MAINTENANCE OF STATE HIGHWAYS

Bulletin No. 81-16

LEGISLATIVE COMMISSION

OF THE

LEGISLATIVE COUNSEL BUREAU

STATE OF NEVADA

October 1980

REPORT ON THE MAINTENANCE OF STATE HIGHWAYS
AS ADMINISTERED BY THE DEPARTMENT
OF HIGHWAYS

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FILE NUMBER 125

ASSEMBLY CONCURRENT RESOLUTION—Directing the legislative commission to study the maintenance of state highways as administered by the department of highways.

WHEREAS, The existence of a safe and efficient system of highways within the State of Nevada is essential to the economy and general welfare of the state; and

WHEREAS, The highways of the state have been aging and deteriorating in recent years, yet sufficient maintenance has not been accomplished to keep the condition of the highways from declining; and

WHEREAS, As the population of the state continues to grow, the highways receive increasingly heavier use and a greater number of miles of highway lanes are being placed into service; and

WHEREAS, The revenues being derived from the motor vehicle fuel tax may not prove adequate to keep pace with the future costs of highway maintenance; and

WHEREAS, The vital interests of the state require that the programs for highway maintenance be carried forward with maximum efficiency; now, therefore, be it

Resolved by the Assembly of the State of Nevada, the Senate concurring, That the legislative commission is directed to study the maintenance of the highways of this state as administered by the department of highways; and be it further

Resolved, That the study include determinations of whether:

1. The department is managing and utilizing its available resources for maintenance in an economical and efficient manner;
2. Any inefficient practices or inadequate systems exist and if so, the causes;
3. The department is achieving the desired objectives of its programs of maintenance;
4. The department will require any additional sources of revenue to support future programs of maintenance; and
5. Any new methods or techniques are suitable for application to those programs and would produce greater benefits; and be it further

Resolved, That the results of the study and any recommended legislation be reported to the 61st session of the Nevada legislature.

1979

REPORT OF THE LEGISLATIVE COMMISSION

TO THE MEMBERS OF THE 61ST SESSION OF THE NEVADA LEGISLATURE:

This report is submitted in compliance with Assembly Concurrent Resolution No. 30 of the 60th Session of the Nevada Legislature. Assembly Concurrent Resolution No. 30 directed the Legislative Commission to study the maintenance of the highways of this state as administered by the Department of Transportation and determine whether the Department is using its available maintenance resources economically and efficiently; if any inefficient practices or inadequate systems exist and why; if the desired maintenance objectives are being achieved; if additional sources of revenue will be needed for future maintenance programs and if any new more beneficial methods or techniques are suitable for application to the maintenance program.

The Legislative Commission appointed a subcommittee chaired by Senator Richard E. Blakemore and including Assemblymen Thomas J. Hickey, Alan H. Glover, John M. Polish and Doug Webb to conduct the required study. This report includes a brief review of the subcommittee's methodology, a summary of findings and recommendations, a perspective on the highway maintenance program and detailed explanation of the results of the subcommittee's review.

In the conduct of its assigned inquiry, the subcommittee held four meetings in northern and southern Nevada and toured both private contractor's facilities as well as some district maintenance offices. At the hearings, Nevada Department of Transportation, Federal Highway Administration representatives, private contractors and industry spokesmen, including representatives from the Nevada Motor Transport Association and the CMI Corporation provided testimony to the subcommittee. In addition, numerous groups, such as the Asphalt Institute and the International Slurry Seal Association, supplied much written material to the subcommittee. The subcommittee wishes to acknowledge the contributions of these groups to the conduct of the A.C.R. 30 study. The subcommittee especially wishes to thank Mr. Bob Mendenhall of Las Vegas Paving, Incorporated for taking the time from his busy schedule to arrange a tour of his recycling facilities. His participation was very much appreciated.

The Assembly Concurrent Resolution No. 30 Subcommittee believes that the Department of Transportation represents a complex organization in terms of services provided, responsibilities assigned and dollars expended. It is hoped that this study will provide some useful information to the Legislature in terms of the Department of Transportation's maintenance program.

However, the subcommittee honestly believes that the true value of this study lies in its contribution toward furthering the Legislature's awareness of the need for further in-depth review of more specific transportation issues. Tantamount among these issues, the subcommittee believes, is the need for a complete productivity study and salary survey comparing Nevada Department of Transportation maintenance employees with their counterparts in private industry. The A.C.R. 30 report provides more detail on this subject; however, the subcommittee is firmly convinced this area needs to be more fully explored, probably with the assistance of a private consulting firm. In addition, although the subcommittee conducted its own maintenance equipment utilization survey, the members believe there may also be a need for a complete study in this area. However, the need for this study may be mitigated should a new equipment management system, as proposed by the Director of the Nevada Department of Transportation, provide much of the needed information currently lacking in the Department's equipment program.

The subcommittee also has included in its report resolutions for several suggested study topics on important transportation issues for the future and it is hoped this paper will provide suggestions for futher legislative inquiry.

One of the issues that is not discussed in detail in this report, however, is the impact of the proposed Mobile Missile System (MX) on the highway program. Although the manpower drain that the Department would experience should the MX come to fruition is briefly touched upon in the report, the subcommittee did not report on the impacts to the road systems that the MX would cause. Departmental representatives presented a report on possible MX problems to the subcommittee at their May 9, 1980, meeting, based upon possible location criteria; however, it was explained that the lack of available information on MX made meaningful discussion on this topic almost impossible. For this reason, the subcommittee has not included any information on the probable impacts of MX on the road system. Suffice it to say, the subcommittee is convinced that the impact will be tremendous, not only in manpower drain, but also on wear and tear on roads, the drying up of materials sources, and the

inevitable problems caused by tremendous population influxes. The subcommittee believes that any further comments would, at this point, be based upon speculative information and, as such, lie outside the purview of this report.

This report is transmitted to the members of the 61st Legislature for its consideration and appropriate action.

Respectfully submitted,

Legislative Commission
Legislative Counsel Bureau
State of Nevada

Carson City, Nevada
October 1980

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LEGISLATIVE COMMISSION

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Senator Melvin D. Close, Vice Chairman

Senator Richard E. Blakemore
Senator Carl F. Dodge
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Senator Thomas R. C. Wilson

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REPORT TO THE LEGISLATIVE COMMISSION OF ITS SUBCOMMITTEE FOR STUDY OF MAINTENANCE OF STATE HIGHWAYS

I. INTRODUCTION

The 60th Session of the Nevada Legislature, in approving Assembly Concurrent Resolution No. 30, recognized a safe and efficient system of highways as being essential to the state's economy and general welfare. In the text of the resolution the Legislature noted the lack of sufficient maintenance on the state's aging and deteriorating highway system, the impacts of increased service miles and heavier use on the highways brought about by a growing population and the possibility that the revenues being derived from the motor vehicle fuel tax would not be adequate to meet the costs of future maintenance programs. The Legislature believed it imperative that the maintenance program of the Department of Transportation be carried forward with maximum efficiency, stating that an effective highway maintenance effort was of "vital interest" to the state. Passage of Assembly Concurrent Resolution No. 30, which directed the Legislative Commission to study the maintenance of the highways of this state as administered by the Highway Department, is positive proof of the Legislature's commitment to this important subject.

Passage of A.C.R. 30 capped a Legislative Session that had reviewed numerous budgetary and statutory proposals aimed at providing financial aid to the ailing Highway Fund, a fund which, in the 6-year period July 1, 1975 to June 30, 1981, was estimated to suffer an approximate $17.2 million decline in ending balance. During the 1979 Session many funding proposals that would have eased this situation were reviewed and the following actions were approved:

1. S.B. 569 (Chapter 569, 1979 Statutes) transferred the financial responsibility in the Drivers License Division of the Department of Motor Vehicles from the Highway Fund to the General Fund and provided that drivers license fees be deposited into the General Fund. The total relief this measure provided to the Highway Fund was estimated at approximately $500,000 for the biennium since the costs of operating the Drivers License Division exceeded the revenues derived from license fees.

2. The Legislature approved a $4.6 million General Fund appropriation to provide for an addition to the Department of Motor Vehicles Building in Carson City. If the practice of previous biennia had been followed, this appropriation would have come from the Highway Fund, therefore, siphoning more funds from needed "on-the-road" programs.

3. Assembly Bill 325 (Chapter 628, 1979 Statutes) provided a $5 million General Fund appropriation for the purpose of replacing obsolete road maintenance equipment and vehicles. Without this appropriation Department officials testified that needed replacement of maintenance equipment would have been deferred.

In addition, the Legislature approved two significant pieces of legislation designed to aid Nevada cities and counties in meeting their increasing highway needs. Discussion of this legislation follows:

1. Assembly Bill 750 (Chapter 526, 1979 Statutes) allowed county commissioners to impose an additional 1 or 2 cent per gallon tax on gasoline if approved by a vote of the people. This legislation was designed to aid growing urban areas in accommodating their increased highway needs; subsequently, the receipts from this additional tax could be used only for construction or reconstruction of roads in the county and not for routine maintenance costs.

2. Assembly Bill 549 (Chapter 325, 1979 Statutes) allowed for the proceeds of the county motor vehicle fuel taxes to be used for surfacing and resurfacing of highways as well as new construction. Under previous law these revenues could only be used to finance new construction, therefore, this statute broadens the activities allowed under statute and provided additional flexibility to county road departments.

Notable in its absence, however, was the passage of any legislation that would have increased the Transportation Department's ability to significantly increase its revenues. Despite Department of Transportation officials' insistence that additional revenues were necessary to decrease the growing maintenance backlog, neither the Governor's nor the

Legislature's final programs provided any significant financial relief to the Highway Fund. The only measure relative to the revenue issue that received some consideration was Senate Bill 419.

S.B. 419 would have provided, according to the Transportation Department representatives, $11.5 million in additional revenues for the Highway Fund through the assessment of an additional 2 cent per gallon tax on gasoline and diesel fuel. Department representatives explained that the first priority for the additional funds would have been to restore some of the severely cutback contract resurfacing and overlay programs on the state's highway system. S.B. 419 was approved by the Senate and recommended for passage by the Assembly Taxation Committee, but received no further consideration on the Assembly floor. While numerous other pieces of legislation were introduced during the session that addressed the future revenue needs of the Department, no others generated any volume of departmental, executive, or legislative support.

In hearings before the legislative money committees, Department officials indicated that the 1981 Legislature would be approached for an increase in motor vehicle fuel taxes or user fees. They were advised, however, that such an increase would be difficult to obtain if the public was not convinced that all waste and duplication of effort in the Department had been eliminated and that the highway program was being operated efficiently. Passage of A.C.R. 30, therefore, addressed the Legislature's concern that the state's highway program be run efficiently and focused upon the Department's maintenance effort as well as the Department's future needs for additional revenue sources. Specifically, the highway maintenance study was to include the following determinations of whether:

1. The Department is managing and utilizing its available resources for maintenance in an economical and efficient manner;

2. Any inefficient practices or inadequate systems exist and, if so, the causes;

3. The Department is achieving the desired objectives of its program of maintenance;

4. The Department will require any additional sources of revenue to support future programs of maintenance;

5. Any new methods or techniques are suitable for application to those programs and would produce greater benefits.

The subcommittee appointed by the Legislative Commission to review these subjects included:

Senator Richard E. Blakemore, Chairman
Assemblyman Thomas J. Hickey, Vice Chairman
Assemblyman Alan H. Glover
Assemblyman John M. Polish
Assemblyman Doug Webb

The subcommittee held four meetings on January 9, 1980; February 14, 1980; May 9, 1980; and July 10, 1980. Prior to the subcommittee's first meeting, however, a compilation of numerous Federal Highway Administration reports, National Cooperative Highway Research Program reports and industry magazine articles were reviewed by the subcommittee in preparation for the technical presentations and discussions which accompanied the A.C.R. 30 subcommittee's work. During the course of the subcommittee's activities, presentations were made by Nevada Department of Transportation (NDOT) officials, regional Federal Highway Administration (FHWA) personnel, private contractors, Department of Motor Vehicle (DMV) representatives, and industry spokesmen including the Nevada Motor Transport Association and the C.M.I. Corporation. Testimony ranged from a complete review of the Department of Transportation's maintenance program and the need for additional nonfederal aid revenue with which to meet maintenance objectives to a technical discussion of the advantages offered through profiling and recycling of roadway materials as a means of achieving greater efficiency in an energy conscious society. In addition, the subcommittee solicited much written material from the slurry seal industry concerning the benefits that process affords to highway maintenance programs.

The subcommittee also held a great deal of discussion on the effect of increasing vehicle weights upon the deteriorating road system with input coming from federal reports, state enforcement agencies, and trucking industry spokesmen.

In addition, subcommittee members toured a privately owned recycling plant. The tour included an explanation of the newly installed computerized mixing apparatus as well as an inspection of recycling pavement equipment. Individual members of the subcommittee toured some of the Transportation Department's district offices and yards and talked with district engineers and maintenance foremen to more completely

understand district maintenance goals and operations as well as to gain input about departmental shortcomings and possible solutions to the growing maintenance problem.

The subcommittee's task became more difficult with the retirement of the Director of the Nevada Department of Transportation during the course of the study--and the naming of his replacement by the Board of Transportation Directors. Needless to say, the incoming Director's views also had to be taken into consideration during the subcommittee's final deliberations.

The subcommittee approached its final study determinations by dividing its review into the five major topics mandated for review by the resolution. Part II of this report provides a summary of the subcommittee's findings and recommendations in each of the five major topics.

Part III provides a perspective of the maintenance program within the Nevada Department of Transportation, while part IV details the subcommittee's findings and recommendations.

II. SUMMARY

This summary highlights the key findings and recommendations of the A.C.R. 30 subcommittee.

Determination: Is the Department of Transportation Achieving the Desired Objectives of its Programs of Maintenance?

The Nevada Department of Transportation's maintenance objectives are to provide:

(a) that physical maintenance which preserves and keeps a highway, including all of its elements, in or nearly as practicable its original as constructed condition or its subsequently improved condition and,

(b) those traffic services and operations which provide safe, convenient and economic highway transportation for the public.

The subcommittee believes that the Department is partially achieving its stated maintenance objectives in that it is providing those traffic services and operations which provide safe, convenient and economic highway transportation for the public. However, the subcommittee is convinced that the Department is unable to provide an acceptable level of physical maintenance needed to keep the state's highways "in, or nearly as practicable, its original as constructed or its subsequently improved condition."

The subcommittee believes that this inability to provide needed physical maintenance services in a timely manner, unless checked, will lead to a severe erosion of the quality of safe, convenient and economic traffic services and operations now being provided to the motoring public.

The subcommittee found that a variety of factors have led to the Department's inability to adequately preserve its capital investment in roadways which has led to a growing backlog of needed maintenance projects. These factors include numerous items over which the Legislature and the Department of Transportation have little control such as:

(a) The effects of deferred maintenance;

(b) Increased vehicular traffic, including an increase in the truck mix in the volume of traffic;

(c) Inflation's effects upon the costs of maintenance materials and labor sources;

(d) The increased costs to the Department brought about by state, federal and local laws and ordinances to deal with the increased environmental sensitivity of the public;

(e) Weather (specifically, the effects of the freeze/thaw cycle and the requirements for snow removal);

(f) Design or structural capacity and age.

The subcommittee found that there were two factors over which the Legislature could exercise some control to favorably impact the maintenance abilities of the Department. These two factors include: (a) control of overweight vehicles and, (b) provision of new or changed revenue bases required by the Department to meet minimal service levels in all phases of the highway program.

The subcommittee believes increasing vehicle weights, specifically in commercial carriers are a significantly important factor in the increasing deterioration of the state's roadways. To help combat this problem, the subcommittee recommends the following:

(a) The imposition of stricter fines for overweight vehicles (use of a fine schedule similar to that being used in Oregon). (BDR 43-97, Appendix N)

(b) Mandatory unloading requirements for repeat weight violations (BDR 43-96, Appendix N).

(c) The establishment of a continuing interim committee for further legislative review of the Department of Transportation. The subcommittee suggests further study in such areas as the need for a special permit issuance system, the impact of exempting synthetic fuels from motor vehicle fuel tax requirements, and the economic impact of deteriorated highways on all system users and cost allocation and user oriented studies to more equitably distribute costs (BDR 98, 99, 100, Appendix N).

(d) An immediate review of the current special permit system by the Department of Transportation with particular emphasis upon the recovery of all costs to the Department in issuing overweight, overlength, and overwidth permits.

The subcommittee's findings on the Department's future revenue needs are discussed later in the summary.

Determination: Do any Inefficient Practices or Inadequate Systems Exist and if so, the Causes.

The subcommittee found that some inefficient practices and inadequate systems do exist within the highway maintenance program being offered by the Department. The subcommittee concerns are listed below:

1. The subcommittee believes that the Department of Transportation has already established the backbone for a solid data system through which numerous maintenance decisions can logically be assessed. This data system is referred to as the Maintenance Management System (MMS). It appears, however, that the system is not being fully utilized to provide answers to the questions of groups outside the Department such as executive/administrative or legislative personnel. In effect, it appears that the system is not being used to analyze the reasons for cost differentials between districts nor to evaluate cost beneficial practices within the Department by management level decision-makers, but currently is being used more as a sophisticated accounting system for the Department's maintenance program.

2. During the subcommittee's hearings, testimony was presented that indicated maintenance of existing roadways was the Department's top priority. This testimony conflicted with oral representations made by departmental officials elsewhere, and it was later determined that matching federal aid really constituted the Department's first priority. The subcommittee was concerned with the efficacy that such prioritization represents in that the NDOT continues to add new miles of road while the dollars to maintain those miles are not available. In addition, it was discovered that maintenance project prioritization amounted to "worst case first" methodology for project selection and the subcommittee believes such a policy may not always lead to the best use of the few maintenance dollars available.

3. A Federal Highway Administration report presented to the subcommittee indicated that maintenance employee productivity and optimum maintenance crew size should be evaluated since it appeared that, at a time when monetary considerations often required the cutback of activities or materials, work projects were assigned based solely upon manhours available, i.e. labor intensive work. Department officials indicated this was the case during the course of the subcommittee's hearings.

   The subcommittee also received much testimony indicating that state maintenance employees' salaries were not competitive with those paid by private industry nor did the state provide sufficient incentive for career oriented employees. The subcommittee believes that employee productivity and wage and career satisfaction are of prime importance to the efficient operation of the highway maintenance program.

4. Maintenance equipment utilization figures for the Department in Fiscal Year 1978-79 indicated the statewide utilization rates in the various equipment classes did not reach 60% of total time available (a private industry guide for lease/purchase decisions). In fact, a number of equipment classes were considerably below the 60% level which led the subcommittee to seriously question the efficiency of the Department's equipment management program. The subcommittee was particularly concerned about this finding in view of the $5 million General Fund appropriation made during the 1979 Session for the purchase of replacement maintenance equipment.

5. The subcommittee spent much time discussing innovative technologies and methodologies in the highway maintenance field with Department of Transportation representatives. After the second hearing, it appeared to the subcommittee that the Department's efforts in researching and testing newly developed technologies did not represent a concentrated approach to the problem. The subcommittee was particularly concerned about the status of the Research and Development Division within the Department and the role that function plays in developing new maintenance strategies and alternatives, particularly in view of the less than 1% of total budget allocated for that purpose within the Department in Fiscal Years 1979 and 1980.

Determination: Is the Department Managing and Utilizing its Available Resources for Maintenance in an Economical and Efficient Manner?

The preceding discussion leads to the subcommittee finding that available resources (although probably insufficient to meet all minimum program level requirements), are not being used as efficiently as they might be. In effect, the subcommittee believes that the Department has trouble in defining its maintenance needs, in expressing those needs adequately to executive and legislative bodies, and that, currently, NDOT is not doing enough to improve its service delivery abilities in the maintenance field.

The Department finds itself at a turning point in regards to declining revenues and accelerating costs, and the subcommittee believes the most economic use of the limited resources that are available is imperative to insure both legislative and public confidence in the Department's efforts as well as to convince all sectors in Nevada of the need for additional revenue sources to support highway activities.

Determination: Are any New Methods or Techniques Suitable for Application to Future Programs of Maintenance that Would Produce Greater Benefits?

During the course of the subcommittee's investigations, the Director of the Nevada Department of Transportation retired and a new Director was named to the post. At the subcommittee's final work session, the new Director asked that he be given time to implement his new programs and ideas. The subcommittee subsequently recommended that the Director be given adequate time to address not only problems he perceived within the Department but also to address the problems pointed out by the subcommittee. The subcommittee requested he report his progress in these issues to the Assembly and Senate Transportation Committees of the 1981 Session of the Legislature. The subcommittee specifically suggested the Director review and be prepared to report on the following:

1. More complete use of the existing Maintenance Management System, particularly as it can be applied to the level of service consequences of any reduction in budget, analysis and tracking of the effects of budget shortfalls and deferred maintenance, and evaluation of the cost effectiveness of various maintenance operations.

2. The potential for the establishment of a more formalized and objective maintenance project priority formula. The subcommittee believes the current practice of reacting to the "worst case first" and relying solely upon on-site inspections by maintenance foremen to determine maintenance needs may not always lead to the most prudent use of the few dollars available for maintenance activities.

3. The possible evaluation and review of maintenance employee productivity (including a review of the Department's current performance standards), optimum maintenance crew size, and competitiveness of state salary and career ladder progressions when compared to private industry. Such an evaluation could be conducted in-house or conducted with the use of private consultants. If the private consultant option is chosen, the subcommittee suggested the Director may want to approach the Department of Administration for use of part of its General Fund appropriation made for productivity study purposes.

4. The subcommittee suggests that the Department review the implementation of maintenance equipment utilization standards particularly in view of the legislative utilization review that indicated equipment use could be increased up to 15% over 1978-79 use. As a means toward this end, the subcommittee endorses the installation of an internal dual rental system to more adequately account for equipment use and accurately attribute costs as a means toward encouraging higher use rates. In addition, the subcommittee suggests a more intensive investigation into heavy equipment leasing either from contractors or heavy equipment firms. The subcommittee also believes that the installation of an Equipment Management System, as suggested by the new Director, could streamline the current equipment acquisition utilization and disposal process and lead to substantially greater economies in the future.

5. During the course of the subcommittee's hearings many questions were asked to determine the relationship between increased traffic, age, and heavier weight allowances upon the conditions of roadways within the state. The Department was unable to provide the answers to these questions. The Department was also unable to provide a specific listing of the "maintenance backlog", a rating of roadway status, condition and serviceability within each district, as well as a

detailed explanation of the costs and benefits of various maintenance strategies that could be applied to this backlog. During the hearings, the subcommittee heard a presentation from the FHWA explaining the capabilities of a Pavement Management System (PMS). It appeared that a Pavement Management System, using much of the inventory data already collected for the existing Maintenance Management System, could have provided much of the requested information to the subcommittee. The subcommittee, therefore, strongly endorses the installation of a Pavement Management System to provide information about roadway status, cost efficiency of various repair methodologies, and the subsequent allowance for selection of the optimum maintenance or betterment strategy.

Determination: Will the Department Require any Additional Sources of Revenue to Support Future Maintenance Programs?

The subcommittee heard much testimony about the Department's need for additional resources coupled with information explaining rising costs to the Department in meeting its maintenance objectives. Indeed, the lack of available revenue was cited as one of the primary reasons the Department was not meeting all of its maintenance objectives and was perceived as the major problem in meeting future maintenance goals.

The subcommittee believes that the Department is in need of additional revenue sources to meet higher maintenance costs as well as to dent the growing backlog of maintenance work. Although there are a number of funding strategies that could be considered, the subcommittee believes the specifics as to how these funds should be acquired are, more properly, a topic for the Assembly and Senate Taxation and Transportation Committees. The subcommittee, therefore, recommends that the specific funding strategies, as recommended by the Transportation Board of Directors and the Governor, be presented to the applicable legislative subcommittees for their consideration and review during the 1981 Legislative Session. The subcommittee also recommends the Legislature's review of these funding strategies include discussion of whether or not the new revenue sources or any part of them should be earmarked for specific program use.

III. PERSPECTIVE

A. History

According to the April 1967 edition of "Nevada Highway News", the Nevada Highway Department was created by legislative action early in the 20th century. The "News" reports the following: "The inauguration of a highway department was a logical development of federal action to set up a nationwide program. Until 1911 the State of Nevada did not participate in any manner with road improvements. In that year the Legislature gave the State Engineer general supervision of road work carried out by convict labor, and appropriated $20,000 for the purpose. When this money was exhausted after some work in Washoe and Ormsby counties the program came to an end, and state participation was not renewed until the legislative session of 1917. The Legislature, realizing that something must be done to improve the condition of at least the principal roads, and acting under the stimulus of aid given by the federal government, enacted 'The State Highway Law'. It was signed by Governor Emmet D. Boyle on March 23, 1917. The following month the Governor formed the Highway Board, thus taking the first organizational step in development of Nevada's highway program."

In 1956, Congress passed the Federal Highway Act which upgraded standards and accelerated construction of the National System of Interstate and Defense Highways. Correspondingly, the 1957 Session of the Legislature passed Chapter 370 to further organize the Department and arrange its oversight of the state's road construction program. In Chapter 370 of the 48th Session, the Legislature recognized the importance of a safe and efficient highway system and observed that inadequate roads and highways obstruct the free flow of traffic, result in undue motor vehicle operational costs, endanger the health and safety of the state's citizens, depreciate property values and impede the general economic and social progress of the state. With these concerns in mind, the Legislature designated that the Highway Department be administered by a Board of Directors (composed of the Governor, Attorney General and Controller) whose duty was to plan, develop, operate, maintain, control and protect the highways of the state for present and future use within the limits of available funds.

The Department's duties and responsibilities remained largely unchanged until the 1979 Session of the Legislature transformed the Highway Department into the Department of Transportation pursuant to Chapter 683 of the 1979 Statutes. As such, the Department's responsibilities include development of an integrated and coordinated transportation planning and operation agency with statewide responsibility for multi-modal transportation needs. In addition, the centralization of the state Transportation Department was perceived as an advance toward providing technical assistance to local transportation agencies as well as an aid in dealing with the increasing number of relations with the Federal Government. The impetus for changing the Department to a central transportation agency came from legislation drafted as a result of a 1977 Legislative Interim Subcommittee appointed to study the feasibility of creating a commission to regulate transportation (Bulletin 79-5).

The Board of Directors remained as the administering body with a Director and Deputy Director reporting to the board. Chapter 683, however, did provide for the reorganization of the Department into four functional divisions, those being the Administrative, Operations, Engineering and Planning Divisions. Functionally, maintenance responsibilities fall under the control of the Operations Division headed by an Assistant Director (vacant from the time of creation July 1, 1979 to July 23, 1980) who reports to the Director of the Department through the Deputy Director. The Assistant Director of Operations also has the responsibility for the materials and testing, construction, equipment, and communications sections as well as the six maintenance districts, in Las Vegas, Reno, Elko, Ely, Tonopah, and Winnemucca. An organizational chart of the Department, as established by Chapter 683, is included as Appendix A.

B. Maintenance Program Status

The maintenance activities of the Department are broadly grouped into three functional areas. They are:

1. Routine Maintenance, which is that physical maintenance which preserves and keeps a highway including all of its elements in or nearly as practicable its original as constructed condition or

its subsequently improved condition and those traffic services and operations which provide safe, convenient and economic highway transportation for the public.

2. Additions and betterments, which are those improvements, adjustments, or additions to a highway which more than restore it to a satisfactory maintenance level and which result in better traffic serviceability without major changes in its original construction.

3. Stockpiling, which is the accumulation of a reserve supply of goods and raw materials for use when needed.

Maintenance services are coordinated through the 14-employee central maintenance division headed by a Highway Engineer VI and performed largely by personnel in the six districts, each headed by a Highway Engineer VI (See Appendices B and C for organizational charts) or, when funds are available, through contracts with private businesses. All told, including overhead personnel, the maintenance efforts of the Department occupied over 700* employees of the 1,325 authorized for the Department in Fiscal Year 1978-79. This manpower use (excluding CETA employees) represented approximately 53% of the total manpower available to the Department during that fiscal year and almost 50% of total departmental salary expenditures.

According to information presented by the Transportation Department, the maintenance division and the six districts' maintenance workload, as of November 16, 1979, consisted of 13,792 lane miles, 3,666 mowed shoulder miles, 16,231 lane striping miles, 1,775,136 square feet of pavement marking requirements, and 7,947 miles of ditches. (A map and complete listing of the 11/16/79 maintenance unit inventory for each district as well as for the state is attached as Appendix D.)

The activities performed by the maintenance forces in pursuit of the maintenance objectives are classified into major program groupings for management system reporting purposes. Shown below in sequential order of

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* NDOT originally indicated the maintenance employees totalled 631 people in FY 1978-79. This was later corrected to the 700 figure.

expenditure in FY 1979 (largest to smallest) are the significant maintenance programs conducted by the Department. A complete listing of specific activities under each program heading is contained in Appendix E.

1. Flexible Pavement Program
2. Material Production Program
3. A & B Surface Treatment Program
4. Snow and Ice Control Program
5. Traffic Service Program
6. Roadside Maintenance Program
7. Maintenance of Roadside Facilities Program
8. Roadside Clean-up Program
9. A & B Grading Program
10. Maintenance of Roadside Appurtenances Program
11. Rigid Pavement Program
12. A & B Traffic Service Program
13. Planning & Scheduling Program
14. Repairing Miscellaneous Concrete Appurtenance Program
15. Structure Maintenance Program

Provision of the major maintenance program services in 1979 required 24% of the Department's $106,790,740 budget. This amounted to $25.7 million. Slightly over half of that amount ($13.2 million) was expended in the area of operating materials and maintenance equipment acquisitions. The operating category expenses included such items as utility payments, maintenance materials (salt, salt and sand, chip, aggregate, premix and plantmix and liquid asphalt), diesel fuel, gasoline, building supplies, landscaping products, and guard rail and sign purchases. Of interest is the fact that maintenance operating expenditures in Fiscal Year 1979 equaled 87.9% of all departmental operating costs while maintenance equipment costs totaled 95.6% of the Department's total equipment expenses in that fiscal year. It should also be noted that the total maintenance program costs were reduced by $815,398 in Fiscal Year 1979 through receipts from equipment rentals to other departmental divisions, i.e. construction, design, planning, etc.

