respondents who had an opinion felt rest area maintenance was about the same in Montana as in other states, while 32.5% said rest stop area maintenance was worse in Montana and 19.1% said it was better in Montana.

Statistically Significant Relationships Between Rest Area Maintenance Comparison and Demographic/Travel Variables

Respondents who had been in Montana for only 1 to 5 years were more likely than other respondents to think rest area maintenance was better in Montana.

Respondents Rating of Eight Maintenance Activities

For the purposes of this survey, highway maintenance activities were divided into 8 categories: winter maintenance, maintaining a smooth highway surface, maintenance of roadsides, maintenance of signs, debris removal, rest stop maintenance, striping maintenance, and winter road condition reports. The respondents were asked to rate each of these activities with the responses poor, fair, good, very good and excellent. Table Six summarizes the results of that rating. The ordering of the activities in Table Six is provided by the mean score for each item on a 1 to 4 scale where 1 = poor, 2 = fair, 3 = good, and 4 = excellent.

Also reported in Table Six are the standard deviation (SD) of the distribution of rating for each activity and the standard error of the mean (SE) for the ratings of each activity. While it is not possible to indicate what constitutes a statistically significant difference between means because each mean represents a separate variable, the standard deviation and standard error of the ratings should assist in making any additional interpretations. The largest standard of error is 0.029 resulting in a 95% confidence interval of $\pm$ 0.057. This means that if the difference between two means is greater than 0.11, each mean is outside of the 95% confidence interval of the other. Therefore a difference between means greater than 0.11 should be considered a real difference.

Table Six shows that the maintenance of highway signs is rated highest (3.04) followed by winter road information (2.89), debris removal (2.78), winter maintenance (2.77), rest stop maintenance (2.74), striping (2.74), roadside maintenance (2.73), and highway surface maintenance (2.40). These ratings show that the maintenance of signs is rated highest followed by winter road information. Debris removal, winter maintenance, rest stop maintenance, striping and roadside maintenance are all rated about the same.

Finally, highway surface maintenance is clearly rated the lowest of all maintenance activities.

TABLE SIX
RATING OF MAINTENANCE ACTIVITIES

Activity	Poor	Fair	Good	Excellent	N	Mean	SD	SE
Signage	1.5%	11.7%	68.4%	18.4%	994	3.04	0.600	0.019
Information	7.6%	16.3%	55.3%	20.8%	827	2.89	0.816	0.028
Debris Removal	8.3%	21.8%	54.0%	15.9%	992	2.78	0.811	0.026
Winter Maint.	6.3%	24.1%	55.6%	14.0%	956	2.77	0.762	0.025
Rest Stop Maint.	9.3%	22.2%	53.6%	14.9%	830	2.74	0.823	0.029
Striping	7.2%	20.9%	62.3%	9.6%	997	2.74	0.727	0.023
Roadsides	5.9%	25.6%	57.6%	10.8%	975	2.73	0.729	0.023
Surfaces	13.4%	37.9%	44.3%	4.4%	998	2.40	0.772	0.024

Statistically Significant Relationships Between Rating of Maintenance Activities and Administrative District

The ratings of only two of these activities was found to be related to Administrative District. Respondents in the Butte District rated debris removal higher than did respondents in other districts, while respondents living in the Glendive and Billings Districts rated debris removal lower. Respondents living in the Butte District also rated the maintenance of roadsides higher than did respondents living elsewhere while respondents living in the Glendive District rated the maintenance of roadsides lower.

Statistically Significant Relationships Between Rating of Signage and Demographic/Travel Variables

Respondents who said they were professional drivers rated signage higher than did other respondents, while respondents who said their most common trip was related to agriculture rated signage lower. Also respondents between 36 and 45 rated signage better than did other respondents while respondents between 18 and 25 rated signage lower. Finally, respondents who had driven in other states rated signage higher than did respondents who had not driven in other states.

Statistically Significant Relationships Between Rating of Winter Roadway Information and Demographic/Travel Variables

Respondents over 65 rated winter roadway information higher than did other respondents, while respondents who had driven in other states in the last 12 months rated winter roadway information lower than respondents who had not.

Statistically Significant Relationships Between Rating of Debris Removal and Demographic/Travel Variables

Respondents who said their typical trip was personal and family errands rated debris removal higher than did other respondents, while respondents who indicated their typical trip was commuting rated debris removal lower. Respondents between 36 and 45 also rated debris removal higher than did respondents of other ages while the youngest respondents who were between 18 and 25 rated debris removal the lowest. Finally, respondents who reported they had driven in other states in the last 12 months rated debris removal higher than did respondents who had not driven in other states in the last 12 months.

Statistically Significant Relationships Between Winter Maintenance and Demographic/Travel Variables

Respondents who were professional drivers and those who said their typical trip was commuting rated winter maintenance lower than did other respondents, while respondents who indicated their typical trip was commuting rated winter maintenance higher. Conversely, respondents who had only been in Montana for 1 to 5 years rated winter maintenance higher than did other respondents while those who had been in the state for 11 - 20 years rated winter maintenance lower than did other respondents. Respondents with post graduate education also rated winter maintenance higher than did other respondents, while those with just a high school diploma rated winter maintenance lower. Generally older respondents rated winter maintenance higher than did younger respondents.

Statistically Significant Relationships Between Rating of Rest Stop Maintenance and Demographic/Travel Variables

Respondents who had only been in Montana from 1 to 5 years and respondents with a college degree rated rest stop maintenance higher than did other respondents. Conversely, respondents between 18 and 25 rated rest stop maintenance lower than did respondents who were older. The highest rating for rest stop maintenance for any age group was for the respondents between 55 and 65.

Statistically Significant Relationships Between Rating of Highway Striping and Demographic/Travel Variables

Respondents who had been in Montana for more than 30 years rated highway striping higher than did respondents who had been in Montana for less time. Conversely, respondents who were between 18 and 25 rated striping lower than did respondents of other ages.

Statistically Significant Relationships Between Rating of Roadside Maintenance and Demographic/Travel Variables

Respondents who indicated their typical trip was a personal or family errand and respondents who had been in Montana for only 1 to 5 years rated roadside maintenance higher than did other respondents.

Statistically Significant Relationships Between Rating of Surface Smoothness and Demographic/Travel Variables

Respondents who drove more than 15,000 miles per year rated highway surfaces lower than did respondents who drove less than 15,000 miles per year.

Importance of Highway Maintenance Activities to the Respondents

The respondents were asked how important each of the eight maintenance activities were to them. They were asked to respond with not important, somewhat important, important and very important. Table Seven summarizes the respondents' perception of the importance of these different activities. The ordering of activities in Table Seven is provided by the mean score of each activity on a 1 to 4 scale where 1 = not important, 2 = somewhat important, 3 = important and 4 = very important.