The maintenance activities of the Department are, for the most part, funded totally with state source dollars. This revenue is derived from motor vehicle fuel tax, special fuel taxes, motor vehicle user fees, and a

variety of miscellaneous charges. The sources of these collections are discussed below.

NRS 365.170 imposes an excise tax of 4.5 cents per gallon on all motor vehicle fuel sold, distributed, or used in the state. This 4.5 cents per gallon is allocated entirely to the state and, in Fiscal Year 1979, amounted to $22.2 million or 42% of all Highway Fund collections. State law also provides for the imposition of another 1.5 cents per gallon tax on motor vehicle fuel, however, proceeds from these taxes accrue to the benefit of cities and counties of the state. In addition, counties with street and highway plans can impose an additional 1 or 2 cent tax as well as, with voter approval, an additional 2 cent tax (as included in Chapter 526 of the 1979 Statutes). These last revenues, however, are for county use only and do not accrue to the state's benefit.

The state also receives the proceeds of the 6 cent per gallon special fuel tax assessed on the sale or use of special fuels (primarily diesel fuel) pursuant to NRS 366.190. According to the Department of Motor Vehicles, in Fiscal Year 1979, the special fuel receipts totaled $4,551,661 or 9% of the total nonfederal aid revenues deposited in the Highway Fund during the year.

Revenues received in the Highway Fund from the Department of Motor Vehicles come from a variety of sources such as motor vehicle registration fees, motor carrier fees, and, until July 1, 1979, drivers' license fees. (Pursuant to Chapter 569 of the 1979 Statutes drivers' license fees were placed in the General Fund with the operating appropriation for the division also being provided with General Fund monies.) Specifically, vehicle registration fees include record search, title fees, personalized plate fees, inspection and scale fees, and penalties, while the Motor Carrier Division charges include unladened weight, mileage tax, prorated registration, convoy license, 48-hour carrier permit, public service, overweight and length, and penalty assessments. In Fiscal Year 1979, motor vehicle user revenue (including drivers' license fees) totaled $21,456,514 or 41% of all nonfederal aid revenue receipts.

The final category of nonfederal aid revenue is miscellaneous revenues. These revenues are derived from the sale of excess property and miscellaneous sales of

the Department of Transportation. In Fiscal Year 1979, this revenue constituted $4.6 million or 9% of the total revenue receipts to the Highway Fund.

The Department's total nonfederal aid receipts in Fiscal Year 1979 equaled $52,761,927 with user fees and gasoline taxes (excluding special fuel) comprising 83% of all receipts.

In addition to maintenance and state only expenditures, these funds are also used to supply the matching requirements for federal aid revenues (usually 95% federal to 5% state and supplied on a reimbursable program) as well as the operating appropriations for the Department of Motor Vehicles plus smaller allocations to the Attorney General, Public Service Commission and Department of Taxation.

Finally, no review of the Nevada Department of Transportation's maintenance program can be complete without a summarization of the capabilities of the Maintenance Management System (MMS).

In 1974, a decision was made to capture the maintenance activities of the Department on a computerized management system. The system was developed to allow a more accurate tracking of the manhours, activities, and costs of each of the maintenance functions performed by the Department. According to the Department, the objectives of the system are:

1. To develop performance standards which, for principal maintenance activities, describe the procedures to be followed, the men, equipment and materials to be used, and the rate of production to be achieved.

2. To determine workloads through the measurement of quantities of the various elements on the highway system (system inventory) and to evaluate external influences (weather, traffic, etc.) acting upon that system which create a need for maintenance.

3. To budget (dollars) resources (men, equipment, materials) to meet the predicted workload in terms of specific programs (activities, quantities, locations) to be achieved.

4. To schedule activities within the budgeted program to utilize resources in the most efficient manner, to reduce fluctuations in manpower and equipment requirements to a minimum, and to keep the highway system operating in a safe, convenient manner.

5. To establish a management information system which provides the basic knowledge required by operating managers for routine decisions and a special (exception) report required by top management for control and improvement of the program.

The Maintenance Management System provides the capability to evaluate the huge number of elements contained in Nevada's maintenance program. Not only does the system produce reports indicating total expenditures by activity, but it also produces comparison reports that show how well foremen and districts conform to standard production rates and unit costs and to district and statewide averages. The subcommittee found the MMS to be of invaluable assistance during the course of its hearings. For a more complete review of the system and its capabilities, refer to Appendix F.

C. Workload Growth Comparison

Not only are the Nevada Department of Transportation's maintenance forces charged with maintenance of the existing system and preservation of that system under heavy use (68% of all vehicle miles traveled are driven on state roadways, according to NDOT officials) but, they must also plan for the care and preservation of the evergrowing network of roads intertwining all parts of the state. Continuing emphasis on the interstate construction program has tremendously impacted the workload of the Transportation Department's maintenance forces.

A review of the growth of the maintenance responsibilities within the Department since 1974 indicates significant growth in major workload units. Specifically, the 5-year period from 1974 to 1979 saw a growth of nearly 17% in the number of lane miles under the responsibility of state maintenance forces, nearly a 20% growth in the number of shoulder miles requiring mowing, and a 44% increase in the linear feet of guardrail to be maintained. Of particular note is the huge

increase in the number of landscaped acres under control of the state forces, up from 12 acres in 1974 to 215 acres in 1979.

This growth in workload, however, was not accompanied by a parallel growth in the status of the maintenance and betterment program in comparison with total Department effort during the same 5-year period. The maintenance program, as a percentage of total highway program, grew only 5.26% from 18.77% of total program to 24.03%. The bar chart shown as Appendix G depicts the relatively static posture of the maintenance program within the total departmental program effort.

But while the relative status of the maintenance program grew slightly when compared with total program expenditure, the program expenses did, in fact, increase $15.5 million. Notably, the increase in maintenance program "category" expenditures (i.e. personnel, operating and equipment) saw a huge growth in dollar volume during this time period. Specifically, the personnel category expenditure increased 97.2%, the operating category expense increased nearly 200% and the equipment expenses increased over 600% during the period. The relatively static status of the maintenance program as it relates to overall program, however, indicates the tremendous growth in expenditures for all the phases of the highway program during the same time.

The Nevada Department of Transportation has seen tremendous growth and change in the scope of its responsibilities since its inception in 1917. Needless to say, the program will continue to grow as the state's need for new miles to extend its transportation system continues. And as the state's road system grows so do its needs for increasing maintenance services, not only on the newly added miles, but also on those miles of roadway and shoulder surfaces previously placed into service.

IV. SUBCOMMITTEE FINDINGS & RECOMMENDATIONS

The following section provides a detailed discussion of the testimony presented to the subcommittee leading to the findings and recommendations included in the report.- Once again, the discussion and findings and recommendations are divided into the five major determination topics.

1. Determination: Is the Department of Transportation Achieving the Desired Objectives of its Programs of Maintenance?

The Department of Transportation estimates the book value of those highways and roads under maintenance care by the state, based upon the total cost of building highways from 1917 to June 30, 1979, at $890,611,195. This figure includes construction and engineering costs directly attributable to highway construction. The cost of reconstruction of this mileage, not including the cost of right-of-way, was estimated at $2,299,052,861.* These figures indicate the tremendous investment the citizens of the State of Nevada have in their state road system. Protection of this investment is imperative not only for the safety of the motoring public, but for the continued economic growth and stability of the state. The responsibility to maintain, preserve and protect the existing highway system has been placed upon the maintenance forces of the Department of Transportation.

The specific maintenance objectives of those personnel involved in this never-ending task, as outlined by the Maintenance Management System's Manual of Instruction, are twofold. The objectives are to provide:

(a) that physical maintenance which preserves and keeps a highway, including all of its elements, in or nearly as practicable, its original as constructed condition or its subsequently improved condition and,

(b) those traffic services and operations which provide safe, convenient, and economic highway transportation for the public.

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* Estimates considered extremely conservative in that environmental study costs were not included and were based upon 1978 cost figures which did not include tremendous price increases in asphalt and petroleum products.

The A.C.R. 30 subcommittee, in its analysis of whether or not the Department is achieving these two goals, reviewed each objective separately.

Physical Maintenance

The subcommittee believes that assessment of the maintenance goal of adequate physical mairtenance can only be made through an analysis of the Department's needed maintenance (including a review of how that workload is determined, the amount of work that was accomplished, and the differences between the two levels). The Department reported that Fiscal Year 1973-74 was the last year in which the needed maintenance requirements of the State's highway system were met. Since that time, the Department reported that the difference between those expenditures needed within the Department and those expenditures the Department was able to make had increased tremendously. The chart below indicates the difference as presented by the Transportation Department to the 1979 Legislature.

	Transportation Dept. Actual/Projected Expenditures	Needed Expenditures	Difference
FY 1973-74	$ 62,505,106	$ 62,505,106	$ -0-
FY 1974-75	70,998,599	75,498,599	4,500,000
FY 1975-76	84,904,747	91,404,747	6,500,000
FY 1976-77	92,782,093	100,782,093	8,000,000
FY 1977-78	117,347,158	126,847,158	9,500,000
Est. FY 1978-79	122,785,123	134,285,123	11,500,000
Total	$551,322,826	$591,322,826	$40,000,000

The subcommittee attempted to investigate what this $40 million backlog represented in terms of miles of roadways and, especially, the methodology utilized in determining the "needed maintenance work." Although a serviceability and condition rating of the needed maintenance work was requested, the Department reported that none currently existed. The subcommittee asked how roadway deterioration rates were measured, if road surface deterioration had accelerated in the last two biennia, and if the Department had a listing of the road surfaces needing maintenance attention for each of the fiscal years in the last two biennia. The Department responded:

> "No attempt has been made to determine the rate of deterioration. There are a number of signs that alert those knowledgeable in asphalt construction that the

road needs attention such as oxidation, cracking, rutting, etc. Weather can have a very significant impact on deterioration, particularly with asphalt pavements. We do not have listings for the last two bienniums. Projects were developed to fit the available funds rather than attempting to list all those areas needing attention.

Prior to the 1981 session of the Legislature, we will prepare a specific inventory of those roads and sections that need attention, broken down by the kind of attention needed such as resurfacing, chip seal, sand and seal and reconstruction."

Verbal testimony presented to the subcommittee indicated the backlog represented 640 miles. However, in response to a subcommittee question asking for a detailed listing of the total mileage needing resurfacing, restoration or reconstruction as of December 31, 1979, the Department provided a listing totaling 496.69 miles. The breakdown by district is shown below:

District	Miles
District I - Las Vegas	19.73
District II - Reno	30.17
District III - Elko	85.29
District IV - Ely	36.97
District V - Tonopah	242.48
District VI - Winnemucca	82.05
Total	496.69

In testimony before the subcommittee, however, Department officials hastened to point out that there had been some misunderstanding in compilation of this listing and that the real mileage that needed maintenance attention was the previously cited 640 miles. The only listing of this mileage that the subcommittee was able to obtain was a listing included in a Department of Transportation presentation before the Senate Taxation Committee hearing during the 1979 Session. This backlog listing follows:

DETERMINATION OF RESURFACE (RS) BACKLOG

FEDERAL AID INTERSTATE	MILES	COST Millions
I-15 8.5 mi to 16.4 mi NE Cal Line	7.84	1.4
I-15 Henderson Int. to Flamingo Rd. (incl. Safety)	10.65	3.3
I-80 Sparks to McCarran Hill (incl. Safety)	9.17	6.2
I-80 Mill City to HU Co. Line	12.63	1.6
I-80 6.5 Mi E. of Elko to Halleck	11.95	3.4
	52.24	$15.9

FEDERAL AID SECONDARY		
FAS 431 (Mt. Rose Rd.) 3.5 mi NE N Shore Rd to Slide Mt. Road	8.03	4.1
		$4.1

STATE AID ROADS		
These roads must be resurfaced from State funds because they were dropped from the Federal Aid Secondary System. Since we built these roads with Federal Money, we must maintain them. The backlog is statewide and approximately 18.3% of total State Aid System.	353.31	$6.7

MAINTENANCE CONTRACTS		
Resurfacing backlog needs throughout the system beyond the capability of local maintenance personnel. These contracts are smaller, but more numerous than itemized list above.	230.77	$14.4
GRAND TOTAL	644.35 miles	$41.1

Source: Highway Department presentation to Senate Taxation Committee during 1979 Session.

Department officials also pointed out that the backlog was growing at the rate of $10 million per year. The cause for this annual growth in backlog was explained by the new Director at the July 10, 1980, meeting. He explained that the Department has only been able to resurface 200 miles per year and reconstruct 150 miles per year of the total 7,000 miles of asphalt roads under control of the state. He said that this average of 350 miles per year amounts to a 20-year maintenance cycle when, in fact, for economic salvage and maintenance purposes a 10-year cycle is necessary. The end result of the never-ending cycle is that improper maintenance results in a much more rapid rate of deterioration, which in turn, usually requires reconstruction at a much higher cost.

During the course of the subcommittee's work, it became obvious that the problems that beset the maintenance program prior to the 1979-81 biennium did not slacken, but were magnified. During the first fiscal year of the biennium, the Department, due to a severe decline in the receipts of projected motor fuel taxes and vehicle user fees, was forced to defer $17,365,000 of state funded projects including $7 to $8 million in needed maintenance projects. The new Director informed the subcommittee that no contract maintenance work was planned for Fiscal Year 1980-81, thereby contributing to a further growth in the Department's backlog of maintenance work.

Department officials admitted that they were, for a variety of reasons, unable to adequately provide the necessary physical maintenance services required on the roadways. This was also borne out by Federal Highway Administration representatives who noted that in 1978, Nevada was under the national average in the amount of state expenditures per mile for maintenance of streets and roads. It was pointed out that continued inability to provide needed maintenance services could result in a 10 percent loss of federal aid participation funds for continuing construction work.

The subcommittee questioned whether federal funds could be used for maintenance activities to help diminish the existing backlog as well as prevent the estimated growth in the backlog. Federal representatives and state officials explained that some federal monies were available through the 3-R Program (Resurfacing, Restoration and Rehabilitation), approved as part of the Surface Transportation Assistance Act of 1978. These funds, it was pointed out, can be used only on certain federal aid highways if certain federal criteria are met.

The subcommittee measured the acknowledged backlog and considered the projected annual growth of $10 million per year in that backlog against the Department's stated objective of providing that physical maintenance which preserves and keeps a highway, including all of its elements, in or nearly as practicable its as constructed condition or its subsequently improved condition. The conclusion was reached that the Department is not achieving this maintenance program objective.

Traffic Services

The Maintenance Management System's Manual of Instruction, cites the second objective of the Department's maintenance program as provision of those traffic services and operations which provide safe, convenient and economic highway transportation for the public.

The subcommittee reviewed the growth in traffic volume on major routes within the state since 1974 and noted that, according to the Department of Transportation, vehicular traffic had increased, on an unweighted average, 130% on seven major routes, while truck traffic on those same routes had increased an average of nearly 174%.

During this same period of time, according to preliminary figures from the state's 1981 Highway Safety Plan, the state's population increased 26% while the number of licensed drivers increased 42% (from 398,337 in 1974 to 565,530 in 1979), the number of registered vehicles in the state increased 39% (from 510,627 in 1974 to 709,643 in 1979) and, perhaps, most importantly, the vehicle miles increased 37% (from 4.3 billion in 1974 to 5.9 billion in 1979). This growth in motor vehicles and related driving activities indicates that Nevadans are still using their roadways in increasing proportions and it is suspected that in Nevada, highway travel will continue to grow.

Despite the tremendous growth during the 1974-1979 timeperiod, it is interesting to note that the percent of accidents in which a defective roadway was the primary factor actually declined from .3% in 1974 to a low of .1% in 1979. The subcommittee was encouraged by this statistic that indicates the road system, while increasing its maintenance needs, has not compromised its safety standards.

The subcommittee is concerned, however, that the continued growth in roads in need of maintenance will be felt by the motoring public in terms of increased vehicle operating and fuel costs. Although no figures were available for Nevada alone, the subcommittee noted a report released by The Road Information Program (TRIP) which concluded that driving on poor road surfaces wastes fuel, increases tire wear and causes damage to brake, steering and suspension systems. TRIP estimated that bad road conditions in 1979 cost the average motorist $137 a year in added vehicle operating costs, and $110 in additional fuel charges. The subcommittee believes these costs to be an unfair burden upon the motorists, all of whom are being faced with already escalating costs from all sectors.

It appeared to the subcommittee that NDOT is still able to supply adequate traffic services to the motoring public. The subcommittee believes the state road system is the primary conduit for the transaction of Nevada's tourism and gaming industry. The fact that traffic services are still being adequately supplied to both the citizens and tourists of this state despite huge growth is a good reflection upon the efforts of the Department of Transportation's maintenance personnel.

However, the subcommittee is concerned that the increase in deferred maintenance and the subsequently growing backlog of needed maintenance work will begin to manifest itself in declining road use figures, increasing accident statistics attributable to defective roadways and increased vehicle operating and fuel costs, all of which will have an increasing effect on the state's economy.

Subcommittee Findings and Recommendations

The subcommittee finds that the Nevada Department of Transportation is currently able to achieve its objective of providing safe, convenient and economic transportation for the public. However, the subcommittee is convinced that the Department has been unable to provide that physical maintenance necessary to keep the highway in "as nearly as practicable its original as constructed or subsequently improved condition." In addition, the subcommittee is concerned that should the deferment of necessary maintenance services continue to add to the already large backlog recorded by the Department, the quality of the safe, convenient and economic highway transportation afforded the citizens of this state will deteriorate.

Several factors were outlined to the subcommittee as having significant or great impact upon the Department's ability to provide physical maintenance services to the state's roadways. Presentations by the Deputy Director of the Department of Transportation detailed the following as the primary contributory causes to the Department's inability to keep up with its needed physical maintenance work:

A. Deferred Maintenance--Since the initial fuel shortage of 1973-74 and the accompanying reduction in anticipated user revenue collections, the Department has rapidly fallen behind in preventative maintenance on the state roadways. With each subsequent year, due to lack of adequate resources, the Department has fallen further behind in providing the pavement seals, overlays, and remedial measures required to promote the originally projected design life of our pavements.

   With the latest fuel shortage and resulting reduction in revenues, the gap between needed maintenance and the ability to provide it is becoming even more pronounced.

B. Increased Traffic--Economic growth and expanding populations in the state's urbanized areas of the Las Vegas Valley and the Truckee Meadows have created a demand for increased maintenance services and has placed rapidly increased loadings and wear on pavement structures. This impact was estimated to be large. A copy of a Department of Transportation traffic volume growth chart follows.

   Growth in truck traffic volumes and total vehicle volumes from 1974 to 1979 on major trucking routes.

Route	Percentage Growth 1974 to 1979	
	All Vehicles	Trucks
I-15	136%	185%
I-80	125%	174%
US 6	120%	197%
US 50	134%	156%
US 93	127%	138%
US 95	123%	189%
US 395	146%	177%

C. Economic Inflation--The unprecedented economic inflation has furthered the Department's inability to adequately maintain the state's highways. The costs of the materials and equipment needed in maintenance operations have risen out of proportion to the general rate of inflation in many instances. As an example, price comparisons of some routinely purchased materials and equipment as presented by the Department are as follows:

Equipment	1972 Cost	1979 Cost	% Increase
9,500 GVW Truck	$ 3,564	$ 8,867	149
27,500 GVW Truck	$10,131	$20,569	103
Motor Grader	$21,772	$46,741	115
Loader 2 1/2 Cu.Yd.	$22,650	$51,461	127

Material	1975 Cost	1979 Cost	% Increase
Aggregate Cu.Yd.	$ 2.55	$ 3.32	30
Salt, Cu.Yd.	$12.05	$16.10	34
Plantmix Cu.Yd.	$10.20	$19.05	87

Inflation and local economic expansion has also impacted the Department's ability to hire and retain certain skilled trades. State salaries for some skills are not sufficiently competitive in the labor market, especially in urban areas. The Department noted it had particular difficulty in keeping an adequate source of mechanics, a skill critical in the maintenance area. The adverse impact of inflation upon the Department's ability to maintain was estimated to be large, equaling that of diminished user revenues.

The subcommittee independently reviewed the value of the maintenance materials inventory from 1974 through 1979. Although the methods of estimating inventory value probably varied among the responding districts, the subcommittee was able to verify substantial increases in the maintenance material values including a 99% increase in the price of aggregate, an 82% increase in the cost of premix, an 89% increase in the cost of chips and a 92% increase in the price of asphalt.

D. Environmental and Social Constraints--Increased environmental sensitivity by segments of the public has brought about laws and ordinances that have had a cost impact upon maintenance operations. Following are some of the affected operations:

(1) Deicing--Sanding and salting, a long used method of pavement deicing, is being increasingly criticized as an environmentally detrimental practice that contributes to water and air pollution and is harmful to surrounding plant life. The Department has had to cut back in the application rate of salt and exercise more care in cleaning up the salt and sand residue left on pavements in the wake of deicing operations. This results in increased work expenditure in order to maintain an ice-free pavement surface. Concern over the detrimental effects of the salt and sand applications is especially pronounced in the Tahoe Basin, and may force the Department to use an alternate deicing method such as the application of liquid calcium chloride. This would dictate the purchase of additional equipment and the use of a more expensive material.

(2) Brooming--In more populated areas, out of concern for air quality, more frequent and thorough pavement brooming is required. In order to minimize dust, a more sophisticated and expensive type of brooming equipment is required.

(3) Pavement Planing--In order to eliminate surface bumps and troughs and rideability on a skid resistant pavement surface, it is sometimes necessary to plane pavements. The Department's method of doing this has been through the use of heat-a-planer machines. These machines heat the pavement surface to a semi-solid state that can be planed by tines mounted on the machine. In using these machines a certain amount of air pollution results. Increasing restrictions upon the use of these machines, especially in Clark and Washoe Counties, may force the Department to invest in more expensive cold milling machines to accomplish the planing necessary in these areas.

(4) Litter and Weed Disposal--Air quality restrictions relative to open burning have resulted in increased hauling in order to dispose of weeds and litter in the populated areas.

(5) Signing and Traffic Control--As a result of increased public concern for highway safety and in the loss of sovereign immunity from tort liability suits by the state, increasing attention is being

directed toward adequately signing and controlling the flow of public traffic through maintenance work zones. This results in a higher manpower expenditure in many Department operations.

E. Climatic Conditions--Freeze/thaw, moisture, frost heave and heat have a very detrimental effect on existing pavements. They lead to thermal cracking (expansion and contraction) and early potholing (frost heave) of existing pavements. The Department pointed out that Nevada's temperature differentials (50 degrees plus or minus within 24 hours) are a unique situation contributing to the added impact of weather upon deterioration of the State's highways. The Department indicated that the deteriorating impact of climatic conditions can be greatly accelerated through the lack of adequate maintenance. If the cracks are not filled, water is allowed to intrude during freeze/thaw cycles. This allows the water to freeze and expand which breaks up the pavement. If the subbase becomes saturated, it decreases the structural carrying capacity and permits early breakup of the pavement. If the pavement becomes dry and brittle due to heat, it must be sealed in order to avoid raveling of existing surface. The Department's Chief Materials Engineer pointed out that, when pavements are not properly maintained the surfacing deteriorates at a much more rapid rate which in turn usually requires reconstruction at a much higher cost.

F. Design or Structural Capacity and Age--According to the Chief Materials Engineer, almost all highways, with the exception of some secondary highways within the state, have been designed to last 20 years. This was accomplished using the American Association of State Highway and Transportation Officials' (AASHTO) design method and by projecting traffic increases for 20 years. Should the traffic increase dramatically over the anticipated, this increases the loading on the existing pavements and leads to decreased life of the structural section. This has happened in many of the state's highways due to the phenomenal growth in urban areas, increased mining activities in rural areas and even to increased activities in the petroleum industry in central Nevada.

In addition, he pointed out that there are numerous types of bituminous materials utilized in highway construction. Many of the low volume highways are constructed utilizing a road mixed material which

consists of a liquid asphalt and a lower quality aggregate mixed and layed on the road cold. This surface is fairly inexpensive, thereby allowing many more miles of surface area for construction dollars. These roadways have a good life unless truck volumes increase dramatically. High volume and high truck volume highways are constructed utilizing plantmix bituminous material. This consists of an asphalt cement and high quality aggregate mixed in a hot plant and layed on the roadway hot. This provides a very good high quality surface, however, since 1974 almost all of the transportation departments throughout the nation have encountered considerable handling difficulties in the asphalt cements being provided by the industry. These problems have led to early rutting on some highways and early cracking on others.

Again, the lack of a preventative maintenance program, caused by inadequate revenues, has a tremendous impact on the serviceability life of roadways. As explained above, while the roads were initially constructed for a 20-year life, the lack of deferred maintenance plus the greater volume of traffic has been reducing the actual lifetime average, according to Transportation Department officials, to between 10 and 15 years.

This situation is not unique to Nevada. Roads and highways across the nation are experiencing the same problems. In an article entitled, "Miles of Bad Roads Ahead for States," Billie Higgens of the American Association of State Highway and Transportation Officials said, "Most interstate highways were predicted to have a life to 20 years, but some have worn out in 10 to 15 years because travel was heavier than predicted." He added that the primary and secondary road system has been neglected in favor of the interstate and states have not been able to upgrade roads every decade due to inflation and highway costs.

G. Increased Truck Weights--The Department explained that, without a doubt, the increased weight limits permitted by a change in federal legislation in early 1974 are a factor in the accelerated deterioration of many of the pavements throughout the state. Although the extent of deterioration related to truck weight increases is difficult to quantify, the Department said truck weights are one of the five major factors taken into consideration when estimating pavement serviceability or life. In addition, the Department's Chief Materials Engineer

said, "Traffic, especially truck volumes have a very pronounced effect on pavement life. In designing structural sections, a factor is included to allow for some overloaded trucks... However, in my opinion, one heavily loaded truck can and will cause permanent distress. An example is one 50 percent overloaded truck will cause more permanent damage than numerous legally loaded trucks. Once this has happened, deterioration will increase at a more rapid pace under normal loads because the structural carrying capacity has been decreased."

He explained that the Department did not have adequate funding facilities or manpower to conduct in-depth studies to isolate the problem of overweight vehicles, but that several states were attempting to investigate and isolate this problem. He noted that isolation of the problem is difficult due to the numbers of factors leading to pavement failures.

In the absence of any other in-depth study attempting to assess the effects of vehicle weights on pavement deterioration, and although the study was considered controversial by some that testified before the subcommittee, the subcommittee did review a General Accounting Office survey entitled "Excessive Truck Weight: An Expensive Burden We Can No Longer Support" issued by the Comptroller General of the United States in July, 1979. The study indicated that national statistics show that about 22 percent of all loaded tractor trailer rigs exceed state weight limits. The report cited information from the American Association of State Highway and Transportation Officials which indicated that concentrating large amounts of weight on a single axle multiplies the impact of the weight exponentially. The report explained that a 5-axle tractor trailer loaded to the current 80,000 lb. federal weight limit weighs about the same as 20 automobiles. However, the impact of that tractor trailer was considered to be dramatically higher. The report said that such a tractor trailer has the same impact on an interstate highway as at least 9,600 automobiles. When the federal limits were raised 10% in 1975, the report indicates the potential for increased traffic related pavement damage rose 35%. The report said that only 63% of interstate mileage and 15% of interstate bridges could adequately accommodate current heavy truck weights and volume without a reduction in the pavement's serviceable life.

However, in a response to the report, the Assistant Secretary for Administration of the Federal Department of Transportation said, "We do not agree completely with the GAO contentions as to the extent of the responsibility for paramount damage attributed to illegally loaded trucks... We believe a strong possibility exists for a reader erroneously to conclude that elimination of illegally loaded trucks will also solve problems concerning pavement deterioration. Pavement wear is an expected phenomenon which is brought about by many factors some of which are seasonal weather cycles, quality of aggregates used during construction, quality of construction and repeated application of vehicle axle loadings. While it is agreed that illegally loaded trucks accelerate the rate of pavement deterioration we believe a more critical factor on many sections of interstate highway is the sheer volume of commercial traffic carrying legal loads which has greatly exceeded traffic projections that were made prior to highway design."

The subcommittee reviewed Nevada's overweight vehicle problem when compared to adjoining states through a comparison of the percent of overweight trucks on all highway systems and on interstate systems between Nevada and Arizona, California, Idaho, Oregon, and Utah. The survey indicated that Nevada was at or near the top in the percentage of overweight trucks on both systems without taking into account weight tolerance or special permit allowances in all states. This information was taken from the most recent biennial truck weight survey in each state as compiled by the Federal Highway Administration, therefore, survey techniques were identical. The subcommittee was particularly alarmed that Nevada not only had the highest overweight vehicle percentage on the interstate system at 23.6% of all vehicles weighed, but that Nevada's overweight percentage on all systems also exceeded the national average. Again it is important to note that these surveys did <u>not</u> check for legality (i.e. fineable overweights or special permit loads) and consisted only of measurements of all trucks over the statutory limits. The subcommittee nevertheless was quite concerned with the survey result. A listing of the six states' overweight percentages for all highway and interstate systems follows:

State	% Overweight Trucks All Hwy. Systems	% Overweight Trucks Interstate
Oregon	22.8%	16.8%
Nevada	22.5%	23.6%
Utah	17.1%	12.8%
Idaho	16.3%	18.6%
California	8.3%	6.9%
Arizona	4.5%	2.2%

The subcommittee members were greatly concerned about the overweight percentages attributed to Nevada by the FHWA studies. Although the studies had been conducted prior to the implementation of stricter enforcement efforts in Nevada, (such as the weigh-in-motion program and passage of the 1979 Legislature's strengthened overweight enforcement statutes), the figures indicated that Nevada has a significant overweight vehicle problem. The subcommittee was told by a representative of the Nevada Motor Transport Association that the key to cutting down on the number of overweight vehicles was increased enforcement combined with a more aggressive justice court approach toward levying overweight fines once the violators had been apprehended. It was explained that, in overweight vehicle cases, certain justice court jurisdictions dismissed citations, reduced the fines, and allowed offenders to post minimal bail with no intent of returning for adjudication. The subcommittee was told these practices greatly eroded the effects of a viable enforcement program.