TABLE SEVEN
IMPORTANCE OF MAINTENANCE ACTIVITIES

Activity	Not Important	Smwhat Import.	Very Import.	Import.	N	Mean	SD	SE
Winter Maint.	0.5%	4.5%	16.9%	78.1%	971	3.72	0.567	0.018
Information	2.8%	6.2%	26.5%	64.4%	852	3.53	0.737	0.025
Striping	1.1%	6.2%	34.3%	58.3%	996	3.50	0.664	0.021
Debris Removal	0.5%	8.1%	38.4%	53.1%	993	3.44	0.662	0.021
Surfaces	1.7%	10.3%	39.6%	48.5%	1001	3.35	0.731	0.023
Signage	2.1%	11.7%	40.9%	45.3%	995	3.29	0.754	0.024
Rest Stop Maint.	4.7%	11.2%	41.0%	43.1%	851	3.22	0.825	0.028
Roadsides	8.5%	20.6%	43.1%	27.9%	980	2.90	0.903	0.029

Table Seven shows that winter maintenance is the most important maintenance activity to respondents with a mean of 3.72 followed by winter roadway information (3.53), striping (3.50), debris removal (3.44), surfaces (3.35), signage (3.29), rest stop maintenance (3.22) and roadside maintenance (2.90). The standard deviation and standard error of the mean are presented for the importance ratings of each activity. The largest standard error is 0.029 with a resulting 95% confidence interval of $\pm$ 0.057 meaning than any difference between means greater than 0.11 can be considered a real difference.

Statistically Significant Relationships Between Importance of Maintenance Activities and Administrative District

Respondents in the Missoula, Glendive and Billings Districts rated the importance of highway striping significantly higher than did respondents in the Butte and Great Falls Districts. Also respondents living in the Glendive District rated the importance of roadside maintenance significantly higher than did respondents in other districts. Finally, respondents living in the Butte District rated the importance of roadside maintenance significantly lower than did respondents living in other districts.

Statistically Significant Relationships Between Importance of Winter Maintenance and Demographic/Travel Variables

Females rated the importance of winter maintenance higher than did males. Respondents over 75 rated winter maintenance as less important than did respondents of different ages, while respondents between 46 and 55 rated winter maintenance more important than did respondents of other ages.

Statistically Significant Relationships Between Importance of Winter Roadway Information and Demographic/Travel Variables

Females rated the importance of winter roadway information higher than did males.

Statistically Significant Relationships Between Highway Striping and Demographic/Travel Variables

Respondents who had been in Montana for 30 or more years rated highway striping as more important than did respondents who had been in Montana for less time, while respondents who had been in Montana for 1 to 5 years rated highway striping as less important than did respondents who had been in Montana longer. Respondents who were 46 and older also rated highway striping as more important than did respondents who were 45 or younger.

Statistically Significant Relationships Between Importance of Debris Removal and Demographic/Travel Variables

Respondents who had been in Montana over 30 years rated debris removal more important than did respondents who had been in Montana less time, while respondents who had been in Montana for 1 to 5 years rated debris removal less important than did respondents who had been in Montana longer. Conversely, respondents between 18 and 25 rated debris removal less important than did older respondents while respondents who were between 55 and 65 as well as those over 75 rated debris removal more important than did respondents of other ages.

Statistically Significant Relationships Between Importance of Smooth Surfaces and Demographic/Travel Variables

Respondents who had driven in other states within the last 12 months rated the importance of smooth road surfaces higher than did respondents who had not driven in other states in the last 12 months. Also, respondents who indicated they drove more than 15,000 miles per year rated the importance of smooth highway surfaces significantly higher than did respondents who indicated they drove less than 15,000 miles per year. Respondents who indicated they were professional drivers and those who said their most common trip was work related rated the smoothness of highway surfaces higher than did respondents who indicated their most common trip was commuting, family or personal errands or agriculturally related. Finally, respondents between 18 and 25 rated the importance of highway surface smoothness lower than did older respondents, while respondents between 46 and 55 rated the importance of a smooth surface higher than did respondents of different ages.

Statistically Significant Relationships Between Importance of Highway Signage and Demographic/Travel Variables

Females rated the importance of highway signage higher than did males.

Statistically Significant Relationships Between Importance of Rest Stop Maintenance and Demographic/Travel Variables

Women rated the importance of rest stop maintenance higher than did males. Respondents who said their most common type of a trip was family or personal errands rated rest stop maintenance higher than did respondents who reported their most common trip was not family or personal errands. Conversely, respondents between 18 and 25 rated rest stop maintenance less important than did older respondents while respondents who were over 75 rated rest stop maintenance more important than did younger respondents. Generally, respondents over 55 rated rest stop maintenance more important than did respondents 55 or less.

Statistically Significant Relationships Between Importance of Roadside Maintenance and Demographic/Travel Variables

Respondents who indicated their most common trip was commuting rated the importance of roadside maintenance lower than did respondents who indicated another type of trip as most common. Generally the longer a respondent had been in Montana, the higher they rated the importance of roadside maintenance. Respondents who did not have a high school diploma also rated the importance of roadside maintenance higher than did other respondents. Conversely, respondents between 18 and 25 rated the importance of roadside maintenance less important than did respondents who were older. Respondents between the ages of 56 and 65 rated roadside maintenance higher than respondents in other age groups. Generally, respondents older than 55 rated roadside maintenance higher than did younger respondents.

Respondents' Perception of the Resource Priority Which Should Be Attached to Each Maintenance Activity

The respondents were asked to think about the allocation of Department of Transportation resources and assign a resource priority of low, medium, moderately high, or very high to each of the maintenance activities. Table Eight summarizes the results of the respondents' assignment of resource priorities. The ordering of activities in Table Eight is provided by the mean resource priority score for each item on a scale where 1 = low, 2 = medium, 3 = moderately high and 4 = high. As Table Eight shows, respondents awarded the highest resource priority to winter maintenance (3.56) followed by information about winter road conditions (3.32), then highway striping (3.22), debris removal (3.06), smoothness of roadway surface (3.05), rest stop maintenance (2.97), signage (2.90) and roadside maintenance (2.51). The standard deviation and standard error of the mean are presented for each activity's resource priority mean. The largest standard error is 0.028 producing a 95% confidence interval of $\pm$ 0.546. Therefore a difference between means greater than 0.11 is a real difference.

TABLE EIGHT
RESOURCE PRIORITIES

Activity	Low	Medium	Moderately High	Very High	N	Mean	SD	SE
Winter Maint.	0.5%	4.3%	33.8%	61.4%	985	3.56	0.602	0.019
Information	3.6%	10.2%	37.0%	49.2%	949	3.32	0.798	0.026
Striping	3.2%	14.9%	38.4%	43.6%	983	3.22	0.813	0.026
Debris Removal	5.4%	19.9%	38.2%	36.5%	984	3.06	0.881	0.028
Surface	1.9%	19.5%	49.7%	28.9	980	3.05	0.748	0.024
Rest Stop Maint.	4.7%	22.3%	44.1%	28.8%	936	2.97	0.836	0.027
Signage	7.7%	21.9%	42.9%	27.5%	978	2.90	0.890	0.028
Roadsides	13.2%	34.5%	40.3%	12.0%	979	2.51	0.868	0.028

Statistically Significant Relationships Between Resource Priorities Assigned to Maintenance Activities and Administrative District

Respondents living in the Missoula District gave roadway striping and debris removal a higher priority than did respondents living in different districts. Also, respondents living in the Glendive District gave roadside maintenance a higher priority than did respondents living elsewhere.

Statistically Significant Relationships Between Resource Priority Assigned to Winter Maintenance and Demographic/Travel Variables

Females assigned a higher resource priority to winter maintenance than did males.

Statistically Significant Relationships Between Resource Priority Assigned to Winter Roadway Information and Demographic/Travel Variables

Females also assigned a higher resource priority to winter roadway information than did males.

Statistically Significant Relationships Between Resource Priority Assigned to Roadway Striping and Demographic/Travel Variables

Females also assigned a higher resource priority to roadway striping than did males. Respondents who had been in Montana for 1 to 5 years assigned a lower resource priority to roadway striping than did respondents who had been in Montana longer, while respondents who has been in Montana over 30 years assigned a higher resource priority to roadway striping than did respondents who have been in Montana a shorter period of time. Finally, respondents between 18 and 25 assigned a lower resource priority to roadway striping than did older respondents, while respondents between 65 and 75 assigned a higher priority to roadway striping than did respondents in other age groups.

Statistically Significant Relationships Between Resource Priority Assigned to Debris Removal and Demographic/Travel Variables

Respondents who had been in Montana for 1 to 5 years assigned a lower resource priority to debris removal than did respondents who had been in Montana for a longer period of time.

Statistically Significant Relationships Between Resource Priority Assigned to Surface Smoothness and Demographic/Travel Variables

Respondents who indicated they were professional drivers assigned a higher resource priority to a smooth road surface than did respondents who listed a different type of typical trip. Respondents who had been in Montana for 1 to 5 years and respondents who had been in Montana for more than 30 years also assigned a higher resource priority to a smooth road surface than did respondents who had been in Montana from 6 to 30 years.

Statistically Significant Relationships Between Resource Priority Assigned to Rest Stop Maintenance and Demographic/Travel Variables

Females assigned a higher resource priority to rest stop maintenance than did males. Also, respondents who drove less than 15,000 miles per year assigned a higher resource priority to rest stop maintenance than did respondents who drove more than 15,000 miles per year. Respondents who indicated their typical trip was a personal or family errand or was agriculturally related assigned a higher priority to rest stop maintenance than did other respondents. Conversely, respondents who had been in Montana for 1 to 5 years assigned a lower resource priority to rest stop maintenance than did respondents who had been in the state longer, while respondents who had been in the state for over 30 years assigned a higher resource priority to rest stop maintenance than did respondents who had spent less

time in the state. Generally, the higher the respondents educational attainment, the lower the resource priority they assigned to rest stop maintenance, and the older the respondent, the higher the resource priority they assigned to rest stop maintenance.

Statistically Significant Relationships Between Resource Priority Assigned to Signage and Demographic/Travel Variables

Females assigned a higher resource priority to signage than did males. Respondents who had not driven in other states in the last 12 months assigned a higher resource priority to highway signage than did respondents who had driven in other states in the last 12 months. Respondents who indicated they drove less than 15,000 miles per year also assigned a higher priority to highway signage than did respondents who drove more than 15,000 miles per year. Respondents who said their typical trip was a personal or family errand assigned a higher priority to signage than did respondents who indicated a different type of typical trip, while respondents who were professional drivers assigned a lower priority to highway signage than did respondents who indicated a different type of typical trip. Also, respondents who had been in Montana for over 30 years assigned a higher resource priority to signage than did respondents who had been in Montana less time. Finally, respondents over 55 assigned a higher resource priority to highway signage than did respondents 55 or less.

Statistically Significant Relationships Between Resource Priority Assigned Roadside Maintenance and Demographic/Travel Variables

Respondents who had not driven in other states in the last 12 months assigned a higher resource priority to roadside maintenance than did respondents who had driven in other states in the last 12 months. Respondents who had been in Montana for over 30 years also assigned a higher resource priority to roadside maintenance than did respondents who had been in Montana for less time. Respondents either with some high school or who were high school graduates assigned a higher resource priority to roadside maintenance than did respondents with other educational attainments, while respondents who had a college degree and who had some graduate work assigned a lower resource priority to roadside maintenance than did respondents with a lower educational attainment. Finally, respondents over 75 provided a higher resource priority to roadside maintenance than did younger respondents while respondents from 18 to 25 provided a lower resource priority to roadside maintenance than did older respondents.

Composite Variables for Each Maintenance Activity

To better understand the perceptions of the respondents toward each maintenance activity, a composite variable was constructed for each activity by combining the answers to the rating, importance, and resource priority questions. The first step in constructing these variables was to reverse the values assigned to the responses to the rating of each maintenance activity. After reversal, an excellent rating = 1, a good rating = 2, a fair rating = 3, and a poor rating = 4. Then, the composite variable for each maintenance

activity was created by adding this reversed value for rating, the score on the importance question (1 = not important, 2 = somewhat important, 3 = important and 4 = very important) and the score on the resource priority question (1 = low, 2 = medium, 3 = moderately high, and 4 = high).

If a respondent had answered all three of the questions about a maintenance activity, the scores on the composite variable for that activity would range from 3 to 12. If the value of the composite variable were a 3, it would indicate an excellent rating of the activity, an answer of not important on the importance question and of low priority on the resource priority question. A score of 12 would indicate a poor rating, very important and a high resource priority. A score of less than 3 is possible if the respondent did not answer each question about a particular maintenance activity.

The higher the score on this composite variable, the lower the rating, the more important the activity is considered, and the higher the resource priority assigned to the activity. Thus, the higher the score on the composite variable, the more attention respondents believe should be paid to the maintenance activity.

Table Nine summarizes the values of the composite variable created for each maintenance activity. Each of the eight composite variables of Winter Maintenance, Surface Smoothness, Striping, Debris Removal, Winter Road Information, Signage, Rest Stop Maintenance and Road Side Maintenance occupies a column in Table Nine. The ordering of columns in Table Nine is based upon the mean score for each composite variable and ranges from Winter Maintenance with a mean score of 9.24 to Road Side Maintenance with a mean score of 7.53. The standard deviation and standard error of the mean are presented for each composite variable. The largest standard error is 0.076 producing a 95% confidence interval of $\pm$ 0.1482. Therefore, a difference between means of greater than .3 represents a real difference. Clearly Winter Maintenance has the highest score, Surface Smoothness, Striping and Debris Removal are tied for second highest, with Winter Road Information and Signage tied for third highest, and Rest Stop and Road Side Maintenance are the lowest.

TABLE NINE
VALUES OF COMPOSITE VARIABLES

Value	Winter Maint	Surface Smthness	Striping	Debris Removal	Wtr Rd Informat	Signage	Rest Stop Maint	Rd Side Maint
1	0.0%	0.0%	0.0%	0.0%	1.0%	0.0%	1.4%	0.4%
2	0.1%	0.1%	0.0%	0.1%	2.4%	0.2%	2.7%	1.1%
3	0.9%	0.1%	0.3%	0.4%	4.5%	0.3%	4.9%	0.9%
4	2.3%	0.5%	0.5%	0.1%	5.3%	1.7%	3.0%	3.7%
5	6.3%	1.2%	1.5%	2.4%	1.5%	3.7%	2.9%	6.3%
6	1.1%	3.2%	3.1%	4.8%	3.6%	8.3%	5.2%	13.9%
7	4.1%	12.0%	10.7%	14.0%	7.7%	16.2%	14.1%	18.9%
8	12.7%	19.9%	21.5%	21.7%	15.4%	29.5%	22.9%	24.9%
9	28.0%	27.6%	25.2%	27.8%	29.5%	23.1%	23.0%	18.0%
10	32.7%	20.2%	23.8%	18.8%	19.5%	14.3%	12.6%	7.1%
11	12.7%	11.5%	9.8%	6.9%	5.6%	2.3%	4.5%	3.3%
12	4.3%	3.8%	3.5%	2.9%	3.8%	0.4%	2.7%	1.3%
N	1001	1002	999	999	968	1000	953	998
Mean	**9.24**	**8.92**	**8.91**	**8.64**	**8.16**	**8.07**	**7.76**	**7.53**
SD	**1.641**	**1.538**	**1.529**	**1.553**	**2.424**	**1.522**	**2.348**	**1.865**
SE	**0.052**	**0.049**	**0.048**	**0.049**	**0.078**	**0.048**	**0.076**	**0.059**