The subcommittee attempted to evaluate the extent of such justice court practices and substantiate the significance of the problem with historic data. In addition, the subcommittee reviewed the provisions of Chapter 468 of the 1979 Statutes calling for bail in the amount of the fine and the disallowance of fine reduction for overweight citations to determine whether the provisions had discouraged such practices at the justice court level or whether stricter statutory measures (including the possibility of withholding local gasoline taxes to enforce compliance) were necessary. However, the historic measurement data was difficult to obtain and the subcommittee felt insufficient time had elapsed since the passage of Chapter 468 in which the effects of the 1979 legislation could be accurately assessed.

The subcommittee believes that, with the passage of time, the effects of the 1979 legislation on the state's overweight enforcement program should be reviewed. If it is discovered that the lack of justice court enforcement of overweight citations continues to be a measurable obstacle toward effective overweight enforcement, the subcommittee believes the imposition of stricter statutory measures to assure compliance should be considered.

H. Revenue Shortages--Perhaps the most significantly impacting factor upon the Department's ability to provide adequate physical maintenance services on the state's roadways can be tied to the lack of revenue available with which to accomplish the work. Between the fiscal years 1974 and 1979 non-federal aid revenue, with which all state physical maintenance must be accomplished, increased 57%. A chart depicting the Department's non-federal aid receipts for the five-year period is shown as Appendix H. Although this revenue growth could be considered to be healthy, it did not keep pace with the growth in expenditures in the maintenance program during the same time period (150%).

In addition, the growth in revenues reflected in the chart does not show the more severe problem experienced by the Department in the first fiscal year of the 1979-81 biennium. As explained by Department of Transportation representatives, the Department anticipated an 8% growth in each of the major revenue producing categories of motor vehicle fuel receipts and motor vehicle user fees over prior year receipts. However, by November of 1979, the Department was estimating a decline of up to 8% in motor fuel tax receipts and no growth in user fee revenues over those receipts of the previous fiscal year. This decline in receipts, in combination with escalating costs and increasing workloads had a significant impact on the Department's maintenance program which led to the deletion, according to Nevada Department of Transportation representatives, of $7 to $8 million in planned maintenance projects in Fiscal Year 1979-80 with no plans for the issuance of any maintenance contracts in Fiscal Year 1980-81.

This unanticipated decline in revenue receipts was not the only financial problem faced by the Department in Fiscal Year 1979-80. The continuing decline in Highway Fund balance since 1975 finally caught up with the Department of Transportation in Fiscal Year 1979-80. Despite the Department's attempts to process revenue transactions as quickly as possible (including bi-monthly transfer transactions) the depleted Highway Fund was unable to support normal "cash flow" operations of the Department during the fiscal year and was forced to get authority to borrow $3 million to meet its contractor payments from the state's Interim Finance Contingency Fund. In the end, the Department ended up

needing to actually transfer only $1 million; however, this "operating capital need" of the Department plainly demonstrated the dire straits in which the Department found itself during the 1979-81 biennium.

Another complicating factor in the declining highway revenue picture should also be discussed. This problem is pictured graphically in Appendix I and amounts to a further drain of dollars available for "on-the-road" maintenance expenditures. This drain is caused by increasing operating appropriations being made from the Highway Fund to agencies outside the Department of Transportation. The major agency that receives such appropriations is the Department of Motor Vehicles. In reviewing this problem it is important to note that the amount of funds that are collected by the Department of Motor Vehicles exceed the on-going operating appropriations required (roughly 2:1), however, these operating appropriations have required an increasing amount of the revenues being generated. For example, in 1974 operating appropriations to the Department of Motor Vehicles equaled 42% of the collections garnered by that agency. In 1979, however, DMV operating appropriations totaled 46% of the user fee collections made by the Department; therefore decreasing the total net collections deposited into the fund. This factor, too, makes a significant impact as dwindling revenues become an ever-increasing problem for the Department.

The subcommittee reviewed numerous potential avenues to correct the decreasing revenue problem. These proposals are briefly reviewed under Determination 5 on page 62.

Subcommittee Findings and Recommendations

The subcommittee finds that there are a number of factors that influence the Department's ability to meet its physical maintenance objectives. A number of these factors are really items over which the Department nor the Legislature have little control. These factors are:

(a) the effects of deferred maintenance
(b) increased traffic
(c) the effects of inflation
(d) increased environmental and social constraints
(e) climatic conditions
(f) structural capacity or age

However, the subcommittee believes two factors which contribute to the increased deterioration of the state's roadways can be favorably impacted by legislative action. These factors are: (a) increased control of overweight vehicles on the state's highways and, (b) provision for adequate revenue sources to meet future programs of maintenance.

While the subcommittee believes that overweight vehicles do have a significant impact upon increased road deterioration, it is important to note that the subcommittee does not believe that elimination of all overweight vehicles will halt all roadway decay. The subcommittee is acutely aware that a combination of all factors cited above are responsible. The subcommittee believes, however, in the absence of any substantiating data to the contrary, that increased control of overweight vehicles in this state will be helpful in the battle to maintain serviceable roadways. To deter the transportation of overweight loads the subcommittee recommends:

1. Increased monetary penalties for violations of the state's weight laws. The Motor Carrier Division of the Department of Motor Vehicles suggested a fine system modeled after Oregon's progressive law would be an aid in increased enforcement of vehicle overweights. The subcommittee agreed and subsequently recommends a change in the overweight vehicle fine system modeled after the Oregon law. (BDR 43-97, Appendix N)

2. A mandatory unloading requirement for those overweight offenders who are apprehended on any state road system the second time. The subcommittee believes a tougher stand on vehicle overweights will also be an aid in detering potential overweight loads. (BDR 43-96, Appendix N) The Department of Motor Vehicles indicates implementation of this measure will have an, as yet, undetermined fiscal impact.

During its review of the effects of overweight vehicles on pavement deterioration, the subcommittee was surprised by the lack of reliable information available on this subject as well as several other related topics. In particular, much discussion without resolution revolved around the special permit system (a system that allows commercial carriers to obtain legal permits to carry loads in excess of the statutory weight, length, and width limits); the potential effects to the Highway Trust Fund and the roadways of

exempting synthetic fuels (ethanol and methanol) from motor vehicle fuel taxation (especially in view of the Iowa experience of an estimated $4.9 million state tax loss due to gasohol exemption in Fiscal Year 1979-1980); and the actual impact of overweight trucks on the deterioration of state highways.

Directly related to the impact of overweight trucks (or even heavier weight limits) is the question of how to equitably allocate highway user costs to the various segments of the motoring society and the contention by the trucking industry that they pay only their fair share of these costs. The subcommittee became very interested in these topics, but for a variety of reasons, was unable to review them thoroughly.

Subcommittee Findings and Recommendations

Because of time and monetary constraints, the subcommittee was unable to probe deeply into other areas of potential study that presented themselves, but in recognizing the need for continued study, recommends the establishment of a continuing legislative interim subcommittee on the Department of Transportation. The subcommittee has suggested some possible areas for study consideration. They are:

1. A thorough investigation of the need for a special permit issuance system in Nevada. (BDR 99)

2. The effects of exempting synthetic based fuels from motor vehicle fuel taxation. (BDR 98)

3. The impact of overweight vehicles on Nevada roadways. (BDR 100)

4. Cost allocation and user oriented studies to more equitably assign road operation costs. (BDR 100)

Realizing many other potential subjects for study consideration exist, this list is meant as exemplary in nature and not as an exclusive listing. (See resolutions, Appendix N)

Discussion with Department personnel led to the subcommittee's conclusion that the current special use permit system in Nevada, while maintaining the legality of trucks operating over the statutory weight limits can potentially lead to increased strain on overburdened highways. The subcommittee's interest in this area was increased during discussions that revealed that the Department does not currently charge for the issuance of certain special use permits. In view of the Department's funding predicament, the subcommittee was particularly concerned about this practice.

Subcommittee Findings and Recommendations

Although the subcommittee believes the need for special permits should be extensively reviewed, it is recommended the Department immediately undertake an in-house assessment of the current system with particular emphasis upon recovery of all departmental overhead and administrative costs in issuing all overweight, overwidth and overlength permits.

2. Determination: Do Any Inefficient Practices or Inadequate Systems Exist and if so, the Causes.

While the subcommittee took stock of the number of "external" factors which obstruct the Department's ability to provide needed physical maintenance services, it also attempted to assess any inefficient practices or inadequate systems within the maintenance program. Discussion of the findings is itemized under program component headings.

Maintenance Management System (MMS)

At the subcommittee's first meeting, an in-depth report about the capabilities of the Maintenance Management System (cited by the Department of Transportation as perhaps the single most important aid to the Department in becoming more cost efficient) was heard by the subcommittee. Although the subcommittee believes the Maintenance Management System's output reports were of invaluable assistance to them in understanding the maintenance program of the Nevada Department of Transportation, a review with Department officials of the MMS information raised the subcommittee's doubts that the system was being fully utilized. For example, information taken from the MMS and reviewed in a different format appeared to Department representatives as newly discovered material. The subcommittee's perceptions were reinforced by the report of a Federal Highway Administration review team that conducted a thorough review of the system and its use in May, 1979.

The review team was composed of Washington and regional FHWA personnel who conducted their review May 7 - 15, 1979. The purpose of the review was to provide the state with an outside evaluation and analysis of the State Maintenance Management System operation.

The review team reported that the principal objective of the Maintenance Management System was to assure a specified level of maintenance on Nevada's highways utilizing men, equipment and materials in a most economic manner. It was the observation of the team that the operations budget and work plan developed by the MMS was not being used by top management for determining the maintenance budgets or as basic documentation for legislative budget hearings. The team suggested that the MMS operations budget and work plan be provided to budget authorities so that level of service consequences of any reduction of budget could be analyzed by decisionmakers.

It also appeared to the team that the MMS was being underutilized in some districts in developing management policy or evaluating maintenance operation efficiency. It was observed that tentative budgets and work programs prepared by the districts were based on existing personnel and equipment rather than the MMS proposed work plan. This procedure has resulted in very little change in field operations. The team recommended that top management endorse the MMS work program and operations budget as a system to be used in maintenance management, that top and mid-level field personnel receive additional training in the use of MMS, that annual work plans and operations budgets prepared in the districts be based more on needs than on personnel and equipment available (districts indicated that when they ran out of equipment or materials they reverted to labor intensive work).

During the course of its review, the subcommittee was also told of this practice, particularly during equipment utilization discussions, i.e. low equipment use was partially explained as a reflection of an attempt to keep maintainers "productive." If the case is as indicated, the practice of assigning labor intensive projects to keep employees productive is viewed by the subcommittee as being a very inefficient practice leading to increased job dissatisfaction as well as an ineffective use of few available dollars.

The review team compared the computed maintenance budget developed by MMS, the tentative routine maintenance budget developed by the districts, and the final maintenance budget developed by headquarters. The comparisons showed a significant maintenance service shortfall between the operations budget and the final line item budget. The team

recommended that top management annually analyze and track the effects of this budget shortfall and deferred maintenance and suggested that this analysis would be especially helpful during legislative budget hearings. The subcommittee agrees wholeheartedly. While the subcommittee realizes the numerous reasons for the growing difference between needed maintenance and that maintenance that is being performed, a more thorough explanation of the effects of the shortfall and the effects of deferred maintenance would be most helpful during legislative hearings.

In addition, the team did not observe a concerted management effort to use the system to evaluate the cost effectiveness of routine or standard maintenance operations, that is, crack filling, sand and chip seals, overlays and reconstruction. The team suggested that the system would be a useful tool for evaluating each of the operations and establishing performance and criteria for use. The team also recommended that specialized maintenance activities be subdivided whenever information benefits could be realized. For example, rest area maintenance is grouped into one operation at present. The team suggested that it may be important to identify vandalism and design correction work. They therefore suggested this operation be divided into routine rest area maintenance and vandalism reconstruction. Front line field supervisors would then be better able to evaluate their operation efficiency.

The team also recommended that training efforts emphasize the management application of the Maintenance Management System. The team stated that it was of the opinion that the system has unlimited benefits to the state if management at all levels are trained to use it effectively.

The subcommittee questioned the regional director of the FHWA for further clarification of the review team's report. Specifically, the subcommittee asked the Director to expand upon the review team's observation that the MMS was not being used to evaluate the cost effectiveness of routine or standard maintenance operations. The Director replied:

> "The Maintenance Management System (MMS) reports the type of operation (i.e., crack sealing, chip seal, overlay) and when and where such operations were performed. This information could be used to determine the most cost effective repair method by tracking through time how long each rehabilitation method lasts

and if it appears effective in controlling pavement deterioration. The State could balance the cost of crack sealing, say, with the cost and performance of a full surface seal. Such a management process would optimize the use of State maintenance funds."

In addition, the subcommittee asked if the MMS, as currently utilized, functioned more as an expenditure reporting device than a management tool. The Director replied:

"In our opinion, the MMS now reports all information necessary to manage maintenance operations. It appeared to us that the information was not being used by management to properly determine budget levels or support additional budget requests. Also, we were concerned that this information was not being made available to the legislature and, therefore, budget officials were not as well advised as possible on the effects of budget actions. In this sense we would feel that the system was being used more for reporting what was done rather than managing the tasks required by a work program."

In addition, the Director observed:

"Generally, we observed that management's use of the information provided by the MMS fell far short of its potential, particularly in budget and need determination."

The subcommittee reviewed a compilation of the state productivity and MMS reports costs and noted the wide divergence in district costs when compared to the state standard, statewide average and other districts. Questions as to the methods used to determine reasons for the wide divergence, led to the finding that no standard procedures are in existence that compare costs, determine reasons for divergence, compare methodologies to reduce costs, etc.

Subcommittee Findings

The subcommittee believes the MMS provides the information needed by the Department to make effective management decisions, but that the Department does not use the system to its fullest extent. This incomplete use represents a considerable loss in efficiency to the Department particularly in the area of departmental understanding of budget effects upon provision of the maintenance program.

Maintenance Project Priority

The over 5,000 miles of streets and roads under state control represent a reconstruction investment to the citizens of the state of over $2.3 billion. The size of this investment, not to mention the disruption of the convenient and economic flow of transportation that would be caused without the system, places the maintenance of the existing roadways high among those requirements that must be met by the state. Yet the relatively static position of the maintenance program within the overall Departmental program would indicate that maintenance is losing ground to the construction program component. While the subcommittee can see that completion of the interstate is not only a high federal priority, but also the top state priority (particularly in view of the 95% federal-5% state matching aid received for most construction projects), the importance of an adequate maintenance program should be realized particularly as it relates to avoidance of future costs. Despite the Transportation Department Director's assurance that maintenance was the Department's number one priority, statements by other representatives indicated otherwise. Indeed, the Department's own general procedures indicated that the Department's number one priority was in matching federal aid projects. The general procedures for setting Department priorities are shown below.

General Procedures for Priorities on all Highways

1. Condition of existing road: Cost of maintaining the existing facility is considered.

2. Need for improvement: Traffic volume and service and safety to the traveling public are reviewed.

3. Geographic location: Emphasis is placed on the needs of the major population centers, but the Department assures that no area of the state is left unconsidered. Political factors are also considered. (emphasis added)

4. Manpower requirements: The numbers and locations of Departmental manpower are assessed.

5. Availability of funds: The state is heavily dependent on federal aid funds for its highway funds; therefore, the availability of these funds is a prime factor in establishing project priorities. (emphasis added)

The subcommittee was not convinced that maintenance could be named as the number one Departmental priority due largely to the federal aid participation program and the need for system completion in Nevada. However, they believe some recognition must be given to the maintenance program. It seems to defeat the purpose of the entire highway program if additional miles of highway are added to the state's system, but the state dollars with which to adequately maintain those miles are not available. Many jurisdictions approach the highway program with that thought, and the subcommittee believes that it represents a question well worth considering.

The subcommittee also examined the process used for maintenance project selection which, according to Departmental representatives, now amounts solely to "a worst case first" situation. The current maintenance and betterment project selection process, as presented by NDOT follows:

> District offices submit on a yearly basis, a listing of those highway sections within their district which present the more serious maintenance problems. All sections are field reviewed by a team which establishes a state priority list of projects to be accomplished within the availability of funds. This program is administered with 100 percent state funds without regard to systems. All individual programs are combined into one overall highway program. This combined program is reviewed and revised as necessary quarterly and receives formal approval of the Highway Engineer and his deputies who in turn secure the necessary approval from the State Highway Board. Revisions of priorities are due to changes in availability of federal funds, changes in estimated costs of projects, complications in the acquisition of right-of-way or the design of the project and the addition of new projects with a higher priority.

There are a number of objective methods by which maintenance project selection can be undertaken. These methods use formulas, rating standards and serviceability indices and level of service decisions in making project and need determinations. The subcommittee reviewed a number of these methods which are discussed in more detail on page 54.

Subcommittee Findings

The subcommittee believes the current method used in maintenance project selection (i.e., on site observation) does not represent a thorough analysis of projects, problems, and strategies available for use in providing the most effective use of available maintenance dollars. The subcommittee believes this narrow basis from which determinations are made does not result in sufficient information being supplied to decision makers upon which cost effective decisions can be made.

Employee Productivity and Salary Comparison

In their review of the system, the FHWA Maintenance Management System review team indicated that the present performance standards of the Maintenance Management System were based upon standards developed by a standard committee in 1974 using average production rates developed from historic data. The team indicated field offices consider the standards to be highly flexible and only general guides, consequently, much of the benefit in managing routine maintenance activities is lost. Indeed, a comparison of district unit costs for the first six months of Fiscal Year 1980 showed wide divergence among, not only districts and the standard, but the statewide average and the standard.

The team also stated that since the standards were based on average productivity, line item budget cut effects on productivity were not obvious to top management. The team recommended that some effort be made to determine optimum crew size and optimum productivity for a given maintenance operation. Field management personnel would have a better tool for field operation management and top management would be better able to evaluate the effects of budget decisions.

The subcommittee became particularly concerned with the productivity issue as a result of representative statements indicating labor intensive work was sometimes assigned to keep workers "productive."

The federal review team also pointed out that present maintenance personnel policies require a 4-year waiting period for eligibility for promotion from maintainer classification. Since promotion is based on oral and other types of examination, the review team said that it appeared this system penalized and made recruits take a second look at state maintenance work for lack of advancement potential. The team recommended that the state either establish intermediate positions, shorten the waiting time and rely on exams to select highly qualified personnel for advancement, or lastly, waive waiting periods for high potential candidates for advancement.

The subcommittee heard much testimony about the competitiveness of state highway salaries when compared with private contractors' wages and with other governmental salaries. In an effort to gain more knowledge in these areas the subcommittee reviewed a comparative report entitled "Progress Report of the Committee on Maintenance and Operations Personnel" prepared by the Transportation Research Board (Appendix J). The comparative data of the progress report on average salaries paid by the governmental transportation agencies as of July 1, 1978, indicates that the western region (Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, Nevada, New Mexico, Oregon, Texas, Utah, Washington, and Wyoming) had considerably higher salaries than the other regions (see page 112). A comparison of selected maintenance classifications, i.e. district engineer, laborer, mechanic, indicated that Nevada was, at that time at least, fairly competitive with other state jurisdictions, and, in all cases, paid a higher monthly average salary than the national average. However, the subcommittee realizes that this information is somewhat dated and could have significantly changed since that time.

The survey also indicated that in 1978 the average number of lane miles per man in Nevada was 26 miles (dividing total permanent and temporary employees into total miles maintained by state forces), which represented the highest ratio in the adjoining western states.

The subcommittee also compared the salaries for construction workers in the private sector against those offered by the state to determine whether or not state wages are competitive. This review indicated the following prevailing wages for two of the least skilled classes in each as of February 2, 1980.

Private			State		
Title	North Wage*	South Wage*	Title	Grade	Wage*
Flagman	$10.55	$10.80	Hwy. Maintainer	25	$5.3964-7.3494
General Laborer	$10.55	$10.80	Hwy. Maintainer Tr.	22	$4.7435-6.4295

* Excludes fringe benefits

Without getting into a detailed analysis, the subcommittee could see that a wide range of variance in salary scale does exist between the two even at the low levels shown above. The subcommittee is particularly concerned about this divergence in view of the possibility of a drain of state employee pools should the proposed Mobile Missile (MX) project come to fruition. The Department of Transportation would be acutely affected by such a project.

Subcommittee Findings

The subcommittee believes there is a definite need for a productivity study to be conducted on the maintenance function within the Nevada Department of Transportation. In particular, the subcommittee believes optimum crew size should be investigated as should the work performance standards, the basis for the Maintenance Management System. The subcommittee also recommends that a comparison with private industry be conducted concurrently and that some sort of adjustment to encourage competitiveness of maintenance employee salaries with the private sector be considered.

Maintenance Equipment Utilization

As the subcommittee delved further into the maintenance question, it became obvious the complex issues within the all encompassing highway maintenance question would be extremely difficult to examine in adequate detail. As a result, the subcommittee decided to closely review the Department's use of its maintenance equipment in Fiscal Year 1978-79.

The subcommittee's concern for full equipment utilization was generated by the $5 million appropriation provided to the Department of Transportation for the replacement of maintenance equipment as approved by Chapter 628 of the 1979 Session.

To gather further information about the Nevada Department of Transportation's equipment use, the subcommittee conducted a review of the Department's equipment use employing the methodology of a similar study conducted by the Virginia Department of Highways. A copy of the review is included as Appendix K as are additional copies of equipment use in each of the districts represented by members of the subcommittee and a listing of the replacement maintenance units as presented by NDOT to the 1979 Legislature. The subcommittee used the Virginia method as a result of its background readings and felt it represented a valid projection technique, particularly in view of the fact it is still being utilized in Virginia as a means of promoting increased equipment usage.

To summarize, a total of 1,024 individual maintenance units were studied (excluding sedans, pickup trucks and miscellaneous equipment) which represented 57.9% of the total units owned by the Department. The total value of the sample units was $12,901,439, or 76.1% of the total value of all equipment items under Departmental ownership based upon original purchase price.

The survey examined a representative sample of maintenance units; derived average usage per sampled unit by maintenance district; and calculated a proposed "standard" of utilization through averaging the six districts' average utilization rate and the district usage representing the highest use rate.

In addition, the survey reviewed the percent of time individual classes were used compared against total potential time for which the equipment was available (established for most classes at 2,080 hours per year, according to the Department of Transportation). This average use was then compared against a private industry demarcation of 60% utilization, the level at which the private sector makes lease versus purchase decisions.

The review showed two things: first, that Transportation Department maintenance equipment use statewide did not in any one class meet the 60% mark (utility truck usage approached 60% with a 59.3% rating while pulvimixers attained the lowest ranking of 7% use); and secondly, annual Departmental equipment use could be increased by 15% over that of Fiscal Year 1978-79 if the Virginia "standard" setting methodology were employed. The 15% increase means that the

Department could perform 15% more work with existing equipment or current work with 15% less equipment, a fact which represents a sizable savings in equipment investment throughout the years.

The subcommittee findings on district maintenance equipment utilization were discussed with NDOT equipment and maintenance personnel to verify the information and confirm methodology. Department maintenance and equipment personnel agreed with the subcommittee's findings.

Under Determination 4 of this section, some subcommittee recommendations are discussed in the equipment use area. However, the subcommittee is concerned about these findings, particularly as they relate to the General Fund appropriation made for the purchase of replacement of maintenance equipment. In effect, these findings indicate the appropriation for equipment replacement could possibly have been reduced had use standards been in effect.

Subcommittee Findings

While the subcommittee is aware that justifiable reasons for low equipment use may exist, i.e. downtime, old equipment, etc., they are equally concerned that the Department attain maximum efficiency in each program component, including equipment use, before approaching the Legislature and the public with additional revenue obtaining proposals.

The subcommittee's own review, the findings of which were agreed to by the Department, indicates the Department could greatly improve its efforts in full equipment utilization. More specific recommendations are made under Determination 4 of this section.

Innovative Technologies

Although the members of the subcommittee are not highway maintenance technicians, they heard much testimony, provided for the benefit of highway personnel in attendance at each meeting, about new technologies within the maintenance discipline. The subcommittee was particularly concerned about the use of new and innovative technologies and methodologies within the Department that could aid in the development of more cost effective practices to slow the effects of spiraling inflation and provide the state's taxpayers with the most cost beneficial programs for their tax dollar. The

subcommittee, therefore, was particularly concerned that less than one percent of the Fiscal Year 1978-79 and 1979-80 Transportation Department budgets was dedicated to research and development.

Departmental officials explained that although the research and development function did not represent a substantive portion of the Department's highway program budget, the Department was kept abreast of innovative technologies through the use of "technology transfers." "Technology transfers" are provided through the rapid and frequent exchange of information between state department of transportation agencies, federal transportation agencies and many of their support agencies such as the National Cooperative Highway Research Program, the National Transportation Research Board, the American Association of State Highway and Transportation Officials Program and the Asphalt Institute, to name but a few. The Department explained that this procedure allows those agencies that do not have vast resources available for research and development to gain the advantages of new information and developments from those agencies that can afford substantive research and development efforts.

While the subcommittee believes that this practice is a sound one, it appears it is incumbent upon those agencies without research and development services to search out the new developments and, in cases where circumstances are not applicable to other participating agencies, to push forward with needed work.

During the course of its hearings, however, the subcommittee was not convinced that the Department of Transportation was wholly dedicated toward searching for new and innovative ideas and practices. Rather, it appeared that the Department tended to isolate itself from the mainstream of progressive ideas and, when presented with new information, approach its investigation reluctantly.

Specifically, much discussion centered around the use of slurry seal as a means of rejuvenation of a roadway through the use of emulsified asphalt without the cost of a complete overlay. Although the International Slurry Seal Association was unable to send a representative to appear before the subcommittee, much written material was solicited and transmitted which the subcommittee passed on to the Department. This information discussed the potential of the process and explained that many of the problems associated with its earlier presentation had been reduced or eliminated.

Department representatives explained the slurry seal procedure had been tried many years before with unsatisfactory results. Discussion about the changes in the process and the benefits it now afforded apparently did not persuade the Department to investigate its use potential. The suggestion was received negatively by all Department representatives except one district engineer who volunteered that he would be willing to try a test patch of slurry seal in his district. This district engineer's attitude was appreciated by the subcommittee and it is suggested this positive approach would, in the long run, be of great benefit to the Department.

Subcommittee Findings

The subcommittee believes that the Nevada Department of Transportation needs to avail itself of all information about technological advances in these times of high prices and declining revenues. The subcommittee understands why a bigger proportion of the NDOT budget cannot be devoted to a research and development function and commends the Department on use of the cost beneficial "technology transfers" approach. The subcommittee believes, however, that use of the "technology transfer" option requires a more positive and progressive search for information than is currently being dedicated to it by the Nevada Department of Transportation.

3. Determination: Is the Department Managing and Utilizing its Available Resources for Maintenance in an Economical and Efficient Manner?

In Fiscal Year 1979, the Nevada Department of Transportation devoted slightly more than 24% of its total expenditures towards maintenance activities. The Department itself admits that this amount was insufficient to adequately perform all the needed maintenance work in the state. Department officials pointed to several methods through which they had attempted to better meet their maintenance obligations. They cited such examples of new technologies including installation of the Maintenance Management System, cycling of old pavement, use of galvanized guardrail, installation of cement barriers and impact free guide posts, redesign of pavement structures and the addition of new materials in road surfaces for better wear. Department officials warned the subcommittee, however, that there was a limit to how much costs could be cut. It was said that the 1981 Session of the Legislature would have to make decisions as to what

kind of highway programs the state wants and is willing to pay for, and that the Legislature would have to either fund the Department adequately or say what services it does not want.

It was with this thought that the A.C.R. 30 subcommittee reviewed many of the maintenance program components in Determination 2 of this section. In addition, the subcommittee has made specific recommendations on each of these areas in the subsequent section, the address of which, it is believed, would help improve the Department's operating efficiency.

The subcommittee believes these areas of concern must be addressed to the Legislature's satisfaction before the Department can expect support for the additional revenue it will be requesting.

Specifically, the subcommittee was not convinced that the Department has objectively determined its maintenance needs, nor is it doing all that it possibly can to run its maintenance program at the greatest cost benefit level.

In addition, the subcommittee expressed great concern that the Department search within itself for new and better methods of performing its maintenance functions. The subcommittee believes that the adage "it's done this way because it's always been done this way" is no longer sufficient explanation for maintenance methodology, particularly in view of an impending financial crisis. The subcommittee believes greater economies can be realized and that the attainment of these economies are a prerequisite before legislative and public support of new revenue sources for the Department can be confidently given.

Subcommittee Findings and Recommendations

The subcommittee believes that the Department has made some honest attempts at improving their efficiency through the installation of improved systems and the implementation of new methods, materials, and technologies. However, the subcommittee believes the Department should dedicate itself further toward more efficient operation of current systems as well as toward finding more efficient practices and economic procedures with which it can truly say it is making the most of the resources available to it for maintenance purposes.