In order to better explain the meaning of these composite variables as well as the respondents' perceptions of the eight maintenance activities, Table Ten shows the mean score of the composite variable for each activity as well as the relative position of each activity in the respondents' rating of how well each activity is currently being accomplished, the respondents' feeling on the importance each activity, and the resource priority assigned by the respondents to each maintenance activity.

TABLE TEN
COMPOSITE VARIABLE MEAN BY RANK OF RATING, IMPORTANCE, AND PRIORITY

	Composite Mean	Rating Rank	Importance Rank	Priority Rank
Winter Maint	9.24	3*	1	1
Surface Smoothness	8.92	6	5	4*
Striping	8.91	4*	3	3
Debris Removal	8.64	3*	4	4*
Winter Road Info	8.16	2	2	2
Signage	8.07	1	6	6
Rest Stop Maint.	7.76	4*	7	5
Roadside Maint.	7.53	5	8	7

Note: * Indicates tied ranks

The mean composite score for Winter Maintenance is the highest of all the composite variables because it is rated the most important maintenance activity by the respondents and is assigned the highest resource priority by the respondents.

Surface Smoothness is rated the next highest on the composite variable not because of its importance and resource priority, which fall in the middle of the rating for all maintenance activities, but because of the rating of the current condition of surface smoothness. Respondents rated Surface Smoothness last as compared with other maintenance activities.

Striping received a mean composite variable score almost identical to the score composite variable mean for Surface Smoothness, but for different reasons. Striping is in the upper middle importance and resource priority ranking and about the middle for rating of current condition.

Debris Removal, statistically ranking similar to Surface Smoothness and Striping, is in the middle of the composite variable ratings because it is in about the middle of the rankings for rating of current condition, importance and resource priority.

Winter Roadway Information is rated fifth in terms of composite variable means, not because it is considered unimportant nor because it is not given a high resource priority value by the respondents, but because respondents currently rate it as being done well.

Signage, statistically ranking similar to Winter Roadway Information, is in sixth place in terms of composite variable means because it is ranked toward the bottom of the eight maintenance activities in terms of importance and priority and because the current condition highways signs is rated higher than any other maintenance activity.

Rest Stop Maintenance is in seventh place in terms of composite variable means because it is rated next to last in Importance and about middle in terms of resource priority

Road Side Maintenance, statistically ranking similar to rest stop maintenance, is in last place in terms of composite variable means because it is ranked dead last in terms of importance and resource priority.

Statistically Significant Relationships Between Composite Variables and Administrative District

The scores on the composite variable Striping are higher for respondents living in the Missoula District than for those living in other districts, while scores of respondents on Striping are lower for respondents living in the Glendive District than for respondents living in other districts.

The scores on the composite variable Road Side Maintenance were higher for respondents living in the Glendive District than they were for respondents living in other districts, while the scores on Road Side Maintenance were lower for respondents living in the Butte District than they were for respondents living in other areas.

Statistically Significant Relationships Between Scores on Winter Maintenance Composite Variable and Demographic/Travel Variables

Females scored higher on the Winter Maintenance composite variable than did males. Respondents who drove more than 15,000 miles per year scored higher on Winter Maintenance than did those who drove less than 15,000 miles per year. Respondents who

indicated their typical trip was work related also scored higher on Winter Maintenance than did respondents who indicated another type of typical trip while respondents who indicated their typical trip was personal or family errands scored lower on Winter Maintenance than did respondents who indicated another type of typical trip. Conversely, respondents who had been in Montana for 1 to 5 years scored lower on Winter Maintenance than did other respondents, while respondents who had been in Montana 11 to 20 years scored higher on Winter Maintenance than did respondents who had been in the state for more or less time. Respondents with less than a high school diploma scored lower on Winter Maintenance than did respondents with a higher level of educational attainment. Respondents over 75 also scored lower on Winter Maintenance than did younger respondents. Finally, respondents over 55 generally scored lower on Winter Maintenance than did respondents 55 years of age or less.

Statistically Significant Relationships Between Scores on Surface Smoothness Composite Variable and Demographic/Travel Variables

Female respondents scored higher on Surface Smoothness than did male respondents. Respondents who had driven in other states in the last 12 months scored higher on Surface Smoothness than did respondents who had not. Respondents who drove more than 15,000 miles per year also scored higher on Surface Smoothness than those who drove less than 15,000 miles per year. Respondents who indicated they were professional drivers scored higher on Surface Smoothness than did respondents who indicated a different type of typical trip. Finally, respondents from 36 to 65 scored higher on Surface Smoothness than did younger or older respondents.

Statistically Significant Relationships Between Scores on Striping Composite Variable and Demographic/Travel Variables

Female respondents scored higher on Striping than did males. Respondents who had been in Montana from 1 to 5 years scored lower on Striping than did respondents who had been in Montana longer. Finally, respondents who had been in Montana from 11 to 20 years scored higher on Striping than did respondents who had been in the state for more or less years.

Statistically Significant Relationships Between Scores on Debris Removal Composite Variable and Demographic/Travel Variables

Respondents who drove more than 15,000 miles per year scored higher on Debris Removal than did respondents who drove less than 15,000 miles per year. Conversely, respondents who had been in Montana for 1 to 5 years scored lower on Debris Removal than did respondents who had been here longer. Respondents who had been in Montana for between 11 and 20 years also scored higher on Debris Removal than did respondents who had been in the state more or less time. Finally, respondents with graduate educational training and those with less than an 8th grade education rated Debris Removal lower than did respondents with a level of educational attainment somewhere between these two extremes.

Statistically Significant Relationships Between Scores on Winter Roadway Information Composite Variable and Demographic/Travel Variables

Females scored higher on Winter Roadway Information than did males. Respondents who drove more than 15,000 miles per year also scored higher on Winter Roadway Information than did respondents who drove less.

Statistically Significant Relationships Between Scores on Signage Composite Variable and Demographic/Travel Variables

Females scored higher on Signage than did males. Respondents who had lived in Montana for over 30 years also scored higher on Signage than did respondents who had been here for less time, while respondents who had been in Montana for 1 to 5 years scored lower on Signage than did respondents who had been here longer. Finally, respondents between 56 and 65 scored higher on Signage than did respondents in other age groups, while respondents between 36 and 45 scored lower on Signage than did respondents in other age groups.

Statistically Significant Relationships Between Scores on Rest Stop Maintenance Composite Variable and Demographic/Travel Variables

Respondents who had been in Montana for 1 to 5 years scored lower on Rest Stop than did respondents who had been in Montana longer. Conversely, respondents who had been in Montana for over 30 years scored higher on Rest Stop than did respondents who had been in Montana for less time.