4. Determination: Are There any New Methods or Techniques Suitable for Application to Future Programs of Maintenance that Would Produce Greater Benefits?

The new Director of the Nevada Department of Transportation took office on July 1, 1980, 10 days before he appeared at the A.C.R. 30 subcommittee's final work session. At that meeting, the subcommittee participated in a "give and take" discussion session, with the Director expressing his hopes and aims for the Department while the subcommittee listed its concerns in specific program areas. The subcommittee believes that the new Director is honestly attempting to address the many problems facing the Department, tantamount among them the failing status of the Highway Fund, and subsequently believes the new Director needs time to deal with the problems he perceives as well as those presented by the subcommittee. Subsequently, the subcommittee recommends that the Director investigate the areas of discussion outlined below and be prepared to give a progress report to the Assembly and Senate Transportation Committees of the 1981 Legislature. The subcommittee believes this additional time will allow for more useful input and information, and also provide for some degree of continuity in legislative oversight of the transportation program.

Maintenance Management System (MMS)

As discussed under Determination 2 of this section, the subcommittee believes that the Maintenance Management System offers the Department many opportunities to fully analyze its maintenance programs in dollars and cents terms. In addition, the system provides comparison reports which can indicate significant divergence in program costs between the six maintenance districts, the statewide average and the performance standards.

However, the insights of the FHWA review team as well as the subcommittee's own observations would indicate this complex system, which has served as a model for Maintenance Management System development in other states, is not being fully utilized within the Department.

In particular, the subcommittee believes the system could be used to show the effects of deferred maintenance and budgetary shortfalls to decisionmakers. That is to say that decisionmakers should be presented a maintenance budget showing the total maintenance work that needs to be done, the dollars allocated for maintenance work (and the reasons for that decision) and the projected shortfall.

In keeping with this use of MMS, the total maintenance work should be estimated based upon needs and not upon available equipment and personnel. That is, the districts' tendency toward reverting to labor intensive work, as identified by the FHWA Maintenance Review Team, should be halted.

In addition, the subcommittee believes the Department could use the MMS in making level of service decisions. These decisions could be particularly useful in times of inadequate revenue levels. Such level of service decision applications could be used to help the Legislature make appropriate decisions about the direction of the state's highway program.

The subcommittee also believes that top management should use the information currently being produced by the system as to cost beneficial methodologies, new cost cutting techniques, etc., to equalize the unit cost disparities between districts. The subcommittee urges the Department to develop a formal procedure that is used to discuss district differences in costs and attempt to find the reasons for them.

Subcommittee Recommendations

The subcommittee believes the Department has developed a very fine data system in the Maintenance Management System, but that for various reasons the system's full potential is not being realized. The subcommittee suggests the Department more fully use the MMS, particularly as it relates to level of service consequences, the differences between shortfalls and deferred maintenance and actual needs and elimination of district "labor intensive" projects in favor of achievement of the planned and needed maintenance program.

Maintenance Priorities

The subcommittee was concerned about the relative priority of the maintenance program with the Department's overall project programming. However, the nature of the Department's participation in the federal aid reimbursible program (95% federal and 5% state dollars) and the need to complete the state's road system, particularly in urban areas, makes any other priority array somewhat difficult. The acquisition of "nickel dollars" as available in the federal construction program is difficult to displace as the number one departmental priority despite the growing importance of an acceptable level of state maintenance work because state work must be funded entirely with state dollars. The subcommittee

believes the fallacy of the continued addition of new miles to the state system for which there are fewer and fewer dollars with which to adequately maintain them will have to be addressed by both the executive and legislative branches of government in the future.

For the immediate future, the subcommittee was greatly concerned about the maintenance project prioritization process. Department officials admitted maintenance projects were taken on a "worst case first" basis and the Department's own procedures indicated that top management made the final choices. The subcommittee believes a more scientific process is necessary in making the decisions as to what project gets funded and what maintenance strategy is applied.

The subcommittee reviewed in depth the Priority Programming for Highway Development Law transmitted from the State of Washington. According to the statute, this law originated when the Washington Legislature found that anticipated revenues available for state highways for the foreseeable future would fall substantially short of the amount required to satisfy all the state highway needs, a situation similar to that being faced by Nevada. The law has as its basis the rational selection of projects according to factual needs, systematic scheduling to carry out defined objectives within limits of money and manpower and fixed in advance with reasonable flexibility to meet changed conditions.

It provides for the definition of functional classes, requires a 6-year program and financial plan, defines the categories of improvements and states the allocation of available highway funds shall be in order of the categories. The major funding categories, in priority order, are improvements necessary to sustain the structural safety and operational integrity of the existing state highway system (excluding interstate improvements); improvements for the continued development of the interstate system to be funded with federal aid; and development of major transportation improvements (including designated but unconstructed highways) which are vital to the statewide transportation network.

The individual projects are prioritized based upon the following: every mile of highway is inventoried as to condition, accidents, geometrics, etc.; deficiencies on the system are identified and listed by district, by functional

class, by sign route and by priority group; deficiencies are compared against acceptable limits (parameters) taking into account such variables as traffic volume, access control, lane configurations, etc.; for every deficiency a corrective action must be programmed or an explanation given as to why corrective action is not possible. These projects are then fit into the funding category groupings.

This process results in a priority array of priority groups that are required to be scheduled in the assigned order with some allowance for unusual situations.

The subcommittee noted the capacity for formalized project development the priority programming law afforded the Washington Legislature. However, the subcommittee, in deference to the new Director, decided that a statutory change to effect project prioritization was not, at this time, necessary. Rather, the subcommittee focused its attention on other project prioritization systems that could be instituted in-house.

The subcommittee's review included other project selection and information systems, such as, highway investment analysis packages, value engineering methodology, adequacy rating systems, photologging, and pavement management systems.

The subcommittee was primarily interested in the properties of a Pavement Management System (PMS) as it relates to maintenance project and application decisions. These properties include:

(1) Ability to predict performance,
(2) Ability to compute costs for various maintenance strategies,
(3) Ability to respond to uncertainties associated with actual performance as compared to predicted performance, and
(4) Ability to make internal changes (system update).

The regional FHWA provided a slide presentation to the subcommittee at its February 14, 1980, meeting which detailed the possibilities of a pavement management system. An extensive Transportation Research Board study was later transmitted to the subcommittee which detailed the development of a pavement management system. The subcommittee believes the Department needs a system that can assist decisionmakers in finding optimum strategies for providing and maintaining pavements in a serviceable condition over a given period of time. The development report stated the

function of a PMS is to improve the efficiency of decision making, expand its scope, provide feedback on the consequences of decisions, facilitate the coordination of activities within the agency and insure consistency of decisions made at different management levels within the same organization.

The subcommittee believes the development of such a system would greatly enhance the Department's knowledge of its maintenance workload, would provide a more complete cost benefit picture to aid in maintenance strategy selection and subsequently be of invaluable assistance in developing a more efficient highway maintenance program. Development of the system need not be an "all or nothing" proposition but, it is believed, can be developed through time to aid in overall program management and project selection. The subcommittee was particularly impressed with the development of such a system because much of the roadway inventory needed to establish a data base for a PMS is already in place and being used in the existing Maintenance Management System, thereby reducing the costs of installation.

Subcommittee Recommendations

The subcommittee believes development of a Pavement Management System would benefit the Nevada Department of Transportation in the area of data collection, special study evaluation, optimum and alternative maintenance strategy selection, and therefore, recommends the implementation of such a system in Nevada. In addition, the subcommittee believes such a system could include a maintenance project prioritization procedure, perhaps borrowing from the priority programming approach in Washington. It is important to note that the subcommittee perceives that development of such a system need not be a one-time all inclusive initiation effort, but that phases of development over time may represent the best way to proceed with this endeavor.

Personnel Productivity and Wage Comparison

Employee productivity has become, in the last few years, a catchall for numerous management needs and studies. However, testimony received by the subcommittee indicated legitimate concerns at the state and federal level about the optimum maintenance crew size as well as productivity of maintenance employees. The subcommittee became greatly concerned about this productivity as it related to MMS performance standards and work accomplishment units.

In addition, the subcommittee's informal review of maintenance employee wages with other governmental jurisdictions as well as with the private sector raised numerous questions, particularly as the wage scales relate to private industry in Nevada. The subcommittee believes this factor could present real problems to the Department in securing adequate employees should development of the Mobile Missile (MX) become a reality in this state.

Subcommittee Recommendations

The subcommittee suggests the Department conduct a productivity study of the maintenance function (either internal or external) to answer the many questions that arose during the course of this study. If the Department chooses outside consultants, the subcommittee suggests one possible avenue might be to approach the Department of Administration to determine whether any General Fund monies appropriated for this purpose to the Executive Branch are available. The subcommittee suggests the review include a determination of the competitiveness of NDOT salaries when compared with private industry and other governmental units' salary scales.

Equipment Utilization

The total value of the Department's maintenance equipment inventory in Fiscal Year 1978-79, based upon original purchase price, was $16,951,276. Testimony received during the course of the subcommittee's hearings indicated an annual book value of equipment inventory at $2-2.5 million with a 10-year replacement cycle. The investment in maintenance equipment alone, therefore, is sizable. The members of the Legislature took heed of this fact and the need to keep maintenance equipment current in approving the $5 million General Fund appropriation for replacement maintenance equipment during the 1979 Legislature.

The subcommittee, therefore, was particularly alarmed at its discoveries of low equipment use rates and the potential for greatly increased use that "use standards" encourage. The subcommittee found that the Department's equipment management practices did not encourage greater use of maintenance equipment.

In particular, the equipment division said it had no authority over districts when it perceived equipment was not being used to its potential. The subcommittee discovered that the

equipment rental rates currently in use were not charged until equipment was actually used, despite the fact it was physically located in the district yards for the entire year. The subcommittee learned that a new rental system was under consideration which would have a standard monthly charge for equipment and a declining usage charge which decreased proportionately as the equipment was used. The subcommittee believes installation of this dual rental system would serve as a good incentive toward increasing equipment use. The subcommittee also suggests that "use standards" be implemented to encourage higher equipment usage. The subcommittee suggests implementation of a standard setting mechanism similar to that demonstrated by the Virginia method with the assignment to a central division (either maintenance or equipment) of the usage monitoring function.

In addition, the subcommittee believes that the Department should look closely at the advantages offered through the leasing of heavy equipment, particularly with the utilization rates experienced by the maintenance districts in Fiscal Year 1978-79. Although the subcommittee received varying opinions as to the viability of this proposal from Department and district personnel and private equipment firms, the low use percentages of certain equipment classes cannot and should not be ignored. If equipment can be rented rather than purchased and the annual usage is far below the total time available, the subcommittee suggests serious consideration be given to the rental option and the resultant savings in purchase, maintenance and disposal costs.

Subcommittee Recommendations

The subcommittee believes that the NDOT must make better use of its maintenance equipment. The subcommittee suggests implementation of use standards as one method to increase use. In addition, until usage rates near the 60% level, the subcommittee strongly urges the Department to consider lease or rental agreements with contractors and heavy equipment firms. This would necessitate greater care in work scheduling, however, the cost savings could well justify such actions.

In addition, the subcommittee believes the standard equipment rental procedure currently in use does not encourage higher district utilization percentages of equipment. The subcommittee believes that a dual rental system that charges a monthly rate for equipment plus a declining charge for usage will encourage more efficient utilization procedures.

At the subcommittee's final work session, the new Director told of plans to implement an equipment management system to more efficiently operate the Department's equipment fleet. It appears to the subcommittee that this system would encompass many of the recommendations and suggestions included above, therefore, implementation of an equipment management system is seen as a positive step toward rectifying many of the existing inefficiencies.

Research and Development

In Fiscal Year 1979, the Nevada Department of Transportation budgeted $62,000 for research and development. In Fiscal Year 1980, $104,400 was budgeted. In both years this amount represented considerably less than 1% of the total departmental expenses and budget in each year.

Although the Department explained that its research and development function is supplied through "technology transfers" with other jurisdictions, it was obvious to the subcommittee that a more aggressive approach to seeking out and using new information obtained through the "technology transfers" is needed by the Department.

The subcommittee's entire procedure during the course of its hearings was directed toward encouraging discussion of new and innovative ideas for use in meeting maintenance objectives. It is hoped the subcommittee was able to bring to light some positive suggestions for use by the Department.

Subcommittee Recommendations

The subcommittee believes that research and development serves a very important function in the development of new and innovative technologies for use in the ever changing world of highway maintenance. Although the subcommittee is not yet convinced reallocation of the few funds available to the maintenance function to the research and development program is justified, the subcommittee hopes the Department will continue to search out new cost beneficial techniques to improve the maintenance product and save the taxpayers' money.

5. Determination: Will the Department Require any Additional Sources of Revenue to Support Future Programs of Maintenance?

The impending crisis of the Highway Fund has been foretold since 1977 when $1-2 million balances at the end of the biennium were projected by NDOT financial personnel. Not until the interim between the 1979 and 1981 Legislative Sessions did the reality of the Transportation Department's financial crisis hit home. It was during this interim the Department was forced to borrow working capital from the Interim Finance Contingency Fund with which to meet its operating expenses.

Heretofore, the gloomy predictions by Department personnel did not come to pass, largely due to healthy motor vehicle fuel receipts. In Fiscal Year 1979-80, however, the Department predicted an 8% growth in that revenue based upon historic patterns. In addition, the Department predicted an 8% growth in motor vehicle user fees. Together these two revenue sources comprise over 80% of the Departmental non-federal aid revenue receipts.

Skyrocketing prices in gasoline as well as increases in the costs of new and used cars, however, kept sales of both low; subsequently, receipts into the Highway Fund were down from that anticipated. In fact, early in Fiscal Year 1980 when revenue receipts fell drastically, the Department estimated as much as an 8% decline over 1979 receipts. The Department had no "cushion" on which to float until revenues again picked up, therefore, the request was made to the Interim Finance Committee at their September 10, 1979 meeting to borrow $3 million to handle a "short term cash flow problem in the Department." The inability of the Department to meet its cash flow needs dramatized an already dramatic situation and brought the message home that the Highway Fund was in trouble.

While the A.C.R. 30 subcommittee was already reviewing the internal operating procedures and systems, the cash flow problems experienced by the Department in the fall of 1979 made the subcommittee's assignment to determine the need for additional sources of revenue even more important.

During the subcommittee's review of the decline in revenue receipts, the Department presented the problems it perceived in the current revenue structure. The Department discussed the effects of higher fuel prices and more fuel efficient vehicles upon declining fuel tax receipts. Department representatives pointed out that as usage of motor fuel declines, the static nature of the per gallon taxing system does not afford sufficient revenues to keep pace with increasing program costs brought about largely by inflation.

In addition, Department representatives noted that the increasing operating appropriations of those agencies funded by allocations from the Highway Fund, particularly the Department of Motor Vehicles, constituted a further drain upon the resources available to the Department.

The subcommittee asked Department officials for their recommendations as to new or revised sources of revenue that they needed to provide adequate maintenance services to the motoring public. The Department explained that, currently, for each penny of tax assessed, the Department collects roughly $5 million dollars. They said, however, that this tax system did not increase with the increased cost of fuel and actually declined as gallon consumption declined. Department officials explained the need for a revenue source that was inflation responsive unlike the gallonage tax. In addition, Departmental representatives said that Nevada's motor vehicle user fees were currently the lowest in the nation and said they felt that some increases in these fees were justifiable since they had not been increased since the 1940's.

At the May 9, 1980, meeting, Department officials indicated that they intended to present the Transportation Board of Directors a proposal to raise an additional $20 million per year with a combination of revenue source changes. In answer to subcommittee questions, the Department responded that they preferred that these additional funds not be specified for application to any particular program, but that with the additional revenue, the Department could again participate in a modest program of state funded resurfacing projects and keep up with inflationary increases. The Department pointed out, however, that their revenue proposal would do nothing to decrease the existing $41 million backlog and that to do that, an additional $10 million per year would have to be raised.

The subcommittee reviewed a number of possible avenues through which new revenue sources could be tapped or old sources augmented. These possibilities included an increase in the motor vehicle and special fuel tax per gallon, the change of the motor vehicle fuel tax to a sales or variable tax approach, the transfer of the Department of Motor Vehicles operating support from the Highway Fund to the General Fund, the allocation of sales taxes received on the sale of highway related items (new and used cars, motorcycles,

garage accessory parts) to the Highway Fund rather than the General Fund, the increase of motor vehicle user fees (i.e. registration or motor carrier fees), or a General Fund appropriation to the Department of Transportation.

In addition, during the course of the hearings, the subcommittee aggressively pursued discussions with federal representatives about the possibility of increased federal participation in maintenance activities. Representatives of the FHWA pointed to the existing 3-R program (Resurfacing, Restoration and Rehabilitation) as the only existing federal maintenance effort. They suggested further contact with the Nevada congressional delegation as the avenue through which federal maintenance dollars could be increased. (Federal Department of Transportation officials indicate the 3-R program may be expanded in the near future to include a 4-R approach--adding reconstruction to the eligible list of federal participation funds.) There appears, however, to be no major shift in the federal approach to aid in system completion with the state's obligation of providing continued maintenance of that system.

The subcommittee's review also led them to investigate what other states are doing to improve the status of their Highway Funds. Since over 80% of the Department's nonfederal participation aid comes from motor vehicle fuel and motor vehicle user fees, the subcommittee reviewed other state approaches in these areas. Of particular assistance was a chart on motor vehicle fuel tax approaches as prepared by the National Conference of State Legislatures shown as Appendix L. While the subcommittee gathered comparative data on user fees from the 11 western states (as supplied by the Department of Motor Vehicles), it appeared these fees are largely a function of user cost assignments made individually in each state and subsequently are not strictly comparable. Each state has to make its own cost allocation decisions and, therefore, these comparisons are not included for review.

During the subcommittee's review of not only the revenue needs but the highway maintenance effort, the subcommittee believed the Department of Transportation should input suggestions and make recommendations as to how some of the problems they faced could best be handled. In the case of revenue needs, the Department did make a presentation to the Transportation Board of Directors at the Directors' May 13, 1980 meeting (a copy of the letter from the NDOT Assistant Director of Administration to Governor Robert List is

attached as Appendix M). At the meeting, however, the Board failed to approve any specific recommendation for increasing the Department's revenue sources. Instead, they authorized the Department to "proceed in developing reasons why it is necessary for this increase based on the last five years of revenues as well as anticipated costs." In addition, they authorized the Department to continue to obtain input from all users to develop alternate approaches to securing needed revenue.

The subcommittee, at its final work session, had hoped to be able to review the Department of Transportation proposal for revenue changes and react to it. The Transportation Board of Directors' failure to endorse a funding proposal precluded the subcommittee from partaking in this important activity. It is hoped that a formal proposal will be forthcoming from the Department's Directors for inclusion in the Governor's recommended biennial spending plan for 1981-1983 and that the 1981 Session will have the opportunity to review the Governor's recommendations in this all important area.

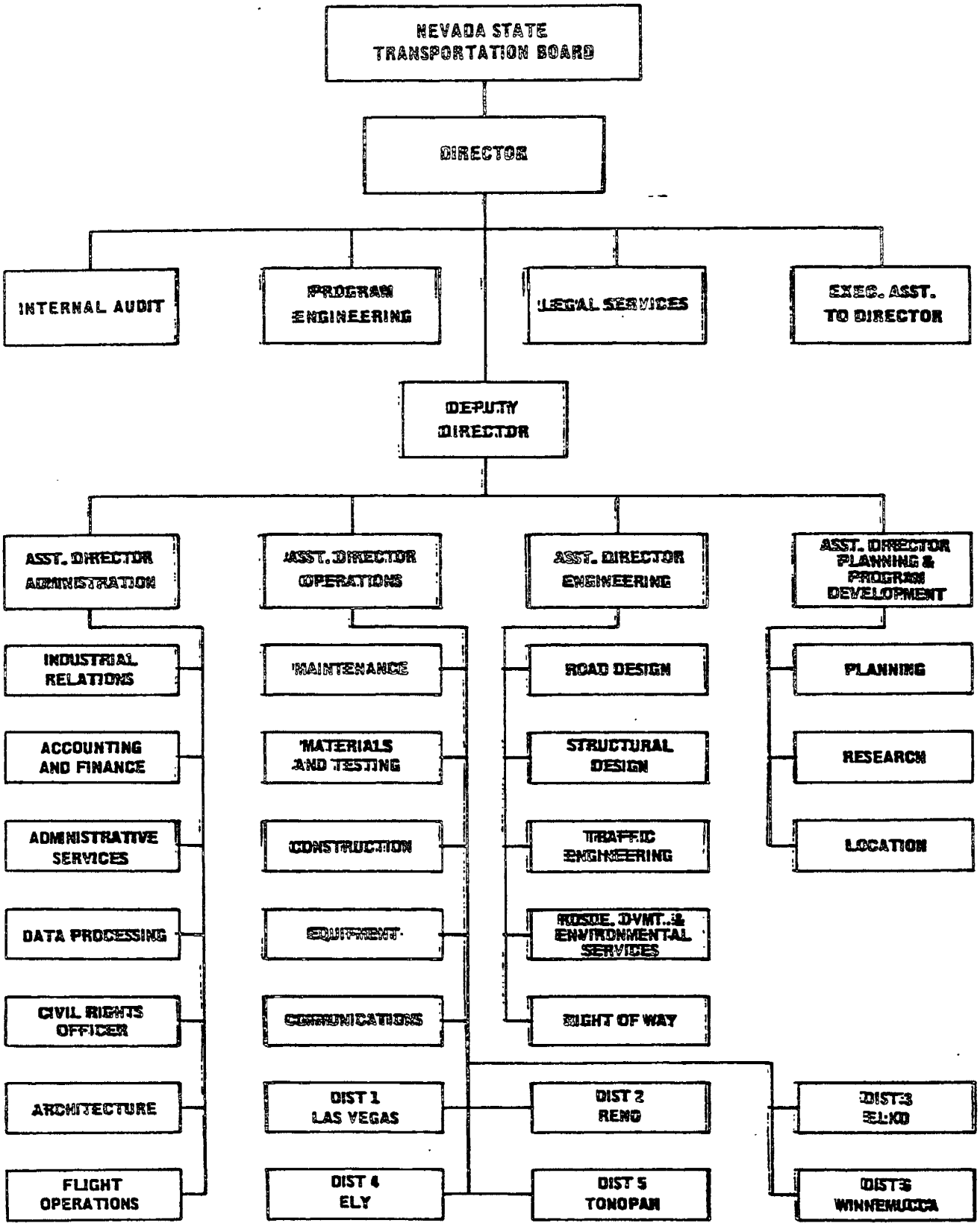
The subcommittee is convinced some aid to the Highway Fund is needed to keep abreast of program needs. The extent of this aid is certainly a matter for intensive review by the Senate and Assembly Taxation and Transportation Committees of the 1981 Legislature.

Subcommittee Findings and Recommendations

The subcommittee believes that the Highway Fund does need either an increase in existing sources or addition of new sources of revenue with which future programs of maintenance can be funded. Although the subcommittee reviewed numerous possibilities, the subcommittee believes such decisions are more properly the charge of the standing Transportation and Taxation Committees of the Legislature. However, the subcommittee also believes that these committees should review specific funding proposals made by both the Transportation Board of Directors and the Governor as to how best the problem should be handled. In addition, the subcommittee recommends this review include a determination of whether or not these funds should be earmarked for specific purposes or whether the discretion should remain solely with the Board of Directors.

Appendix A

DEPARTMENT OF TRANSPORTATION

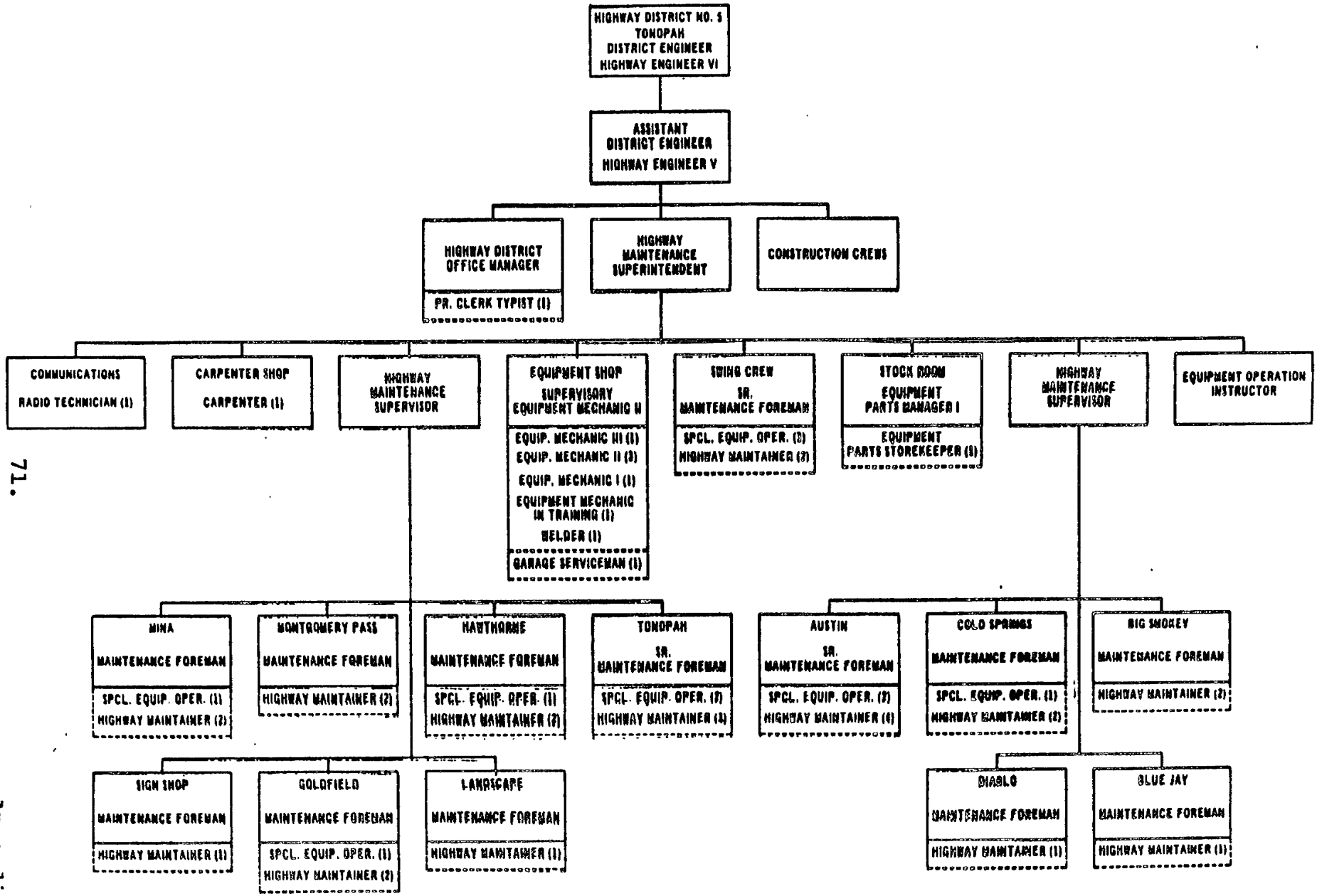


Appendix A

Appendix B

DEPUTY DIRECTOR
ASSISTANT DIRECTOR (Operations)
MAINTENANCE DIVISION
MAINTENANCE ENGINEER
HIGHWAY ENGINEER VI
MANAGEMENT ASSISTANT I
ARCHITECTURE
PROJECT ARCHITECT
SENIOR ARCHITECTURAL DRAFTSMAN
BUILDING CONSTRUCTION INSPECTOR II (2)
DRAFTSMAN IV (2)
PAINTER (1)
ELECTRICIAN (1)
ASSISTANT MAINTENANCE ENGINEER
HIGHWAY ENGINEER V
MAINTENANCE MANAGEMENT COORDINATOR II (2)
MAINTENANCE MANAGEMENT COORDINATOR I (1)

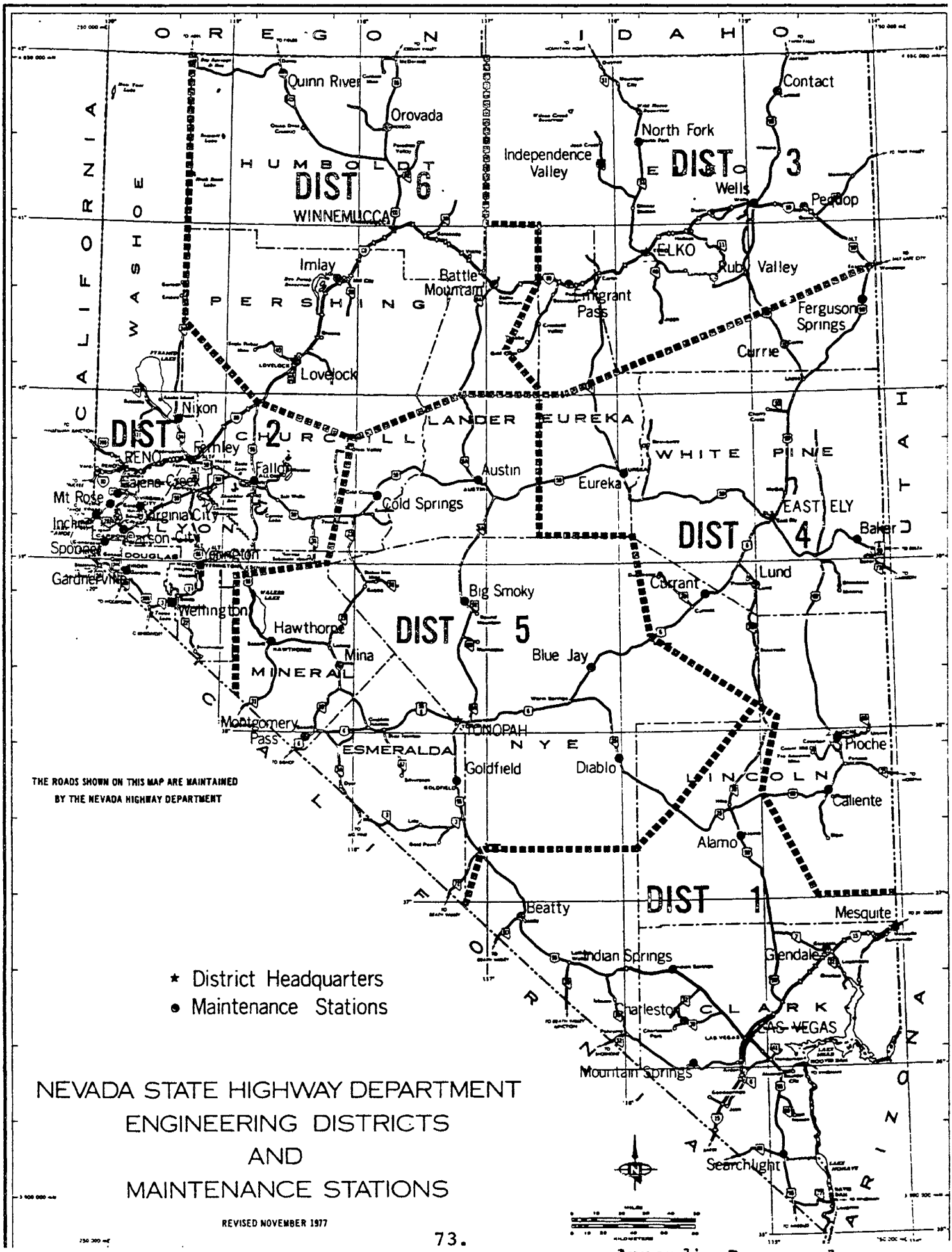
Appendix C



Approved _____
Joseph A. Soyre
Deputy State Highway Engineer
Effective June 1, 1977

Appendix C

Appendix D



NEVADA STATE HIGHWAY DEPARTMENT
ENGINEERING DISTRICTS
AND
MAINTENANCE STATIONS

REVISED NOVEMBER 1977

Inventory 11/16/79	Dist. I	Dist. II	Dist. III	Dist. IV	Dist. V	Dist. VI	Statewide*
Highway Miles	951	1,039	762	889	1,002	721	5,364
Interchange Miles	31	22	90	0	0	15	158
Urban Miles	80	47	8	0	0	0	135
Rural Miles	869	981	747	880	989	691	5,157
P.C. Concrete Directional Miles	35	24	45	0	0	0	104
Bituminous Lane Miles	2,738	2,684	2,050	1,732	1,973	1,998	13,176
P.C. Concrete Lane Miles	130	84	156	0	0	0	369
Gravel Lane Miles	90	16	33	31	15	61	247
Lane Miles	2,958	2,784	2,240	1,764	1,988	2,059	13,792
1 ft. Bituminous Miles	27,983	28,525	19,706	19,670	22,186	19,998	138,069
Mowed Shoulder Miles	780	139	367	901	0	1,478	3,666
Chemical Spray Shoulder Miles	50	1,262	1,345	212	414	263	3,546
Grading Shoulder Miles	722	1,566	957	41	1,799	65	5,150
Urban Multi-Lane Miles	77	39	3	0	0	0	119
Rural Multi-Lane Miles	181	155	129	2	5	150	623
Urban Non Multi-Lane Miles	2	9	6	0	0	0	17
Rural Non Multi-Lane Miles	687	826	618	878	984	541	4,534
Paved Ditches Linear Feet	172,492	344,271	319,308	60,145	87,174	118,694	1,102,084
Unpaved Ditches Linear Feet	7,080,528	2,545,159	6,072,351	7,224,865	13,083,496	4,853,028	40,859,427
Fence Linear Feet	2,990,381	4,450,934	3,566,851	1,590,600	1,869,278	1,912,469	16,380,514
Painted Guardrail Linear Feet	451,123	431,218	130,416	103,963	81,523	35,270	1,233,514
Unpainted Guardrail Linear Feet	73,392	151,853	224,453	14,045	24,974	52,906	541,622
Concrete Guardrail Linear Feet	69,010	60,456	8,765	0	0	12,355	150,586
Culverts	4,881	5,157	4,022	3,979	3,970	3,235	25,244
Drop Inlets	1,264	1,962	2,073	2,217	109	285	7,910
Rest Stops	3	3	8	14	6	5	39
Roadside Parks	3	13	0	1	1	3	21
Bridges	278	169	146	10	5	70	678
Signs	5,225	6,034	2,189	2,731	2,471	2,443	21,093
Sodded Landscape Acres	6	6	0	0	0	0	12
Unsodded Landscape Acres	183	20	0	0	0	0	203
Plantmix Dikes Linear Feet	548,856	542,520	358,512	64,522	87,648	154,862	1,756,920
Tunnels	0	0	0	0	0	0	0

* Totals may not add due to rounding

Appendix E

NEVADA DEPARTMENT OF TRANSPORTATION

LIST OF ACTIVITIES

3.6.0 Work Programs

PROGRAM NUMBER	ACTIVITY NUMBER		ACCOMPLISHMENT UNIT
		MAINTENANCE	
100.00		PLANNING & SCHEDULING PROGRAM	
	100.01	Planning & Scheduling	Man Hours
101.00		FLEXIBLE PAVEMENT PROGRAM	
	101.01	Base and Surface Repair	Cu. Yds.
	101.02	Surface Patching- Premix (Hand)	Cu. Yds.
	101.03	Surface Patching-Premix (Machine)	Cu. Yds.
	101.04	Surface Patching-Spot Seal	Sq. Yds.
	101.05	Seal Coat-Sand	Sq. Yds.
	101.06	Seal Coat-Flush	Sq. Yds.
	101.07	Crack Filling	Lbs. Filler Material
	101.08	Heater Planing	Sq. Yds.
	101.09	Seal Coat-Chips	Sq. Yds.
111.00		RIGID PAVEMENT PROGRAM (P.C.C.)	
	111.01	Temporary Patching of P.C.C. Pavements	Cu. Yds.
	111.02	Permanent Patching of P.C.C. Pavements	Cu. Yds.
	111.03	Paved Shoulder Repair (Premix)	Cu. Yds.
	111.04	Paved Shoulder Seal-Sand	Sq. Yds.
	111.05	Joint Sealing	Lbs. Filler Material
	111.06	Expansion Joint Repair	Lin. Ft.
112.00		REPAIRING MISC. CONCRETE APPURTENANCE PROGRAM	
	112.01	Repairing Miscellaneous Concrete Appurtenances	Cu. Ft.
	112.02	Maintain Tunnels	Man Hours
131.00		ROADSIDE MAINTENANCE PROGRAM	
	131.01	Cleaning Culverts	Each
	131.02	Cleaning Culvert Openings & Drop Inlets	Each
	131.03	Dressing and Shaping Ditches	Lin. Ft.
	131.04	Cleaning Ditches	Cu. Yds.
	131.05	Culvert Repair and Replacement	Lin. Ft.
	131.06	Fill Slope Repair	Cu. Yds.
	131.07	Unpaved Shoulder Slope Maintenance (Blading)	Shoulder Miles

NEVADA DEPARTMENT OF TRANSPORTATION

LIST OF ACTIVITIES

PROGRAM NUMBER	ACTIVITY NUMBER		ACCOMPLISHMENT UNIT
	131.08	Vegetation Control (Mowing, Flailing, Burnings, Etc.) --	Shoulder Miles
	131.09	Vegetation Control (Chemical Weed Spray)	Shoulder Miles
	131.10	Vegetation Control (Hand)	Man Hours
133.00		ROADSIDE CLEANUP PROGRAM	
	133.01	Remove Debris, Litter, Trash	Shoulder Miles
	133.02	Empty Litter Barrels	Each
	133.03	Sweeping: Traveled Way, Shoulders & Gutters	Sweeping Miles
	133.04	Remove Roadway Debris	Traveled Miles
134.00		MAINTENANCE OF ROADSIDE FACILITIES PROGRAM	
	134.01	Maintenance of Rest Stops	Man Hours
	134.02	Maintenance of Roadside Parks	Man Hours
	134.03	Maintenance of Landscape Areas, with Turf	Man Hours
	134.04	Maintenance of Landscaped Areas without Turf	Man Hours
135.00		MAINTENANCE OF ROADSIDE APPURTENANCES PROGRAM	
	135.01	Repair of Right-of-Way Fences and Gates	Lin. Ft.
	135.02	Cattle Guards and Wings	Each
	135.03	Removal of Encroachments (Advertising Signs, etc.)	Each
	135.04	Inspection of Right of Way Fences and Gates	Fence Miles
141.00		TRAFFIC SERVICE PROGRAM	
	141.01	Repair and Replacement of Traffic Signs	Sq. Ft.
	141.02	Guardrail-Repair and Replacement	Lin. Ft.
	141.03	Guardrail-Painting	Lin. Ft.
	141.04	Guardrail-Cleaning	Lin. Ft.
	141.05	Pavement Striping-Dashed and Solid	Striping Miles
	141.06	Raised Pavement Markers	Each
	141.07	Pilot Lining	Pilot Line Miles
	141.08	Pavement Markings and Painted Cattle Guards	Sq. Ft.
	141.09	Roadway Lighting Operations: Highway Lighting, Bridge and Approach Lighting	Man Hours

NEVADA DEPARTMENT OF TRANSPORTATION

LIST OF ACTIVITIES

PROGRAM NUMBER	ACTIVITY NUMBER		ACCOMPLISHMENT UNIT
	141.10	Patrolling for Protection of Public Traffic	Traveled Miles
	141.11	Maintenance of Guideposts, R/W Markers, and Milepost Markers	Each
	141.12	Miscellaneous Sign Maintenance	Each
151.00		SNOW AND ICE CONTROL PROGRAM	
	151.01	Snow Removal, Plowing, Blading, Application of Abrasives, Chemicals	Man Hours
	151.02	Plowing with Rotary Snowplow	Man Hours
	151.03	Patrolling for Snow and Ice Control	Man Hours
	151.04	Installation or Removal of Snow Markers	Each
161.00		STRUCTURE MAINTENANCE PROGRAM	
	161.01	Maintenance and Repair of Structures	Man Hours
	161.02	Inspection of Structures (Bridges and Culverts)	Each
		BETTERMENTS	
254.00		A & B GRADING PROGRAM	
	254.01	Roadway Grade Improvement	Cu. Yds.
	254.02	Channel Excavation and Drainage Grading	Cu. Yds.
	254.03	Install Drainage Structures	Lin. Ft.
256.00		A & B SURFACE TREATMENT PROGRAM	
	256.01	No Activity Assigned	
	256.02	Bituminous Surface Treatment	Cu. Yds.
261.00		A & B TRAFFIC SERVICE PROGRAM	
	261.01	Erection of Route, Safety and Direction Signs	Sq. Ft.
	261.02	No Activity Assigned	
	261.03	Construct Cattle Guards	Each
	261.04	Construct Guardrail	Lin. Ft.
		STOCKPILE	
270.00		MATERIALS PRODUCTION PROGRAM	
	270.01	Aggregate Production	Cu. Yds.
	270.02	Premix Production	Cu. Yds.

NEVADA DEPARTMENT OF TRANSPORTATION

LIST OF ACTIVITIES

PROGRAM NUMBER	ACTIVITY NUMBER		ACCOMPLISHMENT UNIT
	270.03	Mixing Salt and Sand	Cu. Yds.
	270.04	Hauling Materials	Cu. Yds.
	270.05	Chip Production	Cu. Yds.
	270.06	Sign and Sign Post Production	Man Hours
280.00		MATERIALS PURCHASE PROGRAM	
	280.01	Purchase Aggregate	Cu. Yds.
	280.02	Purchase Premix	Cu. Yds.
	280.03	Purchase Plantmix	Cu. Yds.
	280.05	Purchase Chips	Cu. Yds.

Appendix F

STATE OF NEVADA

DEPARTMENT OF TRANSPORTATION

MAINTENANCE MANAGEMENT SYSTEM

Presented to

The Interim Subcommittee to Study Maintenance

Carson City, Nevada

January 9, 1980

Presented by

Nevada Department of Transportation
Maintenance Division

Nevada's Maintenance Management System

Much has been written and spoken about Highway Maintenance Management Systems and many States, Counties and Cities are now using formalized systems of various type and complexities. In order to be successful, a management system must be responsive to the requirement of the field organization as well as the administrative office. It must be simple and efficient and it needs to be understood and used as a reliable tool at each management level.

Nevada's Maintenance Management System is, a tool which assists supervisors and administrators to manage highway maintenance activities in a business like manner, by providing pertinent information for decision making.

For a system to respond to the requirements of the field organization, the field personnel must have the opportunity to participate in the formulation, implementation and refinement of the system. A method we have used effectively, is to personally involve each foreman, supervisor and superintendent in field reviews. In these reviews we can discuss the system in general, invite additional suggestions, review management reports and discuss benefits the department has realized from the system that the foreman would not otherwise be aware of. This personal contact requires a sizeable commitment in time and money but has paid dividends far in excess of the expenditure.

Components of the Nevada system includes performance standards, inventory, budgeting and scheduling work, reporting procedures and output reports for providing management information.

Performance Standards

Performance standards have been established for 75 activities being performed on Nevada's highways as part of routine maintenance, betterment or stockpiling programs. While additional standards may be required from time to time (and some current areas may be dropped), the system seems to work best when the number of activities is limited to the current range of 70-80. While some systems have included several hundred activity standards, the burden on field reporting and the resulting complexity of output reports have proven costly and unsatisfactory.

At the foreman's level, the labor and equipment requirements per unit of activity, as provided by the Performance Standards, can be used directly in scheduling a known or estimated amount of work. A magnetic schedule board provides the foreman with a simple, structured scheduling system that requires very little written input. With the board posted each week in the foreman's headquarters building, crew members are informed of their assignments for the week and of the equipment assigned to the project. This permits the orderly, prompt assembly of crews each day and minimizes lost time in the morning awaiting assignments by the foreman.

Performance Standard Data includes the following:

* a code number for the activity
* a description of the activity
* a unit of measure to be used in reporting work accomplished
* crew requirements
* equipment requirements by number and classification
* material requirements by quantity and classification
* productivity rates expressed as units of work accomplished per unit of labor expended

Performance Standard Data, con't.

* a quality guide describing conditions requiring the maintenance activity and the level of correction to be achieved
* a frequency or workload rate describing the amount of this activity to be budgeted per year
* a brief description of the method and procedure envisioned for this activity
* instructions for reporting this activity

The Performance Standard is a key tool in the MMS. Data contained in the standard is used to prepare the computer-produced Preliminary District Maintenance Budget.

State of Nevada
Department of Highways
Maintenance Division

PERFORMANCE STANDARDS

ACTIVITY NO.	ACTIVITY	ACCOMPLISHMENT UNIT
101.02	Surface Patching - Premix (Hand)	Cubic Yards

ACTIVITY REQUIREMENTS

MEN		EQUIPMENT		MATERIALS	
NO.	CLASS	NO.	TYPE	AMOUNT	DESCRIPTION
1	Foreman	2	Dump Truck Single Axle	1 Gal.	Liquid Asphalt (Tack coat applied at 0.08 Gal./Sq.Yd.
3	Maintainers	1	Loader at Stockpile		
		1	Tilt Bed Trailer	1 Cu. Yd.	Premix

PRODUCTIVITY DATA

Unit/Crew Hr.	Unit/Man Hr.	Crew Hr./Unit	Man Hr./Unit
0.5 Cu.Yd./Crew Hr.	0.125 Cu.Yd./Man Hour	2.0 Crew Hr./Cu.Yd.	8.0 Man hr./Cu.Yd.

QUALITY GUIDE

Condition: Vertical differential of pavement in any direction exceeds 1/2", or differential with paved shoulder is 3/4".

Maintenance Level: Restore loss of surfacing by ravelling or other causes, which affect riding qualities or surface seal.

Frequency or Workload Rate:

Three-fourths (0.75) cubic yard per mile of 24' bituminous surface.

METHOD AND PROCEDURE:

1. At site set up traffic controls, signs, cones, flagmen.
2. Clean and square up area to be patched using hand tools.
3. Apply tack coat.
4. Shovel and rake premix over area.
5. Roll with truck wheels, dust patch to avoid ravelling.
6. Pick up and move to next site.

ACTIVITY REPORTING:

1. This activity will be reported as from-to or spot location mileage.
2. All labor, equipment and materials must be reported.
3. The reported accomplishment will be the total cubic yards of premix applied. For reporting purposes it will be permissible to use truck load counts.

Note: This activity includes the use of a Wylie drum heater. If Wylie drum heater is used, aggregate and liquid asphalt should be reported as materials used. If less than one-half cubic yard is used, it will not be necessary to report materials or accomplishment. It will still be required that labor and equipment be reported against the activity.

Performance Standard for Surface Patching - Premix (Hand)

Inventory

The next important data file established for the MMS, is the inventory of highway systems being maintained. The inventory consists of a record of the quantities of maintainable elements of each highway by route and location. Elements are measured and recorded in units useful for program planning, budgeting and scheduling. Examples are: lane miles of bituminous pavement surface, linear feet of roadside drainage ditches, and linear feet of guardrail. In addition to the physical quantities, significant data about climate, terrain, contiguous land use (i.e., urban, rural), traffic volumes and other characteristics that could have an effect on maintenance requirements are included in the inventory by route and location.

ROAD INVENTORY

System & Route: IR015 County: CL

Sheet no. 1 of 10

(CONTINUOUS LOCATION)

Dist. N Division 1512

							Begin Mile Post	End Mile Post	Units Length	Code Number	Comments
X							0.00	34.82		B	
	R						0.90	4.18		SG	
	L						0.95	4.18		SG	
		L					1.00	1.23			
			R				1.02	4.18			
				R			4.18	4.26			
				L			4.21	4.23			
					R		4.20	4.26		P	
					L		4.21	4.23		P	
						X	4.18	4.26	7	P	
	R						4.26	7.48		SG	
	L						4.26	7.48		SG	
					R		7.48	7.50		P	
					L		7.48	7.65		P	

034-018
8-72

Recorded by: Keith Hilton Date: 5/18/73

Budgeting

A major feature of the MMS is the performance budget, which allocates funds for the performance of a specific maintenance program defined by activity, location, and units of work to be accomplished. This differs significantly from budgets, based upon historical trends, which simply assign dollars to various types of maintenance work.

The performance budget is derived from workload models and the system inventory to produce a preliminary printout of activities, quantities, costs and manhour requirements by District. The preliminary budget printouts are reviewed at the District level and adjusted to reflect field conditions not predictable in the models. The District staff works only with the manhour values in the budget, adjusting totals and distributing them by months before submitting them to the central office for electronic computation of final budget values. The use of activities and manhours at the District level permits the District to think of budgeting in terms of crews and programs rather than dollars. It also permits the District to recognize program limitations and scheduling requirements imposed by staffing levels and available manhours. Conversion of adjusted manhours to adjusted units of work and adjusted dollars is accomplished in the computer without requiring costly computations at the District level.

STATE OF NEVADA
DEPARTMENT OF HIGHWAYS
MAINTENANCE MANAGEMENT SYSTEM
PRELIMINARY COMPUTED DISTRICT
MAINTENANCE BUDGET

DISTRICT 2
FISCAL YEAR 78

PAGE NO. 16
MMS RPT 9-
RUN 03/11/77

ACTIVITY	MAN HOURS	WORK LOAD	COSTS
100.01 PLANNING & SCHEDULING	1,775	1775	15,211
	1,775 *		15,211 *
101.01 BASE & SURFACE REPAIR	107	107	2,261
101.02 SURF PATCH PREMIX HAND	15,151	845	182,393
101.03 SURF PATCH PREMIX MACH	6,107	6806	200,782
101.04 SURF PATCH SPOT SEAL	593	62450	10,252
101.05 SEAL COAT SAND	6,303	1930626	167,823
101.06 SEAL COAT FLUSH	5,578	3232526	195,579
101.07 CRACK FILLING	5,695	152366	83,166
101.08 HEATER PLANING	1,800	61397	24,546
101.09 SEAL COAT CHIPS	2,357	567768	119,794
	39,256 *		926,403 *
111.01 PATCH SPALL AREAS TEMP	653	82	7,816
111.02 PART & FUL DEPTH PATCH	2,075	68	27,095
111.03 PAVD SHD MAINTENANCE P	12	11	354
111.04 PAVD SHD SEAL SAND	36	16716	1,299
111.05 JOINT SEALING	705	6035	8,718
111.06 EXPANSION JOINT REPAIR	72	109	822
	3,553 *		46,106 *
112.01 REPAIR MISC CONC APURT	293	1027	4,664
112.02 MAINTAIN TUNNELS			
	293 *		4,664 *
131.01 CLEANING CULVERTS	606	98	6,218
131.02 CLEAN CULVRT OPEN & DI	1,167	1006	15,426
131.03 DRESS & SHAPE DITCHES	1,730	363225	26,239
131.04 CLEANING DITCHES	1,103	5915	12,769
131.05 CULVERT REPAIR REPLACE	62	65	1,687
131.06 FILL SLOPE REPAIR	4,770	26631	68,375
131.07 SHLDR SLOPE MAINT BLAD	1,651	255	27,421
131.08 VEGETATION CONTROL MOW	362	123	5,643
131.09 VEGETATION CONTROL SPR	660	481	15,841
131.10 VEGETATION CONTROL HND	1,051	1051	11,368
	13,328 *		193,798 *
133.01 REMOVE DEBRIS LITTER	12,255	8045	131,507
133.02 EMPTY LITTER BARRELS	1,891	1970	23,586
133.03 SWEEPING	1,650	2855	40,085
133.04 REMOVE ROADWAY DEBRIS	5,369	29937	55,177
	21,165 *		2[illegible],657 *
134.01 MAINTENANCE REST STOPS	732	832	9,110
134.02 MAINT OF ROADSIDE PARK	2,487	2487	26,235
134.03 MAINT LNDSCAP AREA WT	3,170	3170	36,669
134.04 MAINT LNDSCAP AREA NOT	12,420	12420	134,160
	18,810 *		206,165 *
135.01 REPAIR RW FENCE, GATES	241	5742	3,935
135.02 MAINT CATTLE GUARDS	633	67	8,161
135.03 REMOVE ENCROACHMENTS	5	13	170
135.04 INSPECT RW FENCE, GATE	123	574	1,356
	1,002 *		13,623 *

ACTIVITY	MAN HOURS	WORK LOAD	COSTS
141.01 MAINT ROUTE-MARK SIGNS	5,119	32456	91,50[illegible]
141.02 GUARDRAIL REPAIR	1,277	4032	17,42[illegible]
141.03 GUARDRAIL PAINTING	2,147	155257	43,23[illegible]
141.04 GUARDRAIL CLEANING	1,277	231679	11,55[illegible]
141.05 PAVEMENT STRIPING	5,759	2302	157,00[illegible]
141.06 RAISED PAVEMENT MARKING	131	673	2,17[illegible]
141.07 PILOT LINING	1,837	223	16,23[illegible]
141.08 PAVEMENT MARKINGS	1,662	57715	21,15[illegible]
141.09 HWY LIGHTING SYSTEM	242	282	3,59[illegible]
141.10 PATROLLING	367	6339	8,48[illegible]
141.11 MAINTAIN POSTS-MARKERS	7,173	15656	97,34[illegible]
	27,6[illegible] *		467,01[illegible]
151.01 SNOW REMOVAL	8,367	8366	177,964
151.02 SNOW PLOW ROTARY PLOW			
151.03 SNOW & ICE PATROLLING			
151.04 INST/REM SNOW MARKERS			
	8,367 *		177,964
161.01 MAINT REPAIR STRUCTURE	398	345	3,05[illegible]
161.02 INSPECT STRUCTURES	1,378	5161	14,58[illegible]
	1,776 *		18,43[illegible]
254.01 ROADWAY GRADING	81	1577	1,533
254.02 FLD CNTRL & DRN GRADE	37	782	791
254.03 INSTAL DRAIN STRUCTURE	53	68	1,308
	171 *		3,63[illegible]
256.02 BITUMIN SURFACE TREAT	[illegible]	19069	351,552
	[illegible] *		351,552
261.01 ERECT ROUTE-MARK SIGNS	437	1051	10,439
261.03 CONSTRUCT CATTLE GUARD	156		5,488
261.04 CONSTRUCT GUARDRAIL	55	208	1,395
	[illegible] *		17,322
270.01 AGGREGATE PRODUCTION	3,756	29971	87,522
270.02 PREMIX PRODUCTION	2,728	26781	301,896
270.03 MIXING SALT AND SAND	259	8182	22,756
270.04 HAULING MATERIALS	10,527	54500	194,670
270.05 CHIP PRODUCTION	844	2719	21,739
	18,204 *		628,823
DISTRICT TOTALS	158,607 *		3,382,668

Preliminary Computed Budget Provides District with Printout of Man-hours, Workload (Units of Work) and Costs by Maintenance Activity

The budget information is also used to establish staffing levels for each subdivision of work force. The preliminary computed maintenance budget is generated of each foreman's division. The man hours budgeted are compared to the man hours available by using the Work-Load Analysis Report.

DISTRICT III

WORK-LOAD ANALYSIS

DIVISION NO.	CREW	CREW SIZE	AVAILABLE MAN HOURS	BUDGETED MAN HOURS	% OF TIME BUDGETED
322	Contact	2	3,746	3,083	82.3%
324	Emigrant	5	9,365	7,831	83.6%
325	Independence	2	3,746	3,067	81.9%
327	North Fork	4	7,492	5,096	68.0%
328	Pequop	5	9,365	8,637	80.9%
331	Ruby Valley	2	3,746	5,032	134.3%
332	Wells	9	16,857	13,070	77.5%
350	Elko (Wormek)	7	13,111	10,405	79.4%
351	Elko (Goodale)	7	13,111	10,045	76.6%
340	Elko (Bilbao)	5	9,365	7,360	78.6%
TOTAL	* If this crew was a three-man crew they would have available 5,619 man hours and a % of time budgeted of 89.6%	48	89,904	71,626	79.7%

The crew size is adjusted so approximately 80% of the available man hours is budgeted to routine maintenance. This leaves 20% of their time for betterment activities and work not covered by MMS.

Management Information System

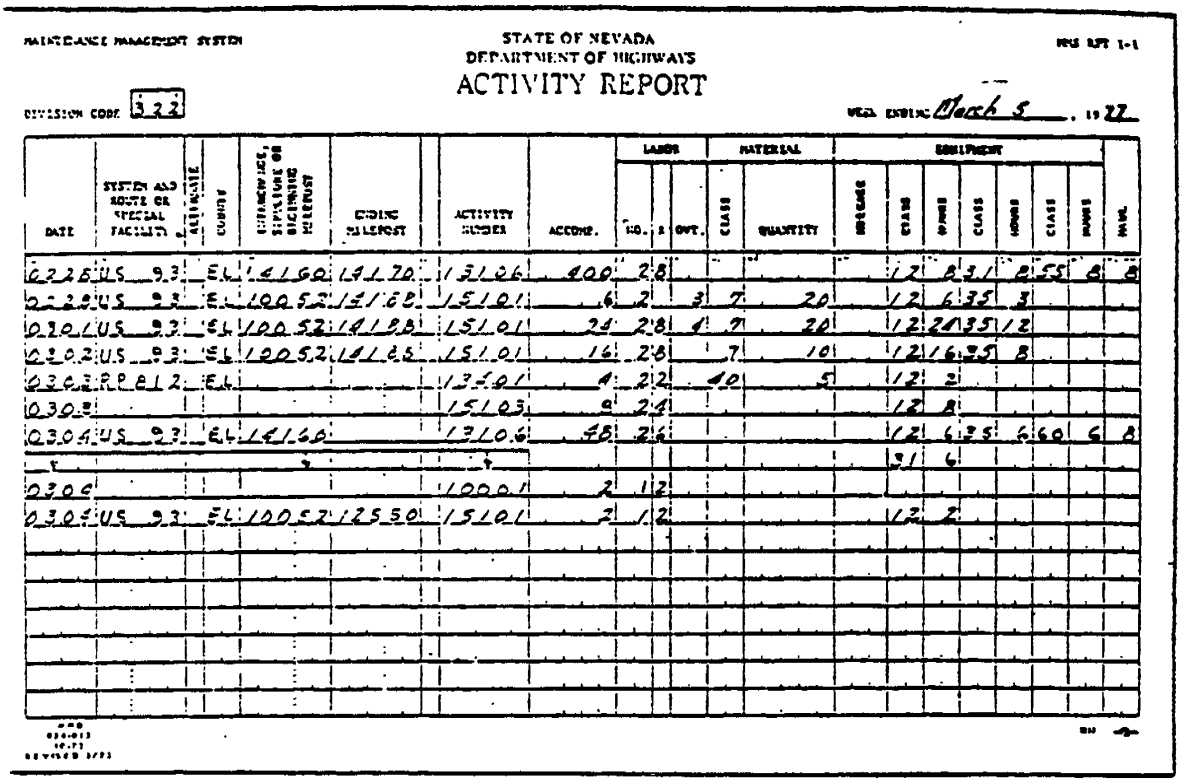
An item around which much of the information system revolves is the basic field data input report. Called the "Activity Report", the document provides information about activities performed, location of work sites, labor, equipment and materials used, and units of work accomplished. From this input data flow the computations, summations and evaluations that comprise a major part of the system.