Statistically Significant Relationships Between Scores on Roadside Maintenance Composite Variable and Demographic/Travel Variables

The longer a respondent had been in Montana, the higher they scored on the Sides variable. Respondents with graduate level education scored lower on Sides than did respondents with less education while respondents with a high school diploma scored higher on Sides than did respondents of other levels of educational attainment. Finally, respondents over 75 scored higher on Sides than did younger respondents, while those between 18 and 25 scored lower than did older respondents.

Respondents Perception of How The Montana Department of Transportation Could Do Better in the Area of Highway Maintenance

The respondents were asked in the form of an open ended question, what the Department of Transportation could do better in terms of maintenance. The responses were categorized and a complete description of the categorization is found in Appendix Three, while Appendix Four provides a listing of the verbatim responses. Both appendices are located in a separate report (Floyd, 1996c). Table Eleven presents a general summary of the categorized answers.

TABLE ELEVEN
WHAT COULD THE TRANSPORTATION DEPARTMENT DO BETTER IN TERMS OF MAINTNENACE

Make Surfaces Smoother	212	22.8%
Winter Maintenance	190	20.4%
Rest Area Maintenance	120	12.9%
Striping	66	7.1%
Debris Removal/Roadsides	65	7.0%
Make Roads Better	59	6.3%
Improve MDT	43	4.6%
Make Repairs Faster	35	3.8%
Signage	31	3.3%
Spray Weeds	24	2.6%
More/Better Maintenance	20	2.1%
Construction	20	2.1%
Slow lanes/More lanes	19	2.0%
Safety	13	1.3%
Use Better Materials	12	1.3%

Table Eleven shows the three areas most often singled out as needing improvement were highway surfaces, winter maintenance, and rest area maintenance.

In What Maintenance Activities Does the Department of Transportation Currently Do a Good Job

The respondents were also asked in an open ended question what maintenance activities done by the MDT met or exceeded the respondents expectations. These questions were categorized. A completed description of the categorization is contained in Appendix Three while a listing of verbatim responses is contained in Appendix Four. Both of these appendices are located in a separate report (Floyd, 1996c). Table Twelve summarizes the answers to these questions.

TABLE TWELVE
MAINTENANCE ACTIVITIES THAT MEET OR EXCEED RESPONDENTS' EXPECTATIONS

Winter Maintenance	144	20.6%
Doing a good job	116	16.6%
General Maintenance	87	12.5%
Construction	45	6.4%
Best they can with resources	42	6.0%
Signage	35	5.0%
Debris Removal	28	4.0%
Surface Smoothness	21	3.0%
Striping	18	2.6%
Rest Areas	17	2.4%
Winter Roadway Information	13	1.9%
Mowing	12	1.7%
Adequate job	12	1.7%
Roadside Maintenance	11	1.6%
They try	10	1.4%

Table Twelve shows the respondents think winter maintenance is the area in which the Department of Transportation meets or exceeds respondent expectation.

SUMMARY

Trained interviewers at the Computer Assisted Telephone Interviewing Laboratory at Montana State University, Billings completed 1,005 interviews with randomly selected adult residents of Montana between September 7 and September 15, 1996. The purpose of the survey was to obtain the perceptions the respondents held about the maintenance of interstate and state highways in Montana.

The Respondents

Half the respondents were male and half were female. The mean age of the respondents was 45.4 with 30.8% of the respondents thirty five years old or less, 26.4% were 56 or over, and the remainder of 42.8% between 36 and 55.

The mean educational attainment of the respondents was 13.8 years of education, 5.2% had not completed high school, 37.1% had completed just high school, 26.1% had completed some college, and 31.6% had at least a college degree.

The mean length of time respondents had been in Montana was 31 years and 46.9% of the respondents reported they had lived in Montana over 30 years, while 11.8% indicated they had been in Montana for 5 or less years.

Nearly 33% of the respondents lived in the Missoula District, 15.7% lived in the Butte District, 21.8% in the Great Falls District, 9.4% in the Glendive District, and 20.3% in the Billings District. Fifty-four percent of the respondents indicated they drive more than 15,000 miles per year, while 45.6% drove less than 15,000 miles. The most common trip made by respondents were personal or family errands (44.5%), followed by commuting (24.4%) and then work related trips (16.1%). Nearly 75% of the respondents indicated they had driven in other states within the last 12 months.

General Perception of Highway Maintenance

When asked to rate overall highway maintenance, 5.6% of the respondents rated overall maintenance as poor while 35.6% said fair, 53.1% said good and 5.8% said excellent. Generally, the more highly educated the respondent, the better they rated highway maintenance. Respondents who reported they were professional drivers rated maintenance the lowest, while those who said their typical trip was family or personal errands rated maintenance the highest. Respondents driving less than 15,000 miles per year rated general maintenance higher than did respondents driving over 15,000 miles per year.

When asked to rate the importance of highway maintenance to them, 62.2% of the respondents said very important, 29.4% said important, 7.7% said somewhat important, and only 0.7% said not important. General highway maintenance was more important to women than to men. Highway maintenance was also generally more important to respondents who had driven in other states than it was to respondents who had not driven in other states. Finally, it was more important to respondents who drove more than 15,000 miles per year than it was to respondents who reported they drove less than 15,000 miles per year.

Comparison of Highway Maintenance in Montana with Other States

Forty six percent of the respondents who had driven in other states within the last 12 months said the highways and interstates of Montana were about the same as the highways and interstates in the other states in which they had driven, while 31.7% felt the roads in Montana were worse and 22.6% felt the roads in Montana were better.

Forty three percent of the respondents who had driven in other states and who had an opinion believed winter maintenance was about the same in Montana as in other states, while 35.7% believed winter maintenance was better in Montana and 21.1% believed winter maintenance was worse in Montana. Respondents living in the Butte District were more likely than respondents living in other areas to think winter maintenance was better in Montana than in others states, while respondents living in the Glendive District were more likely than other respondents to think winter maintenance was worse in Montana than in other states. Respondents with a college degree were more likely than other respondents to think that winter maintenance was worse in Montana than in other states, while respondents with post graduate education and respondents with less than a high school diploma were the most likely to think winter maintenance was better in Montana.

Finally, respondents who had only been in Montana for 1 to 5 years were more likely than other respondents to think winter maintenance was better in Montana.

Almost half these respondents who had driven in other states in the last 12 months and who had an opinion, felt rest area maintenance was about the same in Montana as in other states, while 32.5% said rest stop area maintenance was worse in Montana and 19.1% said it was better in Montana. Respondents who had been in Montana for only 1 to 5 years were more likely than other respondents to think rest area maintenance was better in Montana.

Respondent Perception of the Eight Maintenance Activities

For the purposes of this survey, highway maintenance activities were divided into 8 categories: winter maintenance, maintaining a smooth highway surface, maintenance of roadsides, maintenance of signs, debris removal, rest stop maintenance, striping maintenance, and winter road condition reports. The respondents were asked three different questions about each of these eight maintenance activities. First they were asked how good a job the Montana Department of Transportation (MDT) was doing with each of the eight maintenance activities and to respond with poor, fair, good, or excellent. Then they were asked how important each of the maintenance activities were to them and to respond with not important, somewhat important, important, or very important. Finally, the respondents were asked to think of the allocation of resources to each of the maintenance activities by the MDT and assign a resource priority of low, medium, moderately high, or very high to each of the eight maintenance activities.