A basic design decision required in the development of the Activity Report was the manner and degree of detail to be used in reporting work site locations. The Mile Post System in Nevada provided an excellent basis on which to make this decision. It's flexibility and precision permits actual work site location identification on the Activity Report, whether it be a spot location (at Mile Post____) or a continuous location (from MP____ to MP____). With such information in the data file, the MMS is able to produce output reports on work accomplishments and costs incurred for any period of time for any route and milepost location. High or low productivity and high or low cost locations can be identified by exception reports for further study and follow-up action as warranted.

Another fundamental design feature that required a policy decision on the Activity Report dealt with the use of a single reporting system or parallel reporting systems to serve MMS and the payroll and accounting needs. For Nevada, the parallel reporting system was chosen. This permitted the Activity Report to accept a single line entry for an entire crew's work on an activity at a given location, thus simplifying the report and keeping the number of entries to a minimum. At the same time,

Management Information System, con't.

the payroll report was simplified to permit a single line entry for all maintenance activity hours for each day. The net result was a set of two brief, simple reports, each serving a specific need. Alternative systems developed in other states, employing a single report to serve multiple needs have proven to be complex, requiring a large number of line entries and constrained in timing and processing by the inflexibility of payroll requirements.



MAINTENANCE MANAGEMENT SYSTEM

STATE OF NEVADA
DEPARTMENT OF HIGHWAYS
ACTIVITY REPORT

MMS RPT 1-1

DIVISION CODE 322

WEEK ENDING March 5, 1977

DATE	SYSTEM AND ROUTE OR SPECIAL FACILITY	ASSIGNABLE	COUNTY	DISTANCE FROM, DIRECTION OR BEGINNING REFERENCE	ENDING REFERENCE POST	ACTIVITY NUMBER	ACCOMP.	LABOR NO.	LABOR S	LABOR OVT.	MATERIAL CLASS	MATERIAL QUANTITY	EQUIPMENT MFR CODE	EQUIPMENT CLASS	EQUIPMENT HOURS	EQUIPMENT CLASS	EQUIPMENT HOURS	TOTAL
0226	US 93		EL	14160	14170	13106	400	2	8				12	B	3	0	55	8
0228	US 93		EL	10052	12160	15101	6	2		3	7	20	12	6	35	3		
0230	US 93		EL	10052	14160	15101	24	2	8	4	7	20	12	24	35	12		
0232	US 93		EL	10052	14160	15101	16	2	8		7	10	12	16	35	8		
0232	PROJ		EL			13401	4	2	2		40	5	12	2				
0303						15103	9	2	4				12	8				
0304	US 93		EL	14160		13106	48	2	6				12	6	35	6	60	6	8
													31	6				
0306						10001	2	1	2									
0304	US 93		EL	10052	12550	15101	2	1	2				12	2				

REVISED 3/73

Activity Report

Provides a single set of entries
for crew activity at a given location

Field organization is the key to reliable management reports. A well-informed foreman who believes in and supports the management system will do a much better job of reporting his crew's accomplishment on the "Activity Report". Accurate reporting of work performed is essential if the management reports are to be reliable.

One measure of MMS effectiveness is its capability to generate concise, pertinent management reports that are easily understood by the user. A lengthy, complex report receives very little use and is a discredit to the system. Management reports are structured for various levels of management as each has specific areas of authority and responsibility. As an example, a foreman cannot make decisions controlling the statewide maintenance budget or set district policies. He does assign labor, equipment and materials for each activity his crew performs, so he is interested in his crew's productivity and unit cost as compared to some meaningful yardstick. Conversely, the State Highway Engineer should not be concerned about an individual crew's cost or productivity. He is concerned about statewide summaries and district totals. Areas of responsibility and authority dictate the format and information to be provided each level of management in such reports:

Five that are generated monthly:

* Productivity and Unit Cost Report (foreman's report)
* Productivity and Unit Cost Exception Report (district report)
* Work Accomplishment Report (district report)
* District Operations Report (district report)
* State Operations Report (headquarters)

Six that are provided as year end reports:

* State Productivity Report
* State Unit Cost Report
* District Man-Hour Utilization Report
* State Man-Hour Utilization Report
* Summary of Equipment Hours and Material Quantities by District
* Summary of Equipment Hours and Material Quantities Statewide

Four that are generated for analysis purposes when requested:

* Location Analysis Report
* Activity Analysis Report
* System Route-Activity Summary
* Labor, Equipment and Material Summary Report

The acid test of a system is not in the volume of paper it produces but in the benefits the organization experiences as a result of the information produced. The Nevada Department of Transportation has realized benefits in the following areas as a result of the maintenance management system:

A. The Control of Service Levels by:
    1. Establishing staffing levels for crews and districts
    2. Comparing budget to expenditure by activity
B. The Identification of Economic Methods by:
    1. Proper equipment utilization
    2. Labor utilization
    3. Comparison of department to contract costs
C. The improvement of attitudinal and management techniques because:
    1. Foremen are aware of cost
    2. Foremen feel more a part of the organization
    3. There is improved reporting by foremen on other documents
    4. Improved consideration for established schedules, and
    5. Cost information is provided in a useable form

These examples illustrate the contents of some of our management reports and the manner in which the information is utilized.

To Foreman

Monthly Distribution

STATE OF NEVADA

DEPARTMENT OF HIGHWAYS

MAINTENANCE MANAGEMENT SYSTEM — PAGE NO. 185

PRODUCTIVITY AND UNIT COST REPORT — MMS RPT D-1

FOREMAN: GARRISON (051) — FOR JANUARY — RUN 02/26/77

ACTIVITY	DESCRIPTION	UNIT	MAN HOURS CREW	MAN HOURS DIST	UNIT/MANHRS CREW	UNIT/MANHRS DIST	% PROD.	UNIT COST CREW	UNIT COST DIST	% COST
100.01	PLANNING & SCHEDULING	MN HR		31		1.00			11.03	
	YTD TOTALS:		68	283	1.00	1.00	100	9.61	10.28	94
101.01	BASE & SURFACE REPAIR	CU YD								
	YTD TOTALS:		306	518	2.60	1.95	133	6.36	9.80	66
101.02	SURF PATCH PREMIX HAND	CU YD		96		.10			120.55	
	YTD TOTALS:		299	1,310	.10	.12	83	126.89	111.37	114
101.03	SURF PATCH PREMIX MACH	CU YD								
	YTD TOTALS:		1,121	2,623	1.62	1.20	135	24.18	25.85	101
101.06	SURF PATCH SPOT SEAL	SQ YD								
	YTD TOTALS:		59	93	74.88	132.68	68	.21	.17	126
101.07	CRACK FILLING	LB	30M	1,280	97.99	85.73	114	.16	.18	89
	YTD TOTALS:		30M	1,280	97.99	85.73	114	.16	.18	89
101.08	SEAL COAT CHIPS	SQ YD								
	YTD TOTALS:		410	911	305.05	270.35	113	.27	.27	100
131.02	CLEAN CULVRT OPEN & DI	EACH	32	54	.40	.57	70	33.87	27.56	123
	YTD TOTALS:		32	201	.40	.89	67	21.20	13.75	154
131.04	CLEARING DITCHES	CU YD	132	260	10.57	14.12	58	1.27	.77	165
	YTD TOTALS:		274	2,491	11.20	12.35	91	1.34	1.15	118
131.05	CULVERT REPAIR REPLACE	LN FT		82		.78			10.13	
	YTD TOTALS:		80	314	.59	1.18	50	23.51	18.32	128
131.06	FILL SLOPE REPAIR	CU YD	148	535	8.69	12.53	69	1.35	1.14	118
	YTD TOTALS:		410	4,512	7.51	10.36	72	1.45	1.37	105

** ACTIVITY 100.01 HAS BEEN PRORATED

Productivity and Unit Cost Report

Compares an individual foreman's crew productivity to the district weighted average productivity and the crew's unit cost to the district weighted average cost for every activity reported by the foreman by month and year to date. The district weighted average is the yardstick that enables the foreman to evaluate his crew's productivity and unit cost. Very high cost or low productivity on any activity is intended to trigger a foreman's curiosity to find the reason. If it is something he can control he corrects it, if it is beyond his control he accepts it, but in either case he is aware of the cost and productivity.

To District Engineer

Monthly Distribution

STATE OF NEVADA
DEPARTMENT OF HIGHWAYS
MAINTENANCE MANAGEMENT SYSTEM — PAGE NO. 16

DISTRICT: 1 CITY — WORK ACCOMPLISHMENT REPORT — MMS RPT C-3
MONTH: JANUARY — RUN 02/20/77

ACTIVITY	MONTHLY UNITS COMPL	MONTHLY UNITS SCHED	MONTHLY DOLLARS EXPENDED	MONTHLY DOLLARS BUDGETED	YEAR TO DATE UNITS COMPL	YEAR TO DATE UNITS SCHED	YEAR TO DATE DOLLARS EXPENDED	YEAR TO DATE DOLLARS BUDGETED
100.01 PLANNING & SCHEDULING	85	55	385	471	393	385	3,403	3,297
			385*	471*			3,403*	3,297*
101.01 BASE & SURFACE REPAIR					60	36	342	836
101.02 SURF PATCH PREMIX HAND	13	42	2,560	5,661	128	191	16,565	25,472
101.03 SURF PATCH PREMIX MACH					2,098	[illegible]	59,512	[illegible]
101.04 SURF PATCH SPOT SEAL						19,560		2,667
101.05 SEAL COAT SAND					496,597	660,000	77,928	49,484
101.06 SEAL COAT FLUSH					6,326	217,503	721	11,469
101.07 CRACK FILLING	24,052	21,009	10,810	8,980	58,622	56,505	27,360	23,970
101.08 HEATER PLANING		5,500		1,759	34,161	40,000	11,341	16,463
101.09 SEAL COAT CHIPS					132,936	270,303	26,687	51,696
			13,370*	16,400*			216,336*	201,623*
111.01 PATCH SPALL AREAS TEMP								
111.02 PART & FUL DEPTH PATCH								
111.03 PAVD SHD MAINTENANCE P								
111.04 PAVD SHD SEAL SAND								
111.05 JOINT SEALING								
111.06 EXPANSION JOINT REPAIR								
112.01 REPAIR MISC CONC SPORT					413	200	2,429	810
112.02 MAINTAIN TUNNELS								
							2,429*	810*
131.01 CLEANING CULVERTS		3		203	18	21	1,594	1,621
131.02 CLEAN CULVERT OPEN & OI		66		813	592	462	7,466	5,691
131.03 DRESS & SHAPE DITCHES	12,603		1,172		107,572	34,200	9,425	1,950
131.04 CLEANING DITCHES	15,248	350	9,128	575	35,079	3,503	23,545	5,753
131.05 CULVERT REPAIR REPLACE			16		10	56	670	1,624
131.06 FILL SLOPE REPAIR	1,953	2,800	6,998	5,728	9,083	13,300	29,161	27,208
131.07 SHOULDER SLOPE MAINT BLAD	16		1,397		56	75	5,365	6,035
131.08 VEGETATION CONTROL MOW	3		430		1,176	720	25,433	19,528
131.09 VEGETATION CONTROL SPR	65	50	2,298	1,028	137	358	8,263	9,968
131.10 VEGETATION CONTROL HND					141	76	1,596	756
			20,135*	8,743*			107,353*	86,130*
133.01 REMOVE DEBRIS LITTER	24	19	571	537	150	223	7,127	6,849
133.02 EMPTY LITTER BARRELS	172	130	446	547	1,779	1,792	6,355	4,569
133.03 SWEEPING		135		1,826	319	945	5,159	12,782

Work Accomplishment Report

The work accomplishment report compares the units of work completed to the units of work scheduled and the dollars expended to the dollars budgeted. These units are shown for the current month and as a year-to-date total. The report also summarizes dollars expended and dollars budgeted by maintenance program. In this example the flexible pavement program shows $13,370 expended, with $16,400 budgeted for the current month and $216,336 expended with $201,623 budgeted year-to-date. **This** allows manager to monitor work performed and adjust the maintenance service level for individual activities or groups of activities. It alerts managers to the impact that each activity has on the district maintenance budget.

To State Highway Engineer

Annual Distribution

STATE OF NEVADA

DEPARTMENT OF HIGHWAYS

MAINTENANCE MANAGEMENT SYSTEM

STATE UNIT COST REPORT FOR 1973 — MMS RPT 0-9 RUN 07/29/74

ACTIVITY DESCRIPTION	ACCOMPLISHMENT UNITS	STANDARD UNIT COST	STATE	DIST. ONE	DIST. TWO	DIST. THREE	DIST. FOUR	DIST. FIVE	DIST. SIX
100.01 PLAN & SCD	MN HR	6.86	6.84	7.32	6.60	6.67	7.65	6.56	6.84
101.01 B & S REPR	CU YD	12.67	10.99	14.48	14.63	14.49	3.89	12.63	26.51
101.02 SUR PACH H	CU YD	91.46	90.03	59.30	69.66	79.67	54.25	119.25	98.67
101.03 SUR PACH M	CU YD	14.49	14.17	14.47	11.90	15.24	14.52	23.55	17.81
101.04 SUR PACH S	SQ YD	.09	.12	1.51	.19	.09	.07	.12	.16
101.05 SEAL COT S	SQ YD	.05	.06	.07	.06	.06	.06	.05	.04
101.06 SEAL COT E	SQ YD	.03	.03	.04	.03	.04	.02	.03	.03
101.07 CRACK FILL	LB	.25	.31	.25	.41	.24	.23	.34	.34
101.08 HEAT PLAN	SQ YD	.25	.23		.22				.24
101.09 SL CCT CHP	SQ YD	.11	.09	.08		.11	.07	.12	
111.01 PAT SPAL T	CU YD	91.26							
111.02 P & FO PAT	CU YD	300.06	460.38	460.38					
111.03 PV SH MA P	CU YD	18.10							
111.04 PV SH SL S	SQ YD	.04							
111.05 JOINT SEAL	LB	.93	.97		.97				
111.06 EXP JNT AP	LN FT	5.35	3.76	3.76					
112.01 RPR CON AP	CU FT	2.34	2.14	2.83	1.27			7.48	1.82

** ACTIVITY 100.01 HAS BEEN PRORATED

The State Unit Cost Report

Shows, for each activity, the standard unit cost, the State weighted average unit cost and the weighted average unit cost achieved by each district for the report year. The State Unit Cost Report is a most useful tool for comparing the costs of activities in one district to the costs in another district and to the State average.

This example illustrates the use of information contained in the State Unit Cost Report:

STATE UNIT COST REPORT
July, 1974 through June, 1975

Activity Description	Stand. Unit Cost	State Avg.	Dist. One	Dist. Two	Dist. Three	Dist. Four	Dist. Five	Dist. Six
101.02 Sur Pach H	99.12	104.39	45.84	118.84	86.56	98.76	151.85	139.42
141.07 Pilot Line	56.69	75.19	77.65	98.76	26.05	73.01	52.30	111.96
256.02 Bit Sur Tmt	11.78	12.97	16.51	16.09	9.75	18.42	18.69	10.59
270.01 Agg Prod	2.17	1.75	1.50	1.39	1.41	2.65	1.72	2.42
280.01 Prchse Agg	---	1.62	1.80	1.45	---	---	---	---

101.02 Hand Patching: This activity varies from a low district average cost of $45.84 per cubic yard to a high district average cost of $151.85 per cubic yard. The high cost of 3.3 times greater, indicating this activity needs to be analyzed to determine why such a difference exists.

Analysis of the hand patching operation is accomplished by going to the districts to observe and record with a time lapse camera the methods, materials, labor force, equipment and documentation used by the maintenance crews. Data obtained is used to refine the "standard" to provide a more uniform and efficient method of hand patching, and ideally to reduce the State average unit cost.

141.07 Pilot Lining: The district average unit cost for pilot lining varied from a high of $111.96 per mile to a low of $26.05 per mile. Districts 1, 2, and 6 had costs in excess of $77 per mile. These districts had survey crews available to do the pilot lining. Districts 4 and 5 had costs of $73 and $52 per mile respectively. They normally did not have survey crews available, so the pilot line was placed by maintenance personnel. District 3 had a cost of $26 per mile which is considerably less than the other districts. The District 3 striping crew modified existing equipment which permitted them to pilot line for $26 per mile. This method was used primarily for two-lane rural roads. It consisted of a sighting device, spray painting equipment and controls mounted on a maintenance truck. The sighting device allowed the driver of the truck to align the truck so the paint gun splits the pavement. A second man operated the paint control for applying paint dots. This method is still in the developmental stage with many refinements yet to be tested, but results to date are very encouraging. If it continues to be effective under further testing, it will be incorporated as the standard.

256.02 Bituminous Surface Treatment: The district average unit cost for overlays varied from a high of $18.69 per cubic yard to a low of $10.59 per cubic yard. Districts 2, 4, and 5 had costs in excess of $14 per cubic yard. These districts blademixed their premix to be used on the overlay. Districts 3 and 6 had a cost of approximately $10 per cubic yard for the same activity. These two districts rented a Madsen roadmixing machine to mix their premix. This reduced their cost by over $4 per cubic yard.

270.01 Aggregate Production and 280.01 Purchase Aggregate: The average unit cost for state produced aggregate from July through June was $1.75 per yard whereas the average unit cost for purchasing aggregate from a commercial source was $1.59 per cubic yard. This indicates consideration should be given to purchasing aggregate from a commercial source where available.

1. Cost per cubic yard is slightly lower for purchased material.
2. Better quality provided.
3. Maintenance personnel are freed for other maintenance and betterment activities.

STATE OF NEVADA
DEPARTMENT OF HIGHWAYS
MAINTENANCE MANAGEMENT SYSTEM
SYSTEM ROUTE-ACTIVITY SUMMARY

MMS RPT D-1c
RUN 12/18/74

SYSTEM ROUTE	FROM DATE	TO DATE	DIST	CTY	FROM MILEPOST	TO MILEPOST	ACTIVITY	ACCOMPL. UNITS	TOTAL LABOR	TOTAL EQUIP.	TOTAL MATL.	TOTAL COSTS
SR 027	7- 1	6-30	2	WA	000.00	24.53	151	9,962	51,900	79,903	6,683	139,486
	7- 1	6-30	2		000.00	24.53	151	9,962	51,900	79,903	6,683	139,486

Snow removal on Mt. Rose Highway

Quite frequently the maintenance division is requested to provide cost information on specific sections of roadway. Some examples are: provide cost of snow removal; provide maintenance costs by county for top management; provide maintenance costs for the roadways on the forest highway system. This information is easily obtained on the System and Route Activity System.

The following illustrates how milepost identified cost information might be used as input to design decisions.

The cost for maintaining guide posts on one secondary route 3 miles in length in an urban area was $1,461 for one year. There are approximately 100 guide posts on this route. One approach for evaluating the impact of a different design feature would be to replace all the existing standard guide posts on this route with one of the new "so called" impact resistant guide posts. Since our normal activity reporting procedures require the recording of work locations, and since output reports can be generated for any period of time, for any route or mile post location, comparing the maintenance costs of the standard post to the impact resistant post is quite easy.

STATE OF NEVADA
DEPARTMENT OF HIGHWAYS
MAINTENANCE MANAGEMENT SYSTEM

SYSTEM-ROUTE-ACTIVITY SUMMARY

System Route	From Date	To Date	Dist	City	From Milepost	To Milepost	Activity	Accompl. Units	Total Labor	Total Equip.	Total Matl.	Total Costs
FAE85	7/1/75	6/30/76	2	CC	000.00	3.09	161.11	336	911	161	389	1,461

Impact resistant posts installed July 1976

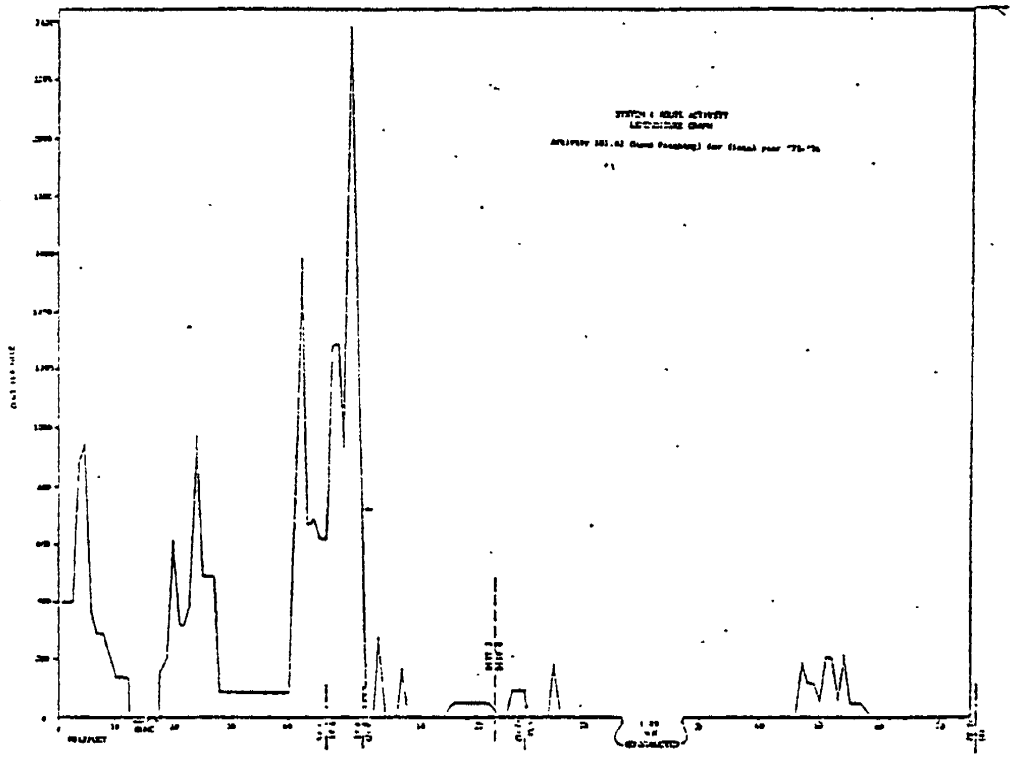
System Route - Activity Summary

System Route	From Date	To Date	Dist	City	From Milepost	To Milepost	Activity	Accompl Units	Total Labor	Total Equip	Total Matl.	Total Costs
FAE85	9/1/76	6/30/77	2	CC	000.00	3.09	161.11	?	?	?	?	?

This same type of comparison can be made between similar routes with alternate design features.

In assigning priorities for the "Interstate Resurfacing, Restoration and Rehabilitation Program" maintenance expenditures for selected activities should be considered. As an example two or three sections of interstate roadway may have the same or nearly the same present serviceability rating but one section may be requiring a greater maintenance effort and expenditure in order to maintain that condition or rating. Obviously, the section that requires the most maintenance expenditure should have the highest priority.

With maintenance expenditures identified in the file by milepost location a graph of expenditures for specific activities by milepost location can be provided using a computer plot program. The information obtained then assists in establishing the priority list for the R-R-R program.

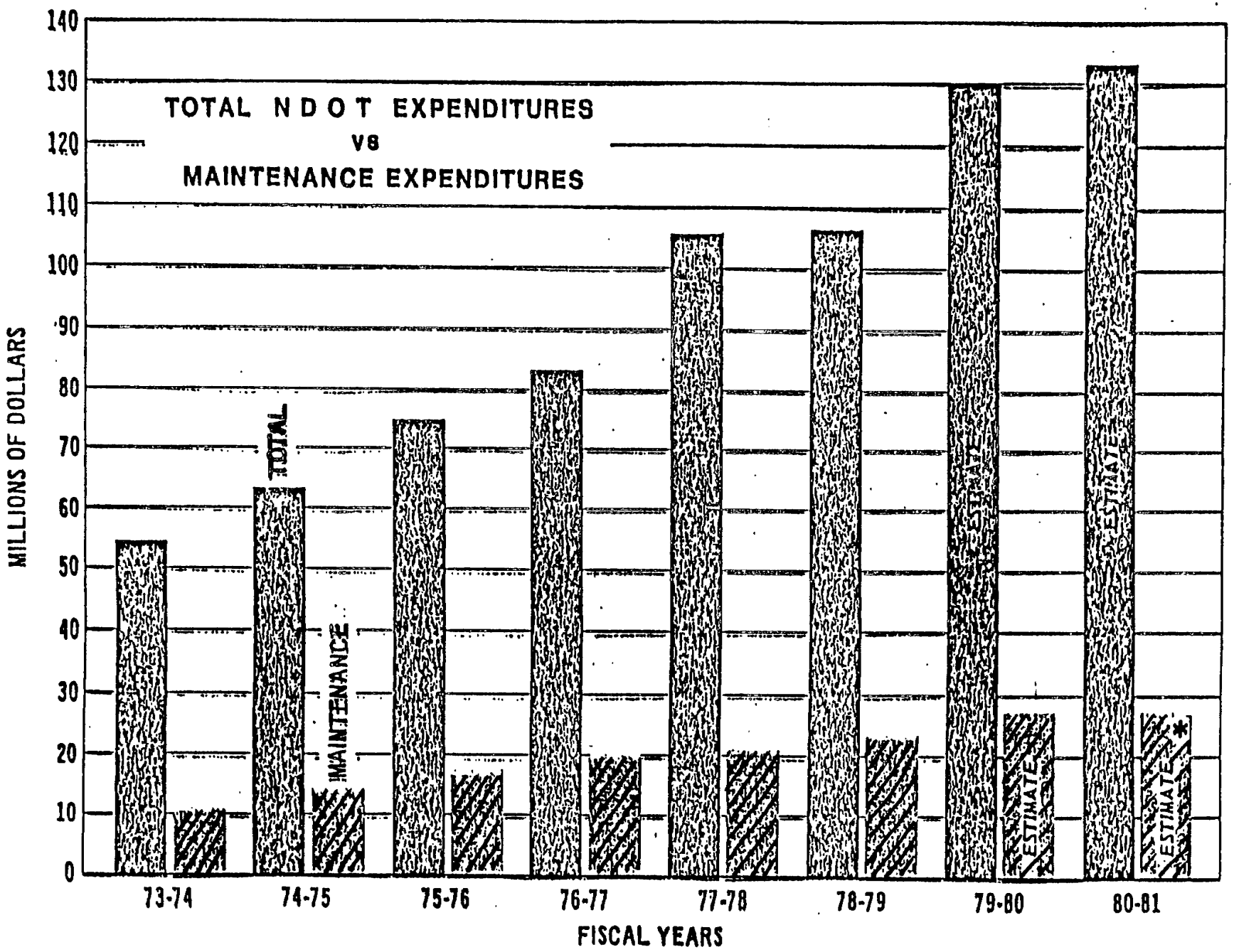


Even though Nevada is a very dry state we have considerable trouble with flash floods. Our sparse vegetation, steep slopes and high intensity short duration storms combine to produce large water concentrations which are not always handled by existing drainage structures. In some instances very little damage occurs to the highway and there is very little traffic disruption. In other cases there is extensive damage and a resulting hazard and inconvenience to the public.

The ability to identify these areas of damage and the subsequent cost of repairs provides information which is used to justify spot drainage improvements or drainage improvements as a part of a reconstruction project. The System and Route Activity Expenditure Graph identifies the area and approximate cost of repairs. If more detailed cost information is required, the System and Route Activity Summary can be used.

The benefits that Nevada has realized from the MMS are extensive. We are just completing six years of historical information and have just scratched the surface. However, the MMS, as with any tool, relies on people to make it work. Without the cooperation and use of managers throughout the organization the MMS can not be a part of the decision making process.

Appendix G



* No increase in maintenance expenditures shown in view of uncertain User Revenues.