A composite variable was then constructed for each of the maintenance activities by combining the answers to the three different questions asked about that activity. To construct these variables, the first step was to reverse the values assigned to the responses to the rating of each maintenance activity. After reversal, an excellent rating = 1, a good rating = 2, a fair rating = 3, and a poor rating = 4. Then the composite variable for each maintenance activity was created by adding this reversed value for rating, the score on the importance question (1 = not important, 2 = somewhat important, 3 = important and 4 = very important), and the score on the resource priority question (1 = low, w = medium, 3 = moderately high, and 4 = high).

If a respondent had answered all three of the questions about a maintenance activity, the range of scores on the composite variable for that activity would be from 3 to 12. If the value of the composite variable was a 3, it would indicate an excellent rating of the activity, an answer of not important on the importance question and of low priority on the resource priority question. A score of 12 would indicate a poor rating, very important and a high resource priority. A score of less than 3 is possible if the respondent did not answer each question about a particular maintenance activity.

The higher the score on this composite variable, the lower the rating, the more important the activity is considered, and the higher the resource priority assigned to the activity. Thus, the higher the score on the composite variable, the more attention respondents believe should be paid to the maintenance activity.

The overall mean scores for each of the composite variables are: Winter Maintenance, 9.24; Smoothness of Surface, 8.92, Highway Striping, 8.91, Debris Removal, 8.64; Winter

Roadway Information, 8.16; Highway Signage, 8.07; Rest Stop Maintenance, 7.76; and Roadside Maintenance, 7.53.

Winter Maintenance

The mean composite score for winter maintenance is the highest of all the composite variables because it is rated the most important maintenance activity by the respondents and is assigned the highest resource priority by the respondents. Females scored higher on the variable than did males. Respondents who drove more than 15,000 miles per year scored higher on Winter Maintenance than did those who drove less than 15,000 miles per year. Respondents who indicated their typical trip was work related also scored higher on Winter Maintenance than did respondents who indicated another type of typical trip, while respondents who indicated their typical trip was personal or family errands scored lower than did respondents who indicated another type of typical trip. Conversely, respondents who had been in Montana for 1 to 5 years scored lower on Winter than did other respondents, while respondents who had been in Montana 11 to 20 years scored higher than did respondents who had been in the state for more or less time. Respondents with less than a high school diploma also scored lower on Winter Maintenance than did respondents with a higher level of educational attainment. Respondents over 75 scored lower than did younger respondents. Finally, respondents over 55 generally scored lower than did respondents 55 years of age or less.

Highway Surface Smoothness

Smoothness of highway surface is rated the next highest on the composite variable, not because of its importance and resource priority which fall in the middle of the rating for all maintenance activities, but because of the rating of the current condition of highway surfaces. Respondents rated highway surface smoothness last as compared with other maintenance activities. Female respondents scored higher on Surface Smoothness than did male respondents. Respondents who had driven in other states in the last 12 months also scored higher than did respondents who had not. Respondents who drove more than 15,000 miles per year scored higher than those who drove less than 15,000 miles per year. Respondents who indicated they were professional drivers also scored higher on Surface Smoothness than did respondents who indicated a different type of typical trip. Finally, respondents from 36 to 65 scored higher than did younger or older respondents.

Highway Striping

Striping received a mean composite variable score almost identical to the score composite variable mean for Surface Smoothness, but for different reasons. Striping is in the upper middle of the ranking for importance and resource priority and about the middle for rating of current condition. The scores on the composite variable Striping are higher for respondents living in the Missoula District than for those living in other districts, while

scores of respondents are lower for respondents living in the Glendive District than for respondents living in other districts. Female respondents scored higher on Striping than did males. Respondents who had been in Montana from 1 to 5 years scored lower than did respondents who had been in Montana longer, and respondents who had been in Montana from 11 to 20 years scored higher on Striping than did respondents who had been in the state for more or less years.

Debris Removal

Debris removal is in the middle of the composite variable ratings because it is in about the middle of the rankings for rating of current condition, importance and resource priority. Respondents who drove more than 15,000 miles per year scored higher than did respondents who drove less than 15,000 miles per year. Respondents who had been in Montana for 1 to 5 years scored lower on Debris Removal than did respondents who had been here longer. Respondents who had been in Montana for between 11 and 20 years scored higher than did respondents who had been in the state more or less time. Finally, respondents with graduate educational training and those with less than an 8th grade education rated Debris Removal lower than did respondents with a level of educational attainment somewhere between these two extremes.

Winter Roadway Information

Winter roadway information is rated fifth in terms of composite variable means, not because it is considered unimportant nor because it is not given a high resource priority value by the respondents, but because it is currently rated as being done well by respondents. Females scored higher than did males. Respondents who drove more than 15,000 miles per year also scored higher on Winter Roadway Information than did respondents who drove less.

Highway Signage

Signage is in sixth place in terms of composite variable means because is ranked toward the bottom of the eight maintenance activities in terms of importance and priority and because the current condition highways signs is rated higher than any other maintenance activity. Females scored higher than did males. Respondents who had lived in Montana for over 30 years also scored higher on Signage than did respondents who had been here for less time, while respondents who had been in Montana for 1 to 5 years scored lower than did respondents who had been here longer. Finally, respondents between 56 and 65 scored higher on Signage than did respondents in other age groups, while respondents between 36 and 45 scored lower on Signage than did respondents in other age groups.

Rest Stop Maintenance

Rest stop maintenance is in seventh place in terms of composite variable means because it is rated next to last in Importance and about middle in terms of resource priority. Respondents who had been in Montana for 1 to 5 years scored than did respondents who had been in Montana longer. Conversely, respondents who had been in Montana for over 30 years scored higher on Rest Stop Maintenance than did respondents who had been in Montana for less time.

Roadside Maintenance

Road side maintenance is in last place in terms of composite variable means because it is ranked dead last in terms of importance and resource priority. The scores on the composite variable for roadside maintenance were higher for respondents living in the Glendive District than they were for respondents living in other districts, while the scores were lower for respondents living in the Butte District than they were for respondents living in other areas. Also, the longer a respondent had been in Montana, the higher they scored on this variable. Respondents with graduate level education scored lower than did respondents with less education while respondents with a high school diploma scored higher than did respondents of other levels of educational attainment. Finally, respondents over 75 scored higher than did younger respondents while those between 18 and 25 scored lower than did older respondents.

CONCLUSIONS AND IMPLEMENTATION

According to the respondents to this survey, the Montana Department of Transportation should now pay attention and provide resources to maintenance activities on interstate and state highways in Montana in the following order:

- Winter Maintenance
- Surface Smoothness and Highway Striping
- Debris Removal
- Winter Roadway Information and Highway Signage
- Rest Stop Maintenance
- Roadside Maintenance

Respondents in living in the Missoula District were more likely than respondents living elsewhere to think attention should be paid to striping and respondents living in the Glendive District were less likely than respondents living elsewhere to believe that attention should be paid to striping.