Appendix H

ANALYSIS OF NON-FEDERAL AID REVENUES

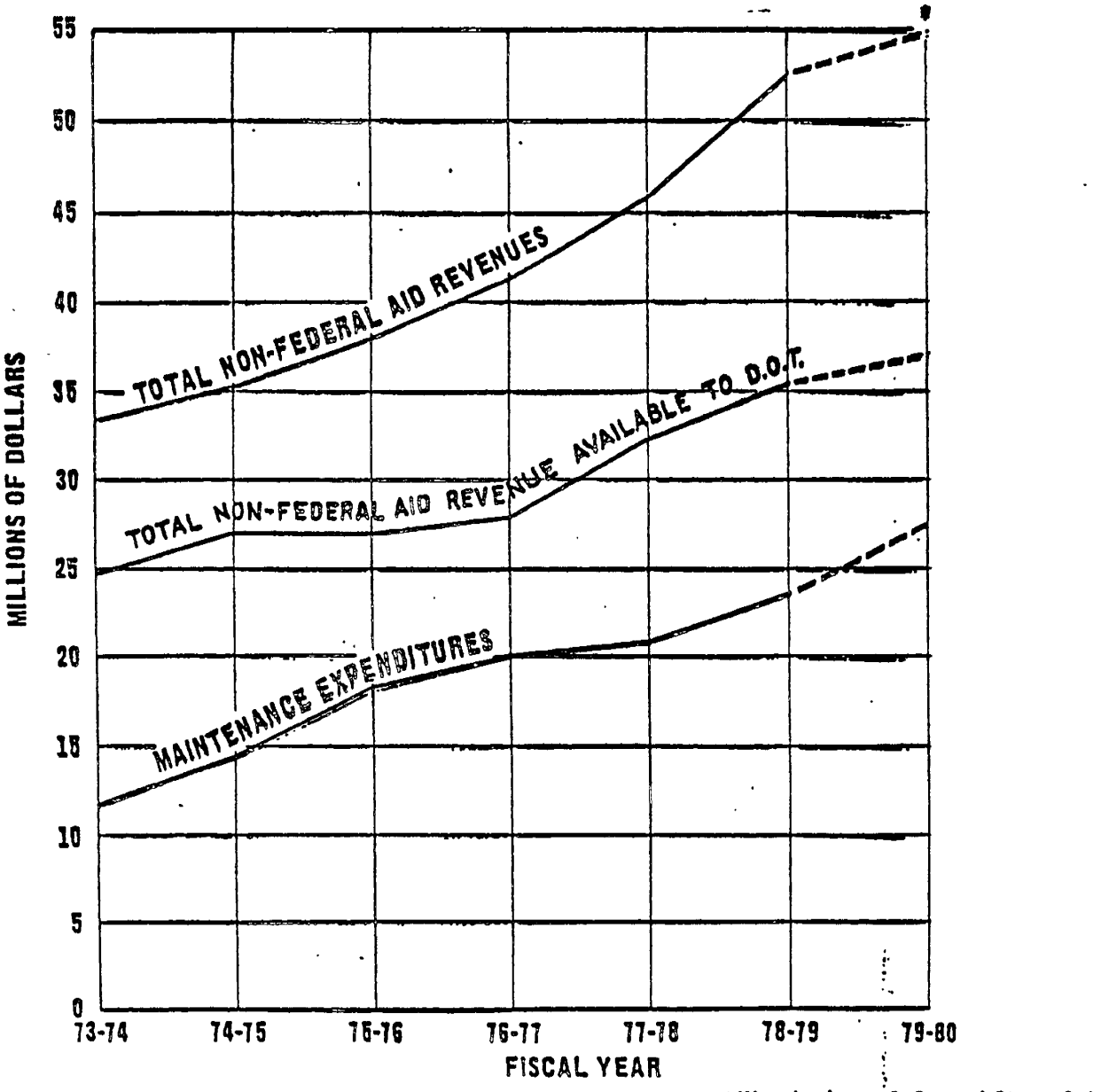
	1973-74	1974-75	1976-77	1977-78	1978-79
Gasoline Tax of 4.5¢ Per Gallon	$16,290,746	$16,574,830	$17,707,527	$18,987,472	$20,474,010	$22,168,803
Special Fuel of 6¢ Per Gallon	*	3,051,807	3,390,897	3,745,694	4,091,726	4,551,661**
Department of Motor Vehicles	16,552,833	14,241,155	15,217,793	16,651,460	18,892,073	21,456,514**
Miscellaneous Revenue	800,000	1,462,204	1,823,869	2,020,717	2,613,412	4,584,949
Total Non-Federal Aid Revenue	33,643,691	35,329,996	38,140,086	41,405,343	46,071,221	52,761,927**

* Combined with DMV

** NDOT originally reported special fuel receipts as being $4,006,423, DMV revenue as $21,835,658, and total nonfederal aid as $52,595,877. These figures represented incomplete fiscal year information. The corrected revenue figures were supplied by the Department of Motor Vehicles.

Appendix I

NON-FEDERAL AID REVENUES VS MAINTENANCE EXPENDITURES



*Kletzke Lane & Second Street Sale

Appendix I

Appendix J

TRANSPORTATION RESEARCH CIRCULAR

Number 196, January 1979
ISSN 0097-8515

Transportation Research Board, National Academy of Sciences, 2101 Constitution Avenue, Washington, D.C. 20418

PROGRESS REPORT OF THE COMMITTEE ON MAINTENANCE AND OPERATIONS PERSONNEL

subject areas
11 administration
40 maintenance

This report was prepared by the TRB Committee on Maintenance and Operations Personnel with the cooperation of the AASHTO Subcommittee on Maintenance. This report is the 34th in a series which began in 1944.

In 1971 the report was expanded to include Traffic Services personnel in addition to Maintenance personnel. The policy questionnaire has been revised from time to time to keep it current with changing trends, but the general format of the report has been retained.

Response to the questionnaire this year was excellent, with all 50 states responding.

SALARIES

This report, for comparative purposes, has been broken down into four regions as follows:

1. The North Atlantic States (Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island and Vermont).
2. The Southeastern States (Alabama, Arkansas, Florida, Georgia, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee, Virginia and West Virginia).
3. The Mississippi States (Illinois, Indiana, Iowa, Kansas, Kentucky, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, Oklahoma, South Dakota and Wisconsin).
4. The Western States (Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, Nevada, New Mexico, Oregon, Texas, Utah, Washington and Wyoming).

The following are the average monthly salaries of certain positions, by regions, as of July 1, 1978, which gives a reasonable cross-section for the comparison of current salaries in these four regions:

JOB TITLE	AVERAGE SALARY ($/MO.) North Atlantic States	South-Eastern States	Mississippi Valley States	Western States
State Maintenance Engineer	2605	2465	2538	2813
District Engineer	2382	2361	2422	2772
Area Supervisor	1316	1126	1392	1655
Laborer	723	586	768	884
Mechanic	954	855	1013	1235
Equipment Operator I	774	669	782	984
Equipment Operator II	816	764	916	1166
Equipment Operator III	946	859	965	1268

These averages all show an increase over 1978.

Using 1967, the current cost index base year, the relative change in selected classifications for 1978 is as follows: State Maintenance Engineer - $193.82%, Equipment Operator I - $198.76%, Laborer - $207.93%, and Mechanic - $200.99%. This will permit a general comparison with the various labor cost indexes available for your area.

PERSONNEL POLICIES

While all the states did not clearly indicate their data in some categories, the following can be determined from an analysis of the report on personnel policies:

Civil Service or Merit System

Only four states do not have a civil service, a merit system or some other comparable plan for all or part of their employees, as indicated by the following tabulation:

North Atlantic States ..... Pennsylvania
Mississippi Valley States ..... North Dakota
Southeastern States ..... Arkansas; North Carolina

Retirement Plan

All states indicate their employees are protected by a state-sponsored retirement plan; in 43 of those states, all or part of the employees are also covered by Federal Social Security.

Fourteen states reported no compulsory retirement age--an increase of 5 over last year; the compulsory retirement age is 65 in 10 states; 67 in one state; 70 in 24 states, and 72 in one state. The retirement age is established by statute in 22 states and by policy in 14 states.

Forty-nine of the reporting states indicate voluntary retirement is possible at an earlier age after a prescribed number of years. The most prevalent minimum years of service for voluntary retirement is 30 years, while the most prevalent minimum retirement age is 55.

Vacation and Sick Leave

All states indicated that permanent employees are granted vacation and sick leave. The minimum or starting basis on vacations ranges from 56 to 168 hours per year, and maximum from 120 to 248 hours per year. Vacation time is cumulative in 49 states, and the maximum time that may be carried over into a new year varies from 160 hours to unlimited, with two states reporting no limit on the amount of vacation that may be accumulated.

The minimum or starting basis on sick leave ranges from 75 to 120 hours per year, and the maximum from 75 to 240 hours per year. All states allow sick leave to be carried over into the ensuing year; the maximum that may be carried over into a new year ranges from 360 hours to unlimited, with 35 states reporting no limit to the amount that may be accumulated.

Insurance

All 50 states have a partially or wholly state-financed hospitalization plan for their permanent employees. Twenty-one of these plans are wholly state-financed. The plan is mandatory in 9 states.

Forty-three states have a partially or wholly state-financed life insurance plan for their permanent employees, with 21 of these wholly state-financed. The plan is mandatory in 18 states.

In 28 states, all or part of the maintenance and operations personnel are protected against lawsuit by a state-financed liability plan.

Unionization

Fifteen states report that supervisory employees have collective bargaining rights, while in 28 states non-supervisory employees have collective bargaining rights.

Thirty-two states report voluntary or mandatory organization of maintenance and operations supervisory personnel in unions or employee associations, with 18 states indicating no union or employee association for supervisory employees.

Forty-two states report mandatory or voluntary organization of their non-supervisory maintenance and operations employees in either national unions, local unions or employee associations, with 8 states indicating no union or employee association organization.

Membership in some type of union is mandatory for supervisors in four states and for non-supervisors in six states.

Service Awards

Forty-five states have some type of award for years of service.

Working Hours and Conditions

Fourteen states pay all employees on a salaried basis, with 19 other states paying all permanent field and supervisory employees on a salaried basis. Eight states pay all employees on an hourly basis.

Forty-five states have an 8-hour day, with 40 hours per week as the standard work week; four states have a less than 40-hour week (three 37½ and one 35), and one state reports a 43½-hour week.

Forty-nine states allow either compensatory time, straight time or time-and-a-half to their permanent field employees. For overtime work, 47 states report non-supervisory personnel earn time-and-a-half compensation for overtime. In 15 states, supervisory employees do not receive any allowance for overtime work.

Forty-eight states require their employees to report to an assembly point preparatory to their day's work; 47 states pay employees from the time they leave this assembly point until they return at the close of the day's work.

All states furnish hard hats and safety vests to their employees; 49 states furnish welding goggles and helmets; 42 states furnish some other types of protective clothing, even though minor, to their maintenance employees.

Forty states have automatic or automatically recommended salary advances.

Forty-nine states have a formalized job classification plan.

Only 8 states use convict labor.

Only two of the states do not allow expenses to employees when they are away from their home station. Both meals and lodging are allowed on the basis of actual expenses in 5 states, actual expenses with a maximum in 13 states, and on a per diem basis in 14 states. In 16 states, the basis of reimbursement for meals and lodging differs.

Forty-one states allow either total or partial reimbursement of moving expenses incurred when an employee is required to change his residence.

Maintenance Responsibility

The Maintenance Division is responsible for all or part of the original placement of highway signs in 19 states, for their replacement and maintenance in 44 states, and for pavement marking in 38 states.

In 47 states, garage or shop operations for vehicle maintenance are under the jurisdiction of the highway department; in 31 states this is limited to highway department vehicles only, while in 10 states servicing is performed for some other state agencies and 6 states for all state agencies.

Lane Miles

The average lane miles per man varies from 5.8 to 38.0.

Maintenance Management System

Thirty-nine of the reporting states have changed or are in the process of changing to a maintenance management system or maintenance performance budget method of operation. Seven states contemplate making this change, while four states indicate they do not contemplate the change.

Basis of Crew Operations

The average number of lane miles handled by a general maintenance crew working out of one location varies from 26 to 1,020 according to the answers given.

The travel distance from a gang or section headquarters to their farthest point of work varies from 6 to 54, with 27 states reporting 25 or under.

Twelve states report that the same crew handles traffic signs and striping with the lane miles handled by each crew varying from 270 to 4,000.

Thirty-three states have special crews for traffic signs, with the lane miles handled by each crew varying from 250 to 5,560.

Forty-two states have special crews for striping, with the lane miles handled by each crew varying from 508 to 11,200 miles.

Twelve states indicate the same special crews handle both signs and striping with the lane mile per crew varying from 270 to 4,454 miles.

DEFINITIONS OF MAINTENANCE AND OPERATIONS PERSONNEL TITLES

NOTE: In the following definitions of titles of maintenance personnel, the first subdivision in the State for supervision purposes is called a "district" or "division". The first subdivision in a district or division is called a "residency".

MAINTENANCE PERSONNEL TITLES

Title No. | Title and Description

1. State Maintenance Engineer - One in an executive capacity who supervises all activities of maintenance for the State Highway and Transportation Department.

2. Assistant State Maintenance Engineer - One who assists the State Maintenance Engineer in the work of supervising the activities of maintenance.

3. District Engineer (In some States, called Division Engineer or Regional Engineer) - One in an executive capacity who supervises highway activities within a district.

4. District Maintenance Engineer - One in an executive capacity who supervises maintenance activities of highways within a district.

5. Assistant District Maintenance Engineer - One who assists the District Engineer and/or the District Maintenance Engineer in supervising maintenance within a district.

6. Resident Maintenance Engineer - One who directs the activities of all maintenance employees and equipment and oversees the maintenance of highways within a residency.

7. Area Supervisor (In some States, called Superintendent) - One who directs the activities of all maintenance employees and equipment and oversees the maintenance of highways within a residency, excluding engineering requirements.

8. Gang Foreman - One who directs the activities of a group of men engaged in maintenance and betterment work such as a grading crew, bituminous repair crew, concrete pavement patching crew, bridge repair crew, roadside maintenance crew, etc.

9. Sectionman - One who in reality is a working foreman, or who can and does perform any of the work necessary to properly maintain the highways within a specified territory; in addition, supervises the work of operators and laborers when necessary. A highly skilled and trained man.

Definitions of Maintenance and Operations Personnel Titles

Title No.	Title and Description
10.	Laborer - One who performs manual labor.
11.	Skilled Craftsman - One who, through special training or experience, has become proficient in a trade such as a carpenter, painter, mason, plumber, etc.
12.	Shop Superintendent - One who is responsible for the operation of a central garage and the supervision of major overhaul and repair of equipment.
13.	Garage or Shop Foreman - One who is responsible for the operation of a garage and the supervision of the maintenance and repair of equipment.
14.	Mechanic - One who, under direct supervision, maintains and repairs all types of automotive equipment.
15.	Mechanic Helper - One who assists the mechanic in the maintenance and repair of all automotive equipment.
16.	Equipment Operator I - Operators of light trucks, mowers, patching rollers, etc.
17.	Equipment Operator II - Operators of heavy trucks, light graders, and rollers used on resurfacing projects.
18.	Equipment Operator III - Operators of specialized equipment such as cranes, shovels, heavy graders, paving machines, etc.
19.	Timekeeper or Clerk - One who keeps the time records of employees, hours of equipment usage, quantities of materials received, used, and on hand; maintenance cost records, etc.

TRAFFIC OPERATIONS PERSONNEL TITLES

20.	State Traffic Engineer - One in an executive capacity who supervises all activities related to traffic operations of the State Highway and Transportation Department.
21.	Assistant State Traffic Engineer - One who assists the State Traffic Engineer in the work of supervising traffic operations.
22.	State Traffic Maintenance Engineer - One in an administrative capacity who programs and implements all phases of maintenance for traffic control activities under the supervision of the State Maintenance Engineer.

Definitions of Maintenance and Operations Personnel Titles

Title No.	Title and Description

23. District Traffic Engineer - One in an executive capacity who supervises traffic operations within a district. May, in some cases, be two positions: one for design and one for maintenance.

24. Assistant District Traffic Engineer - One who assists the District Traffic Engineer in the work of supervising traffic operations within a district.

25. Traffic Supervisor - One who directs the activities of all employees and equipment related to traffic operations within a district.

26. Sign Supervisor - One who directs the activities of all signing, both fabrication and erection.

27. Sign Shop Foreman - One who directs a crew of men in the activity of fabricating traffic signs.

28. Traffic Signal & Lighting Foreman - One who directs a crew of men in activities related to the operation and maintenance of traffic signals and lighting.

29. Striper Foreman - One who directs a crew of men in activities related to pavement markings.

30. Sign Erection Foreman - One who directs a crew of men in activities related to the erection and maintenance of all traffic signs.

31. Sign Fabricator - One who specializes in the fabrication of traffic signs.

32. Sign Technician - One who operates equipment and supervises laborers for all activities associated with signing, both fabrication and erection.

33. Traffic Signal & Lighting Technician - One who works in a technical capacity for operating and maintaining traffic signal equipment and highway lighting.

34. Striper Technician - One who operates equipment and supervises laborers regarding all activities of pavement markings.

OTHER RELATED PERSONNEL TITLES

35. Chief Engineer - One in an executive capacity who supervises all engineering activities of a State Highway Department.

Definitions of Maintenance and Operations Personnel Titles

Title No.	Title and Description
36.	Project Engineer - One who has charge in the field of one or more highway construction projects under the general supervision of a Division Construction Engineer or a Division Engineer.

GENERAL DEFINITIONS

Maintenance - The preservation and upkeep of a highway, including all of its elements, in as nearly as practicable its originally constructed condition or its subsequently improved condition.

Traffic Operations - The operation of a highway facility and services incidental thereto to provide safe, convenient, and economical highway transportation.

NOTE: The word "Operations" in the committee's title indicates "Traffic Operation".

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MAINTENANCE AND TRAFFIC OPERATIONS PERSONNEL TITLES USED BY STATE HIGHWAY DEPARTMENTS (as of July 1, 1978)

MAINTENANCE PERSONNEL

State	(1) State Maintenance Engineer	(2) Assistant State Maintenance Engineer	(3) District Engineer	(4) District Maintenance Engineer	(5) Assistant District Maintenance Engineer
Alabama	State Maintenance Engineer	Asst.State Maint.Engr.	Division Engineer	Div. Maint. Engr.	Asst.Div.Maint.Engr.
Alaska	Dep.Commissioner M&O	State Maint.Engr.Highways M&O	Reg. Director M&O	Transp. Maint. Mgr.	Asst.Transp.Maint.Mgr.
Arizona	Asst.State Engr.-Maint. Sect.	Maint. Oper. Engr.	District Engineer	Dist. Maint. Engr. Dist. Maint. Supv.	-
Arkansas	Civil Engr. VIII	Civil Engr. VI	Civil Engr. VII	Dist. Maint. Supt. II	Dist. Maint. Supt. I
California	Chief,Div of Maint.	Chief,Hwy.Maint. Chief,Struc.Maint.	Dist.Dir. of Transp.	Branch Chief (various)	Section Chief, et al
Colorado	Staff Maint. Supt.	-	District Engineer	Dist. Maint. Supt.	Asst.Dist.Maint.Supt.
Connecticut	Director of Maint.	Oper. Maint. Mgr.	Dist. Maint. Mgr.	-	Dist.Maint.Oper.Supv.
Delaware	Chief, Maintenance	-	Asst. Chief Engr.	-	Asst.Dist.Maint.Engr.
Florida	State Maintenance Engineer	Deputy State Maint. Engr.	District Engineer	Dist. Maintenance Engr.	Asst. Dist.Maint.Engr.
Georgia	State Maintenance Engineer	Asst.State Maint.Engr.	District Engineer	Asst.Dist.Engr.-Maint.	Maint. Asst.
Hawaii	Chief,Land Transp.Fac.Div.	Asst.Chief,Const.& Maint.	District Engineer	Dist. Maint. Engr.	-
Idaho	Maint.Supv.	Asst.Maint.Engr.	Dist. Engr.	Dist. Maint. Engr.	-
Illinois	Engr. Mgr. 3 Engr. of Maint.	Engr. Mgr. 1 Maint. Sect. Chiefs	Engr. Mgr. 3 District Engineer	Engr. Proj. Supv. Dist. Maint. Engr.	-
Indiana	Chief, Div. of Maint.	Asst. Chief, Div. of Maint.	District Engineer	Dist. Maint. Engr.	Asst.Dist.Maint.Engr.
Iowa	Maintenance Engineer	Asst. Maintenance Engineer	District Engineer	Dist. Maint. Engr.	-
Kansas	Engineer of Maintenance	Asst. Engr. of Maint.	District Engineer	Dist. Maint. Engr.	Asst.Dist.Maint.Engr.
Kentucky	Dir.Div of Maint.	Asst.Dir.Div.of Maint.	District Engineer	Asst.Dist.Engr.Oper.	Dist. Maint. Engr.
Louisiana	Chief Maint.& Oper. Engr.	Road Maint. Engr. Br. Maint. Engr.,et al	District Engineer	Asst.Dist.Engr.-Maint.	Asst.Dist.Maint.Engr.
Maine	Engr.of Maint.& Oper.	Hwy. Maint. Engr.	Division Engineer	-	-
Maryland	Asst.Chief Engr.-Maint.	Chief,Bureau of Hwy.Maint.	District Engineer	Asst.Dist.Engr.-Maint.	-
Massachusetts	Maintenance Engineer	Asst. Maint. Engr.	Dist. Highway Engr.	Dist. Maint. Engr.	Asst. Dist. Maint. Engr.
Michigan	Engineer of Maintenance	Asst. Engr of Maint.	District Engineer	Dist. Maint. Engr.	Asst. Dist. Maint. Engr.
Minnesota	Director, Maintenance	Road Services Engr. Equipment Engr., et al	District Director	Asst. Dist. Dir.-Maint.	Maint. Oper. Engr. Maint. Pre-Oper. Engr.
Mississippi	State Maintenance Engineer	Asst.State Maintenance Engr.	District Engineer	Dist. Maint. Engr.	Asst. Dist. Maint. Engr.
Missouri	Div. Engr. Maint. & Traf.	Asst. Div. Engr.-Maint.	District Engineer	District Maint.& Traf.Engr.	Maint. Supt.
Montana	Administrator - Maint.	Asst. Admin. - Maint.	-	Chief, Field Maint.	-
Nebraska	Maintenance Engineer	Maint. Oper. Mgr.	District Engineer	Dist. Hwy. Maint. Supt.	-
Nevada	Chief Maintenance Engr.	Asst. Maint Engr.	District Engineer	-	Asst. Dist. Engr.
New Hampshire	Maintenance Engineer	Asst. Maint. Engr.	Division Engineer	-	Asst. Division Engr.
New Jersey	Chief Engr.Const.& Maint.	Chief,Bureau of Maint.	Reg. Engr. Transp.	Reg. Maint. Engr.	Proj. Engr. Maint.
New Mexico	Asst.Chief Hwy.Admin.-Oper.	-	Dist. Hwy. Engr.	Dist. Maint. Engr.	-
New York	Dir. of Trans Maint.	Dir. of Hwy. Maint.	Reg. Dir. of Transp.	Reg. Hwy. Maint.Engr A,B,C	Sr.Civil Engr. Asst. Civil Engr.
North Carolina	Mgr. of Maint. & Equip.	Head of Maintenance	Division Engineer	Asst. Div. Engr.-Maint.	District Engineer
North Dakota	Maintenance Engineer	Asst. Maint. Engr.	District Engineer	Asst. Dist. Engr.	-
Ohio	Engineer of Maintenance	-	Dist. Deputy Dir.	Dist. Maint. Engr.	Asst. Dist. Maint. Engr.
Oklahoma	State Maintenance Engineer	Asst.State Maint. Engr.	Division Engineer	Div. Maint. Engr.	Field Maint. Engr
Oregon	State Highway Engineer	-	Region Engineer	-	Region Maint. Engr.
Pennsylvania	Dir Hwy. Maintenance	Civil Engineer V	Hwy. D. E. II Hwy. D. E. III	Hwy. Maint. Supt. VI	Civil Engr. III Hwy. Maint. Supt. IV
Rhode Island	Asst.Dir.-DOT-Div.of Maint.	-	Sr. Civil Engr.	-	-
South Carolina	Maintenance Engineer	Asst. Maint. Engr.	District Engineer	Dist. Maint. Engr.	-
South Dakota	Engineer of Maintenance	Engr.of Maint.Oper.,Engr.of Br.Maint. & Maint.Plan.Prog	District Engineer	Asst. Dist. Engr.-Maint.	-
Tennessee	State Maintenance Engineer	Asst.State Maint.Engr.	Regional Engineer	Reg. Maint. Engr.	Asst. Reg. Maint. Engr.
Texas	Chief Engr.,Maint.& Oper.	-	District Engineer	Dist. Maint. Engr. Supv. Maint. Engr.	Asst. Dist. Maint. Engr.
Utah	Engineer for Maintenance	-	District Directors	-	-
Vermont	Director of Maintenance	Asst.Dir.of Maint.	-	Dist.Transp.Admin.	Asst.Dist.Transp.Admin.
Virginia	State Hwy. Maint. Engr.	St.Hwy.Maint.Engr.Asst	Hwy Dist. Engr	Hwy. Asst. Dist. Engr	-
Washington	Maint. and Oper. Engr.	Asst. Maint. & Oper. Engr.	District Administrator	Dist. Maint Engr.	Asst. Dist. Maint Engr.
West Virginia	Chief Engr Oper.	Dir.-Maint. Div.	District Engineer	Asst. Dist. Engr Maint.	-
Wisconsin	Chief Maint Engr.	Asst. Chief Maint.Engr.	District Engineer	Dist.Chief Maint. Engr.	Asst. Maint. Supv.
Wyoming	State Const.& Maint.Engr.	-	-	-	-

(6) Resident Maintenance Engineer	(7) Area Supervisor	(8) Gang Foreman	(9) Sectionman	State
District Engineer	Superintendent	Foreman	Hwy. Comp Guard	Alabama
Dist. Supv. (Supt.)	Ins.In Title #6	Maintenance Foreman	Ins.In Title #8	Alaska
-	Hwy.Maint.Crew Supv.	-	Hwy.Maint.Worker III (Leadman)	Arizona
-	Area Foreman	Job Supt.	Crewleader	Arkansas
-	Hwy. Superintendent	Hwy.Maint.Landscaping & Tree Supv.	Hwy. Landscaping, Maint. & Tree Leadworkers	California
-	Sr. Hwy. Foreman	Hwy. Foreman	Sr. Hwy. Maint.	Colorado
-	Maint. Gen. Supv.	Maint. Supv.	Maint. Crew Leader	Connecticut
Hwy.Maint.Oper.Mgr.	Hwy. Maint. Supt.	Hwy. Maint. Supv.	Labor Foreman I, II, III	Delaware
Maint. Engineer	Hwy. Maint. Foreman II	Hwy. Maint. Foreman I	Hwy. Maint. Tech. III	Florida
Maint. Area Mgr.	-	Hwy. Maint. Foreman II	-	Georgia
-	Comms. & Maint. Supt. VI	Hwy. CSM Supv., et al	Hwy. Labor Supv.	Hawaii
-	Transp.Maint.Foreman	Br. Maint. Supt. -	Hwy. Maint. Supv., et al Hwy.Maint.Oper.Leadworker	Idaho
-	Maint.Field Engr.	Hwy.Maint.Leadworker	Hwy. Maintainer	Illinois
Dist.Maint.Coordinator	Sub-Dist. Supt.	General Foreman	Unit Foreman	Indiana
Resident Maint. Engr.	Hwy. Maint. Supv. &	Hwy.Maint.Supv.3 Hwy.Maint.Supv.2	Hwy.Maint.Supv.1	Iowa
-	Dist.& Area Supt.	Dist. & Area Supv.	Sub-area Supv.	Kansas
-	Maint. Supt.	Hwy. Foreman	Asst. Hwy. Foreman	Kentucky
-	Superintendent	Foreman I, II, III, et al	-	Louisiana
-	District Supv.	Hwy. Foreman	Crew Leader	Maine
Res. Maint. Engr.	Hwy. Maint. Supv.	Supv. Road Maint.	-	Maryland
-	Hwy. Maint. Foreman	Hwy. Repair Foreman	Hwy. Repair Working Foreman	Massachusetts
-	Area Supt.	Transp.Maint. Supv.	Transp. Maint. Supv. IV	Michigan
-	Br. Maint. Supv.	Br. Foreman	Hwy. Maint. Worker	Minnesota
-	Hwy. Maint. Supt., et al	Hwy. Maint. Foreman	Hwy. Maint. Worker., Sr.	
-	Hwy.Maint.Supt. II	Hwy. Maint. Foreman I-II	Equip. Oper. II	Mississippi
-	Maint. Area Supv.	Special Maint. Foreman	Hwy. Maint. Foreman	Missouri
-	Maint. Foreman	-	Field Maint. Supv.	Montana
-	Hwy. Maint. Supt.	Hwy. Maint. Supv.	-	Nebraska
-	Hwy. Maint. Supt.	Sr.Hwy.Maint.Foreman	Hwy. Maint. Foreman	Nevada
Maint. Supv.	Maint. Supt.	Const. Foreman	Hwy. Patrol Foreman	New Hampshire
Dist. Maint. Supv.	Area Supv.	Foreman, Hwy.Maint., Bridge, et al	Asst.Foreman Hwy.Maint., Br., et al	New Jersey
Resident Engineer	Hwy.Maint.Supt.	Hwy.Maint.Foreman I,II	Ins.In Title #8	New Mexico
Resident Engineer	-	Br. Repair Supv. II Hwy. Maint. Supv. II	Br. Repair Supv. I Hwy. Maint. Supv. I	New York
Road Maint. Supv.	Area Foreman	Maint.Crew Leader II & III	Maint. Crew Leader I	North Carolina
-	Maint. Supt.	Foreman	Leadman	North Dakota
Proj. Engr. 2	County Supt.	Hwy. Worker 3	Hwy. Worker 2	Ohio
-	Maint. Dist. Foreman	Hwy. Const. Supt.	-	Oklahoma
District Engineer	-	Hwy. Maint. Supv.	Asst. Supv. or Special Supv.	Oregon
Civil Engineer II	Hwy.Maint.Supt.II,III,IV	Hwy.Foreman I,II,III	-	Pennsylvania
Chief Hwy.Maint.Supv.	Hwy.Maint.Supv.	Road Maint.Foreman	Labor Foreman	Rhode Island
Assoc.Res.Maint.Engr. Res. Maint. Engr.	-	Hwy.Maint.Crew Supv.I-III	-	South Carolina
Res. Maint. Engr.	Hwy. Maint. Supt.	Hwy. Maint. Supv.	Hwy. Maint. Foreman	South Dakota
Dist. Maint. Engr.	Foreman II	Reg. Maint. Supt.	Hwy. Supv.	Tennessee
-	Maint.Const.Supv.I&II Sr. Marine Supv.	Maint.Const.Fore.II & III	-	Texas
-	Maint. Supv.	Hwy. Oper. Foreman	Station Foreman	Utah
-	Hwy. Maint. Gen. Supv.	Br. Maint. Supv. Hwy. Maint. Worker C	Hwy. Maint. Worker B	Vermont
Hwy Res. Engr. A.	Hwy. Res. Maint. Supv.	Hwy. Foreman	-	Virginia
-	Hwy. Supt.	Maint. Supv.	Maint. Lead Tech.	Washington
-	County Maint. Supv.	Asst. County Maint. Supv.	Foreman	West Virginia
-	Asst. Area. Supv.	County Employees	County Employees	Wisconsin
-	Hwy Foreman II	Hwy. Foreman I	-	Wyoming

MAINTENANCE AND TRAFFIC OPERATIONS PERSONNEL TITLES USED BY STATE HIGHWAY DEPARTMENT (as of July 1, 1978)