Respondents living in the Glendive District were more likely than respondents living elsewhere to believe that attention should be paid to roadside maintenance, while respondents living in the Butte District were less likely than respondents living elsewhere to think that attention should be paid to striping.

Females were more likely than males to think attention should be paid to winter maintenance, surface smoothness, striping, winter roadway information, and signage.

Respondents who drove more than 15,000 per year were more likely than respondents who drove less than 15,000 miles per year to think that attention should be paid to winter maintenance, surface smoothness, debris removal, and winter roadway information.

If changes are made in the manner in which MDT pays attention to and provides resources to these maintenance activities on the basis of the findings of this survey, the public's perceptions of highway maintenance in Montana may or may not change to reflect the differences in allocation of resources. To determine whether the public's opinion changes, this survey, in exactly the same form, should be repeated in two years.

REFERENCES

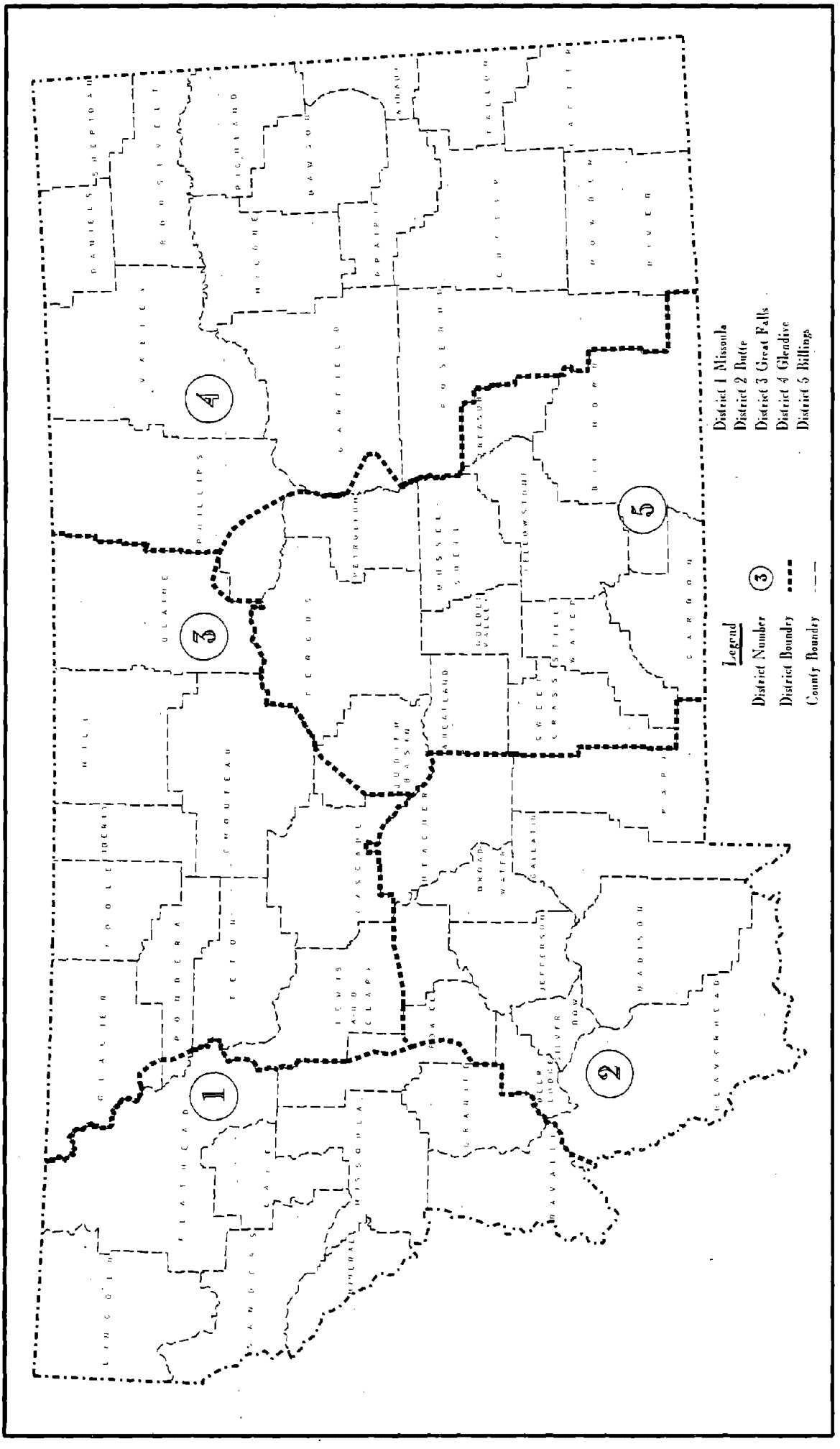
Floyd, J.W. (1996a) *Customer Opinion Survey of Highway Maintenance Services, Phase One Report: Survey Needs,* Montana Department of Transportation, Helena, MT.

Floyd, J.W. (1996b), *Customer Opinion Survey of Highway Maintenance Services, Phase Two Report: Survey Research in Other States,* Montana Department of Transportation, Helena, MT.

Floyd, J.W. (1996c), *Perceptions of Highway Maintenance in Montana: The Results of a Telephone Survey. Final Report. Appendices Three and Four,* FHWA/MT-96/8136B, Montana Department of Transportation, Helena, MT.

APPENDIX ONE:

MAP SHOWING MDT ADMINISTRATIVE DISTRICTS AND MONTANA COUNTIES


Legend
District Number
District Boundry
County Boundry
District 1 Missoula
District 2 Butte
District 3 Great Falls
District 4 Glendive
District 5 Billings

APPENDIX TWO:

TRANSPORTATION SURVEY QUESTIONS

Hello

Hello, my name is _____ and I am calling from Montana State University, Billings. We are conducting a survey on attitudes and opinions of highway maintenance for the Montana Department of Transportation. The Department of Transportation wants the opinions of citizens of Montana about the condition of our roadways.. Your participation in this survey will assist the department in establishing future priorities and enable the maintenance program to better use available resources. In order to interview the right person, I need to speak to the member of your household who is at home, over 18, and has had the most recent birthday. Would that be you? CTRL-END OR 3 DIGITS

Intruct

Before I ask the first question, let me explain that this survey deals only with maintenance of highways. Maintenance includes such things as maintaining the established roadway surface, snow and ice removal, removal of debris and litter, maintaining roadsides, repairing signs, re-painting roadway stripes and rest area maintenance. This survey does not deal with the construction of new highways nor construction of new rest stops. This survey only deals with interstates and state highways in Montana. We are not asking you about city streets or county roads, just interstates and state highways. Finally, your household was randomly selected by a computer and all your answers will remain anonymous.
PRESS ANY KEY TO CONTINUE

RateAll

How would you rate overall interstate and state highway maintenance in Montana?

1. Poor
2. Fair
3. Good
4. Excellent
5. DK or NR

ImpAll

How important would you say interstate and state highway maintenance in Montana is to you?

1. Not Important
2. Somewhat Important
3. Important
4. Very Important
5. DK or NR

RateWint

How would you rate winter maintenance of interstates and state highways in Montana? By winter maintenance, I mean snow and ice control including plowing, sanding, de-icing, and preventing drifting.

1. Poor
2. Fair
3. Good
4. Excellent
5. DK or NR

ImpWint

How important would you say interstate and state highway winter maintenance is to you?

1. Not Important
2. Somewhat Important
3. Important
4. Very Important
5. DK or NR

RateSurf

How would you rate the surface of Montana's interstates and state highways. In making this rating, consider ride quality which is affected by potholes, ruts, bumps, cracks, etc.

1. Poor
2. Fair
3. Good
4. Excellent
5. DK or NR

ImpSurf

How important is the smoothness of Montana's interstates and state highways to you?

1. Not Important
2. Somewhat Important
3. Important
4. Very Important
5. DK or NR

RateSide

How would you rate the management of interstate and state highway roadsides in Montana? Roadside management includes mowing shoulders and eliminating unwanted vegetation.

1. Poor
2. Fair
3. Good
4. Excellent
5. DK or NR

ImpSide

How important is interstate and state highway roadside management in Montana to you?

1. Not Important
2. Somewhat Important
3. Important
4. Very Important
5. DK or NR

RateSign

How would you rate the condition of interstate and state highway signs in Montana?

1. Poor
2. Fair
3. Good
4. Excellent
5. DK or NR

ImpSign

How important is the condition of interstate and state highway signs to you?

1. Not Important
2. Somewhat Important
3. Important
4. Very Important
5. DK or NR

RateRemv

How would you rate the removal of debris such as litter, roadkill, and fallen rocks, on Montana's interstates and state highways?

1. Poor
2. Fair
3. Good
4. Excellent
5. DK or NR

ImpRemv

How important is the removal of debris on interstates and state highways in Montana to you?

1. Not Important
2. Somewhat Important
3. Important
4. Very Important
5. DK or NR

RateRest

How would you rate the maintenance of rest areas on Montana interstates and state highways. Rest area maintenance includes cleaning rest areas and keeping rest areas in working order.

1. Poor
2. Fair
3. Good
4. Excellent
5. DK or NR

ImpRest

How important is interstate and state highway rest area maintenance to you?

1. Not Important
2. Somewhat Important
3. Important
4. Very Important
5. DK or NR

RateStrp

How would you rate the condition of striping (lines) on Montana's interstates and state highways? Striping and lines include the middle lines, no-passing lines, left turn lanes, and shoulder lines.

1. Poor
2. Fair
3. Good
4. Excellent
5. DK or NR

ImpStrp

How important is interstate and state highway striping to you?

1. Not Important
2. Somewhat Important
3. Important
4. Very Important
5. DK or NR

RateInfo

How would you rate winter roadway information and the way it is provided by the Montana Department of Transportation? Roadway information is provided by a statewide 800 telephone number, highway advisory radio, and changeable message signs.

1. Poor

2. Fair

3. Good

4. Excellent

5. DK or NR

ImpInfo

How important is up to date winter interstate and state highway information to you?

1. Not Important

2. Somewhat Important

3. Important

4. Very Important

5. DK or NR

PriWint

Now I am going to go back through the list of maintenance activities. This time, I want you to think about allocation of resources to each of the activities. For each activity, please tell me if you think it warrants a low, medium, moderately high, or very high resource priority when deciding how state highway maintenance resources should be utilized. Remember, we are only dealing with interstates and state maintained roadways.

What resource priority should be placed on interstate and state highway winter maintenance in Montana?

1. Low
2. Medium
3. Moderately High
4. Very High
5. DK or NR

PriSurf

What resource priority should be placed on smooth pavement on interstates and state highways in Montana?

1. Low
2. Medium
3. Moderately High
4. Very High
5. DK or NR

PriSide

What resource priority should be placed on interstate and state highway roadside management in Montana?

1. Low
2. Medium
3. Moderately High
4. Very High
5. DK or NR

PriSign

What resource priority should be placed on repairing and replacing signs on interstates and state highways in Montana?

1. Low
2. Medium
3. Moderately High
4. Very High
5. DK or NR

PriRemv

What resource priority should be placed on debris removal on interstates and state highways in Montana?

1. Low
2. Medium
3. Moderately High
4. Very High
5. DK or NR

PriRest

What resource priority should be placed on rest area cleanliness and maintenance on interstates and state highways in Montana?

1. Low
2. Medium
3. Moderately High
4. Very High
5. DK or NR

PriStrp

What resource priority should be placed on roadway striping on interstates and state highways in Montana?

1. Low
2. Medium
3. Moderately High
4. Very High
5. DK or NR

PriInfo

What resource priority should be placed providing accurate and up to date information about the current condition of state maintained highways in Montana?

1. Low
2. Medium
3. Moderately High
4. Very High
5. DK or NR

OthState

Just a couple of more questions about interstate and state highway maintenance.

Have you driven on roadways in states other than Montana in the last 12 months?

1. Yes
2. No
3. DK or NR

GenComp

How would you compare general roadway conditions of Montana's state maintained roadways with the general roadway conditions of state maintained roadways in other states? IF THEY SAY THEY HAVE BEEN IN MORE THAN ONE STATE, ASK FOR A GENERAL COMPARISON. IF THEY CANNOT DO THAT, HAVE THEM COMPARE WITH THE STATE THEY DROVE IN MOST RECENTLY.

1. Montana roadways worse

2. About the same

3. Montana better

4. DK or NR

WintComp

How would you compare winter maintenance of Montana's state maintained roadways with winter maintenance of state maintained highways in other states?

1. Montana winter maintenance worse

2. About the same

3. Montana better

4. DK or NR

RestComp

How would you compare rest area cleanliness and maintenance in Montana with rest area cleanliness and maintenance in other states?

1. Montana rest areas worse

2. About the same

3. Montana better

4. DK or NR

Better

The Department of Transportation is striving to improve maintenance operations. In your opinion what could the department do better?

TYPE IN ANSWER AND THEN PRESS ENTER. YOU HAVE 3 LINES.

GoodNow

What is the department doing that meets or exceeds your expectations?

TYPE IN RESPONSE AND THEN PRESS ENTER. YOU HAVE 3 LINES.

Trips

As you probably know different types of people have different types of opinions. The following questions are for statistical purposes only.

Which of the following types of trips would you say is most typical of your driving?

1. Commuting to and from work
2. Work related trips, that is trips that are made as a part of work activities.
3. Personal and family errands or trips
4. Agriculture related trips
5. Professional driving
6. Other
7. DK or NR

HowFar

Would you say you drive more or less than 15,000 miles per year?

1. More
2. Less
3. DK or NR

Age

How old are you?

TYPE IN THEIR AGE AND PRESS ENTER USE 100 FOR 100 OR OLDER AND 101 FOR DK OR NR.

Educ

What is the highest level of education you have completed?

TYPE IN ANSWER AND PRESS ENTER. 12 IS HIGH SCHOOL GRADUATE, 16 IS COLLEGE GRADUATE, 18 IS MASTERS DEGREE AND 20 IS DOCTORATE. USE 21 FOR DK OR NR

InMT

How long have you lived in Montana?

TYPE IN THEIR ANSWER AND PRESS ENTER USE 100 FOR 100 OR MORE AND 101 FOR DK OR NR.

Sex

RESPONDENTS SEX (DO NOT ASK)

1. MALE

2. FEMALE

3. CANNOT TELL

Bye

That was the last question. Thank you very much for taking the time to answer these questions. Good bye and have a nice day (or evening).