MAINTENANCE PERSONNEL (cont'd)

State	(10) Laborer	(11) Skilled Craftsmen	(12) Shop Superintendent	(13) Garage or Shop Foreman	(14) Mechanic
Alabama	Laborer	Skilled Craftsman	Div. Equip. Maint. Engr.	Mechanic Foreman	Auto & Heavy Equip. Mech.
Alaska	Laborer	Elec., Painter, Carpenter, et al	Foreman	Inc.In Title #12	Mechanic
Arizona	Laborer, et al	Bldg. Maint. Worker 1, et al	Equip. Services Mgr.	Equip. Shop Foreman & Supv.	Equip. Mechanic 1, et al
Arkansas	Laborers I & II	Carpenter, Welder, Painter, Paint & Body	Dist. Equip. Supv.	Shop Foreman	Mechanic
California	Hwy.Maint.Worker Serv. Asst., et al	Carpenter, Skilled Laborer	Hwy. Equip. Supt. I or II	Hwy.Mech.Supv. I or II	Hwy. Equip. Mech.
Colorado	Utility Worker	-	Sr. Shop Foreman	Asst. Shop Foreman	Auto & Equip.Mech.
Connecticut	DOT Maintainer II	Qualified Craft Worker	Repair Garage Supv.	Crowleader	Qualified Craft Worker
Delaware	Laborer	Labor II	Hwy. Equip. Supt.	Auto Supv.	Auto Mech. I, II, III
Florida	Hwy. Maint., Tech. I or II	Plumber Carpenter	Auto Equip. Repairman Foreman	Auto Equip. Repairman Foreman	Auto Equip. Repair Mech. I & II
Georgia	Laborer	Skilled Laborer DOT	Maint. Shop Mgr. -DOT	Mech. Shop Supv.	Mech., Sr.
Hawaii	Gen. Laborers Trade Helpers	Br. Maint. Workers Carpenters, et al	Auto Mech. Supv.	Auto Mech. II	Auto Mech. I & Machinist
Idaho	Laborer	Maint. Carpenter	-	Shop Foreman	Mechanic
Illinois	-	-	-	-	Auto.Mech.
Indiana	Inc.In Title #16	Mech. II	Hwy. Shop Supv. IV	Inc.In Title #12	Mech. III
Iowa	Custodial Workers Maint. Workers 1 & 2	-	-	-	Auto Mech.
Kansas	-	-	Shop Supt.	Auto Mech. II	Auto Mech. I
Kentucky	Maint. Laborer	Carpenters, Bridgemen, Welders	-	Garage Foreman	Mech. Sr.
Louisiana	Laborer Utility	Welder, Painter, et al	Shop Supt. I & II	-	Mech. I, II, III
Maine	Hwy. Maintenancemen I	Mech. Elec. Carp. & Other Trades	Equip. Supt.	Auto Mech. Foreman	Auto Mech.
Maryland	Hwy. Worker I	Hwy. Worker II	Dist. Equip. Supv.	Auto. Services Supv.	Auto. Services Mech.
Massachusetts	Laborer	-	Supt. Shop & Equip.	Dist. Hwy. Equip. Foreman	Motor Equip. Repairman
Michigan	Laborer I	Br.Worker III, Welder IV, Elec.	Motor Equip. Supt. VII	Auto Mech. VI	Auto Mech. IV
Minnesota	Laborer I & II, et al	Carpenter, Br. Worker, et al	Equip. Fabr. Supt. Hwy. Equip. Supv.	Hwy. Equip. Mech. Foreman	Hwy.Equip.Field Mech., et al
Mississippi	Gen. Laborer I & II	Carpenter Welder	Equip. Maint. Supt.	Shop Foreman II	Equip.Mech. I-V
Missouri	-	-	Dist. Garage Foreman	Chief Shop Mech.	Shop Mech.
Montana	Laborer	Truck Driver Under 5 Ton	Div. Shop Foreman	Working Shop Foreman	Mech.
Nebraska	-	-	Auto Equip. Repair Supt.	Auto Equip. Repair Supv.	Auto Mech. II
Nevada	Hwy.Maint.Laborer	Hwy.Maintainer	Hwy.Equip.Oper.Supv.	Supv.Equip.Mech.II	Equip.Mech.II
New Hampshire	Hwy. Maintainer I	Asst.Hwy.Patrol Foreman	Equip. Engr.	Garage Foreman I & II Garage Sub-Foreman	Hwy.Equip.Mech. Auto Mech.
New Jersey	Maint. Worker I & II	Br.Repair I & II Const. Repair I & II	Master Mech. Supv. Garage Foreman	Foreman Mech. Asst. Foreman Mech.	Mech.
New Mexico	Utility Workers	Maint. Specialist	Auto Shop Foreman	Inc.In Title #12	Hwy.Equip.Special. Auto Mech.
New York	Laborer	Maint. Asst., Br. Repair Asst., et al	Motor Equip.Maint. Supv.	Motor Equip. Maint. Supv. I	Motor Equip.Mech.
North Carolina	Gen. Utility Worker	Landscape Spec. I & II	Equip. Supt.	Mech. Supv. I & II	Mech. II
North Dakota	-	Trades Man Trades Helper	Motor Vehicle Shop Foreman	-	Mech. I & II
Ohio	Hwy. Worker I	Carpenter, Painter, et al	Equip.Supt. 3 -Maint.	Equip. Supt. 2 -Maint.	Auto Mech. I
Oklahoma	Hwy. Maint. Man II	Br. Repairman	Auto Shop Supt.	-	Auto Mech. II & III
Oregon	Laborer	Elec. or Carpenter	Hwy. Shop Supt.	Auto Shop Supv. Hwy. Shop Supv.	Hwy. Equip. Mech.
Pennsylvania	Hwy. Maint. Worker Semi-Skil.Laborer	Welder, Carpenter, Mason & Painter	-	Auto Equip. Foreman	Auto Mech. I & II Diesel Mech.
Rhode Island	-	Semi-Skilled Laborer	Auto.Service Specialist	-	Auto Mech.
South Carolina	Hwy. Maint. Worker I	Hwy. Maint. Worker II-IV	-	Trades Worker Supv.	Trades Worker Auto Mech.
South Dakota	-	Mech. II	Equip. Shop Foreman	-	Mech. I & II
Tennessee	Utility Worker I & II	Elec.,Welder,Carpenter, et al	Reg. Garage Supt.	Dist. Chief Mech.	Mech.
Texas	Maint. Tech. I Marine Tech. I	Maint. Tech. II & III Marine Tech. II & III	Shop Foreman IV	Shop Foreman II & III	-
Utah	Maint. Workers	Mech.,Welder,Auto Body Worker,Carpenter, et al	Shop Supv.	Shops Foreman	Diesel Mech.
Vermont	Hwy. Maint. Worker A	Br. Maint. Mech.	Supt. Central Garage	Motor Shop Supv.	Motor Equip. Mech. B
Virginia	Hwy. Maint. Helper	-	Hwy. Dist. Equip. Supt.	Hwy. Equip. Repair Foreman	Hwy.Equip.Mech. A & B
Washington	Laborer	Hwy. Maint. Specialist	Equip. Supt., Hwy.	Equip. Supv., Hwy.	Equip.Mech. I & II, Hwy.
West Virginia	Laborer	Craftsmen III	Dist. Equip. Supv.	Dist. Equip. Supv.	Mech.
Wisconsin	←				COUNTY EMPLOYEES
Wyoming	Hwy. Maint. Worker I	-	Dist. Equip. Supv.	Shop Foreman I & II	Mech. II

(15)	(16)	(17)	(18)	(19)	
Mechanic Helper	Equipment Operator I	Equipment Operator II	Equipment Operator III	Timekeeper or Clerk	State
Asst. Mechanic	Hwy. Maint. Tech. I	Hwy. Maint. Tech. II	Hwy. Maint. Tech. III	Clerk & Engr. Asst.	Alabama
Ins.In Title #14	Equip. Oper. IV	Equip. Oper. III	Equip. Oper. II	-	Alaska
Auto Service Attend.I, et al	Hwy. Maint. Worker I	Hwy. Maint. Worker II, et al	-	Gen. Office Clerk Typist	Arizona
-	Equip. Oper. I	Equip. Oper. II	Equip. Oper. III	Bookkeeper III	Arkansas
Mech. Helper	Ins.In Title #10	Hwy.Maint.Equip.Oper.	-	Hwy.Field Office Asst.	California
Auto Maint. Man	-	Hwy. Maint. Man	Hwy. Equip. Oper.	-	Colorado
DOT Maintainer 3 & 4	DOT Maintainer 3	DOT Maintainer 4	DOT Maintainer 5	Foreman's Aide	Connecticut
Auto Serviceman	Equip. Oper. I	Equip. Oper. II	Equip. Oper. III	Clark I & II	Delaware
Auto Serviceman	Hwy. Maint. Tech. I, II	Hwy. Equip. Oper. I	Hwy. Equip. Oper. II	Clerk V	Florida
Mechanic	Laborer II	Equip. Oper. I	Maint. Equip. Oper.	Clerk Sr. Maint. Clerk	Georgia
Auto Mech. Helper	Equip. Oper. I	Equip. Oper. II & III	Equip. Oper. IV	Account Clerk IV	Hawaii
Auto Service Worker	Tractor Oper., et al	Trunk Driver et al	Grader Oper., et al		
Mech. Helper	Hwy. Maint. Oper. Trainee	-	Hwy. Maint. Oper.	Maint. Clerk	Idaho
Serviceman	Hwy. Maint. Equip. Oper.	Hwy. Const. Equip. Oper.	Power Shovel Oper.	-	Illinois
Mech. IV	Maint. Worker IV	Maint. Worker III	Maint. Worker II	Clerk VI	Indiana
Auto Mech. Helper	Equip. Oper. 1	Equip. Oper. 2	Equip. Oper. 3	-	Iowa
Auto Mech. Helper	Equip. Oper.I	Equip. Oper. II	Equip. Oper. III	Area Clerk	Kansas
Mech. Helper	Lt. Equip. Oper.	Hwy. Equip. Oper.	Special Equip. Oper.	Timekeeper	Kentucky
Trades Helper, Mech. Apprentice, et al	Equip. Oper. I	Equip. Oper. II	Equip. Oper. III	Clerk II	Louisiana
Laborer I & II	Hwy. Maint.Man II & IIA	Hwy. Maint.Man III	Hwy. Maint. Man IV	-	Maine
Auto Services Helper	Motor Equip. Oper. I	Motor Equip. Oper. II	Motor Equip. Oper. III	Shop Clerk	Maryland
Skilled Laborer Mech. Semiyman	Skilled Laborer	-	Maint. Equip. Oper.	Clerk Tallyman	Massachusetts
Trades Helper II	Laborer II	Equip. Oper. III	Equip. Oper. IV	Calculations Clerk IV	Michigan
Hwy.Equip.Mech.Appr.	Ins.In Title #9	Hwy.Equip. Oper.	Ins.In Title #9	Inc.In Title #8	Minnesota
Auto Service Attend.					
Gen. Labor II	Equip. Oper. I	Equip. Oper. II	Equip. Oper. III	Clerk II	Mississippi
Mech. Helper	Maint. Man	Maint. Crew Leader	Dragline Oper.	Dist. Stock Clerk	Missouri
Service/Comm. B	Equip. Oper. I	Equip. Oper. II	-	Admin. Officer I	Montana
Auto Mech. I	Hwy. Maint. Worker	-	Sr. Hwy. Maint. Worker	Office Clerk II	Nebraska
-	-	-	Maint. Spec. Roadway	Hwy. Dist. Office Mgr.	Nevada
Trades Helper	Hwy. Maintainer II	Hwy. Maintainer III	-	Asst. Clerk III Clerk IV	New Hampshire
Mech. Helper	Trunk Driver	Equip. Oper.	Hwy. Equip. Oper.	-	New Jersey
-	Equip. Oper. I	Equip. Oper. II	Equip. Oper. III	Timekeeper	New Mexico
Asst. Mech.	Hwy. Equip. Oper.	Const. Equip. Oper.	Crane & Shovel Oper.	Sr.Clerk T.M-Typist	New York
Mech. I	Mech. Oper. I	Mech. Oper. II	Mech. Oper. III,IV,V	Hwy.Reports & Inv. Clerk II & III	North Carolina
Ins.In Title #14	Equip. Oper. I	Equip. Oper. II	Ins.In Title #9	Clerk III	North Dakota
Asst. Auto Mech.	Equip. Oper. 1	Equip. Oper. 2	Equip. Oper. 3	Timekeeper	Ohio
Auto Mech. I	Equip. Oper. I	Equip. Oper. II	Equip. Oper. III	Hwy. Field Clerk	Oklahoma
Hwy.Equip.Mech. Trainee	Hwy. Maint. Worker	Sr. Hwy. Maint. Worker	Hwy. Maint. Spec.	Ins.In Title #16	Oregon
Tradesman Helper	Equip. Oper. I & II	Equip. Oper. III	Equip. Oper. IV	Clerk II	Pennsylvania
Auto Mech. Helper	Motor Equip. Oper.	Utility Motor Equip. Oper.	Hwy. Motor Equip. Oper.	Sr. Clerk Steno	Rhode Island
Trades Helper	Ins. In Title #11	Inc.In Title #11	Inc.In Title #11	Clerk I-III	South Carolina
Equip.Service Worker I & II	Hwy. Maint. Worker I	Hwy. Maint. Worker II	Hwy. Maint. Worker III	Chief Clerk Admin.Serv.Asst. Office Supv.	South Dakota
-	Dist. Hwy. Equip. Oper.	Reg. Hwy. Equip. Oper.	-	Jr. Asst. Clerk	Tennessee
-	-	-	-	-	Texas
Auto Serviceman	Hwy. Oper. Spec.	Hwy. Oper. Spec.	Hwy. Oper. Spec.	-	Utah
-	Ins.In Title #10	Equip. Oper. B	Equip. Oper. C	Storekeeper	Vermont
Hwy Equip.Mech.Helper	Hwy.Equip.Oper.A	Hwy.Equip.Oper.B	Hwy.Equip.Oper.C	Hwy.Timekeeper	Virginia
Shop Asst. Hwy.	Maint. Tech. I	Maint. Tech. II	Maint. Tech. III	Maint.Div.Office Asst.	Washington
-	Equip.Oper.I	Equip.Oper.II	Equip.Oper.III	Field Clerk	West Virginia
					Wisconsin
Mech. I	Hwy. Maint. Worker II	Lt. Equip. Oper.	Hwy. Equip. Oper.	-	Wyoming

MAINTENANCE AND TRAFFIC OPERATIONS PERSONNEL TITLES USED BY STATE HIGHWAY DEPARTMENTS (as of July 1, 1978)

TRAFFIC OPERATIONS PERSONNEL

State	(20) State Traffic Engineer	(21) Assistant State Traffic Engineer	(22) State Traffic Maintenance Engineer	(23) District Traffic Engineer	(24) Assistant District Traffic Engineer
Alabama	Asst.State Maint.Engr. (Traf.)	Traf. Engr. Admin. Asst.	-	Div. Traf. Engr.	
Alaska	Inc.In Title #3	-	-	Reg. Traf. Engr.	Asst. Reg. Traf. Engr.
Arizona	Asst.State Engr. Traf.	Traf. Engr. - Oper. Traf. Engr. - Design	-	Dist. Traf. Engr. Dist. Traf. Supv.	-
Arkansas	Civil Engr. VII	Civil Engr. VI	-	-	-
California	Chief,Div.of Oper.	Chief,Traf.Engr. Chief,Trans.Oper.	-	Chief, Branch	Asst. Dist. Traf. Engr.
Colorado	Staff Traf. Engr.	Asst. Staff Traf.Engr.	-	Traf. & Safety Engr.	-
Connecticut	Mgr. of Traf.	Chief Traf. Engr.	Trans. Engr. of Traf.	Trans. Asst. Engr.	Dist. Serv. Agent II
Delaware	Chief,Bureau of Traf.	-	-	Dist. Traf. Engr.	Asst. Dist. Traf. Engr.
Florida	State Traf.Oper.Engr.	Dep.State Traf.Oper. Engr.	State Traf.Services Engr.	Dist.Traf.Oper.Engr.	Asst.Dist.Traf.Oper. Engr.
Georgia	State Traf.& Safety Engr.	Asst.State Traf.& Safety Engr.	-	Dist.Traf.& Safety Engr.	Trans. Engr. I
Hawaii	Traf. Engr.	Asst. Traf. Engr.	-	-	-
Idaho	Traf.Supv. Engr.Mgr. 2	Asst.Traf.Engr. Engr.Mgr. 1	-	Dist. Traf. Engr. Engr. Proj. Supv.	-
Illinois	Engr. of Traf.	Traf. Oper. Engr.	-	Dist. Traf. Engr.	Oper. Engr
Indiana	Chief,Div.of Traf.	Asst.Chief,Div.of Traf.	Hwy.Engr.Supv. IV	Dist.Traf.Engr.	Asst.Dist.Traf.Engr.
Iowa	-	-	State Traf.Maint.Engr.	-	-
Kansas	Hwy.Marking Engr.	-	-	-	-
Kentucky	Dir.,Div.of Traf.	Asst.Dir.of Traf.	Chief Traf.Engr.	Dist.Traf.Engr.	Asst.Dist.Traf.Engr.
Louisiana	Traf.& Planning Engr.	Asst.Traf.& Planning Engr.	-	Dist. Traf. Engr.	-
Maine	Engr. of Traf.	Asst.Engr. of Traf.	-	Div.Traf.Engr.	-
Maryland	Asst.Chief Engr.-Traf.	Asst.Chief-Traf.Div.	Chief-Bureau of Traf. Oper.	Reg. Traf. Engr.	Traf. Engr. IV
Massachusetts	Traf. Engr.	Asst. Traf. Engr.	Traf. Maint. Engr.	Dist. Traf. Engr.	Asst.Dist.Traf.Engr.
Michigan	Engr.of Traf.& Safety	Asst.Engr.of Traf. & Safety	Field Admin.Engr.	Dist. Traf.& Safety Engr.	Asst.Dist.Traf.& Safety Engr.
Minnesota	Traf. Engr.	Asst. Traf. Engr.	Inc.In Title #20	Dist. Traf. Engr.	-
Mississippi	Traf.Control & Safety Engr.	Asst.Traf.Control & Safety Engr.	-	-	-
Missouri	Inc.In Title #1	Asst.Div.Engr.-Traf.	-	Traf. Engr.	Dist.Traf.Studies Engr.
Montana	Mgr. Traf. Unit	Asst. Mgr. Traf. Unit	-	Engr. -Traf.	-
Nebraska	Traf. Engr.	-	-	-	-
Nevada	Chief Traf. Engr.	Hwy.Engr.IV Traf.	-	Hwy.Engr.II Traf.	-
New Hampshire	Traf. Engr.	Traf. Const. Engr.	-	-	-
New Jersey	Chief Engr.Transp.Oper. & Local Aids	Chief,Bureau of Elec.Oper.	Supv.Elec.,Const. Maint. & Oper.	Dist.Supv.Elec.Prin. Engr.	Asst.Dist.Supv. Elec.Sr.Engr.
New Mexico	Traf. Services Engr.	Asst.Traf.Services Engr.	-	Dist. Traf. Engr.	-
New York	Dir.,Traf.& Safety Div.	Chief,Safety Std.Sys.Bur.	-	Reg. Traf. Engr.	-
North Carolina	Mgr. of Traf. Engr	Asst.Mgr. of Traf. Engr.	Inc.In Title #20	Div. Traf. Engr.	-
North Dakota	Traf. Engr.	-	-	-	-
Ohio	Engr. of Traf.	Asst. Traf. Engr.	-	Dist. Traf. Engr.	Asst. Dist. Traf. Engr.
Oklahoma	Chief Traf. Engr.	Asst.Chief Traf.Engr.	-	Div. Traf. Engr.	-
Oregon	Inc.In Title #3	-	-	Inc.In Title #5	-
Pennsylvania	Civil Engr. VI	Civil Engr. IV	Civil Engr. V	Civil Engr.IV,Traf. Cntl.Spec.III	Civ.Engr.III,Traf. Cntl.Spec.II
Rhode Island	-	-	Chief Hwy.Maint.Supv.-Traf.	-	-
South Carolina	Traf.& Plan Engr.	Asst. Traf. & Plan. Engr.	-	Dist. Traf. & Plan. Engr	-
South Dakota	Traf. Engr.	Traf Oper. Engr. Traf. Design Engr	Proj. Engr. Engr. I	Dist. Traf. Engr.	-
Tennessee	State Traf. Engr.	Asst.State Traf. Engr.	Reg. Traf. Engr.	-	-
Texas	-	-	-	Inc.In Title #4 & 5	-
Utah	Engr. for Safety	Traf. Engr.	Traf.Oper.Engr.	Traf. Engr.	-
Vermont	-	-	-	-	-
Virginia	State Hwy.Traf.Safety Engr.	State Hwy.Asst.Traf. Safety Engr.	-	Hwy.Dist.Traf.Engr.	Hwy.Traf.Engr.A
Washington	Traf. Engr.	-	-	Dist. Traf. Engr.	Hwy. Engr. 3
West Virginia	Dir.Traf.Engr.Div.	Asst.Dir.Traf.Engr.Div.	-	Reg. Traf. Engr.	Asst.Reg.Traf.Engr.
Wisconsin	Chief Traf.Engr.CE7	Traf.Engr.Supv.CE 7 & 6	-	Dist.Chief CE 7 Traf.Engr.CE 5	Dist.Chief Traf. Supv.CE5
Wyoming	State Traf.Engr.Oper.	Hwy.Traf.Signal Oper.Supv.	-	-	-

(25) Traffic Supervisor	(26) Sign Supervisor	(27) Sign Shop Foreman	(28) Traffic Signal & Lighting Foreman	(29) Striper Foreman	State
-	Sign Shop Supv.	Sign Fab. Plant Mgr.	Signal Shop Supv.	-	Alabama
Ins.In Title #13	Ins.In Title #13	Ins.In Title #13	Ins.In Title #13	Maint. Foreman	Alaska
Hwy. Marking Crew Supv.	Hwy.Maint.Crew Supv.	Hwy.Marking Crew Supv.	Traf.Signal Supv.,et al	Hwy.Maint.Worker III	Arizona
-	Admin. Officer III	Admin. Officer I	-	Job Supt.	Arkansas
-	Hwy. Maint. Supv.	Ins.In Title #8	Hwy. Elec. Supv.	Hwy. Maint. Supv.	California
Traf. Foreman	-	Traf. Shop Foreman	Traf. Signal Tech. Foreman	-	Colorado
Ins.In Title #13	Signs & Markings Coord.	Supt. Portland Plant	Dist. Elec. Supv.	Gen. Supv.	Connecticut
Oper. Mgr.	-	Sign Shop Foreman	-	-	Delaware
-	-	Sign Shop Supv.	-	Hwy. Foreman II	Florida
-	Chief of Sign Shop Oper.	Sign Shop Prod. Mgr.	Elec. Signal Engr.	Hwy. Maint. Foreman II	Georgia
-	Traf.Signs & Marking Supv.	-	Traf.Sig.& Hwy.Lighting	Traf.Marking Supv.	Hawaii
-	-	Sign Shop Supv.	Traffic Signal Supt.	Transp. Maint. Foreman	Idaho
Traf.Field Engr. Oper. Tech.	Ins.In Title #13	Sign Shop Foreman	-	Lead Worker,Permanent Marking Foreman	Illinois
-	Engr. Assc. V-IV	Maint. Worker II	Elec.Tech.Supv.IV-III	Maint. Worker II	Indiana
Traf.Control Engr.	Traf.Sig.& Marking Engr.	Sign Shop Supv.	Traf. Sig. Tech. 2	Hwy. Maint. Supv. 2	Iowa
-	-	Sign Shop Worker Supv.	-	Striper Supv.	Kansas
Dist.Traf. Supv.	Traf. Foreman	Sign Painter	Traf. Sig. Inst. (Jr-Pr)	Striper Foreman	Kentucky
Sign & Traf. Supt.	Sign Foreman	Shop Sign Foreman	Elec. Foreman	Striping Gang Foreman	Louisiana
-	-	Sign Shop Foreman	Elec. Foreman	Hwy. Foreman	Maine
Traf. Engr. III	Chief,Sign Design Section	Traf. Sign Shop Supv.	Traf. Sig. Tech.	Supv. Hwy. Markings	Maryland
Hwy.Traf.Maint. Foreman	Supv.of Traf.Equip Traf.Sect.Foreman	Sign Shop Foreman	Traf. Elec. Foreman	Traf. Sect. Foreman	Massachusetts
Sign Supv.VIII	Sign Supv. VII	Sign Supv. V	Elec. 12	Sign Mech. IV	Michigan
Traf. Oper. Coord.	Signing Supv. Sign Supv.	Ins.In Title #8	Elec. Traf. Maint. Supv.	Ins.In Title #13	Minnesota
-	-	Hwy.Maint. Supv. II	Hwy. Maint. Supt.	Foreman,Hwy.Maint.II	Mississippi
-	-	Sign Shop Foreman	Signal & Lighting Foreman	Ins.In Title #8	Missouri
-	-	Painter Foreman	-	-	Montana
-	Sign Shop Supt.	Sign Shop Supv.	Communications Mgr.	Ins.In Title #8	Nebraska
-	Sign Shop Supv.	-	-	Hwy. Maint. Foreman	Nevada
Traf.Maint. Supv.	-	Sign Shop Foreman	Traf. Signal Foreman	Permanent Marking Foreman	New Hampshire
-	Supv. of Hwy. Marking	Foreman Sign Shop	Foreman Elec. Oper.	Foreman Hwy. Marking	New Jersey
Traf. Supv.	-	Sign Shop Foreman	Traf. Elec. Supv.	Ins.In Title #8	New Mexico
Engr.in Charge of Crews	Sign Shop Supv. II	Sign Shop Supv. I	Supv. Elec.	Laborer Supv.	New York
Traf. Services Supv.	Traf. Services Crew Leader	Ins.In Title #26	Traf.Control Tech. II	Traf.Services Crew Leader	North Carolina
-	-	Sign Shop Foreman	-	-	North Dakota
Traf.Control Supt.	Sign Supv.	Sign Supv. 2	Sig. Elec. Supv. 2	Maintenance 2	Ohio
Traf. Supt.	-	-	-	Traf. Marking Foreman	Oklahoma
Ins.In Title #5	-	Sign Shop Supt.	Elec. Supt.	Striping Crew Supv.	Oregon
-	Traf. Control Spec. I	Sign Shop Foreman	Civil Engr. II Traf. Control Spec. I	Hwy. Foreman II	Pennsylvania
Hwy.Maint.Supv. Traf.	-	-	Elec. Foreman	Traf. Line Painter Foreman	Rhode Island
-	-	Hwy.Maint.Crew Supv. I-III	Trades Worker Supv.	Hwy.Maint.Crew Supv. I-III	South Carolina
-	Sign Supv.	Sign Shop Foreman	-	Hwy.Maint.Worker II & III	South Dakota
Signing & Marking Coord.	Hwy. Marking Supt.	-	-	-	Tennessee
-	Sign Supv.	-	-	-	Texas
Signal Supt.	-	-	-	-	Utah
-	Traf. Shop	Supv.	Traf. Sig. Supv.	Worker Crew Leader B	Vermont
Hwy.Traf.Tech. Supv.	Hwy. Foreman	Hwy. Foreman	Hwy.Equip.Elec.Foreman A & B	Hwy. Foreman	Virginia
-	-	-	Traf. Sig. Supv.	-	Washington
-	-	Traf. Tech. III	Elec. Tech. IV	Sign Shop Supv.	West Virginia
Dist.Traf.ET 4 Supv.ET 3	Marking & Signing Supv. ET 4	Marking & Signing Coord. ET 4 & 3	Elec. Supv. ET 4	Marking ET 2 Crew Chief ET 1	Wisconsin
-	-	Sign Shop Supv.	Hwy. Engr.	Hwy. Striping Foreman	Wyoming

MAINTENANCE AND TRAFFIC OPERATIONS PERSONNEL TITLES USED BY STATE HIGHWAY DEPARTMENT (as of July 1, 1970)

TRAFFIC OPERATIONS PERSONNEL (cont'd)

State	(30) Sign Erection Foreman	(31) Sign Fabricator	(32) Sign Technician	(33) Traffic Signal & Lighting Technician
Alabama	-	Sign Painter	Maint. Tech. (Utility Laborer)	Traf. Sig. Tech.
Alaska	Inc.In Title #29	Inc.In Title #33	Inc.In Title #33	Equip.Tech.Elec., or el
Arizona	Hwy.Maint.Worker III	Hwy.Sign Fab.	Hwy.Sign Technician	Traf.Sig.& Lighting Tech.
Arkansas	Job Supt.	Signmen I & II	Sign Supv.	-
California	Inc.In Title #27	Inc.In Title #27	-	Hwy.Elec. I or II
Colorado	-	Sign Fab.	-	Traf. Sig. Tech. I & II
Connecticut	Signs & Marking	GGN & BOT Grade 3	-	Elec. Tech.
Delaware	Dist.Sign & Markings Supv.	Sign Fab. I & II	Trades Helper	Traf.Sig. Rep.
Florida	Hwy. Foreman I	Sign Shop Foreman	Sign Tech.	Instrument Tech. I & II Engr. Tech. IV
Georgia	Hwy. Maint. Foreman II	BOT Skilled Laborer	BOT Skilled Laborer	Traf. Sig. Tech.
Hawaii	-	Sign Painter & Painter	-	Hwy. Lighting Worker & Elec.
Idaho	Transp.Maint. Foreman	Hwy. Sign Fab.	-	Traf. Sig. Tech.
Illinois	Inc.In Title #29	Sign Painter	Inc.In Title #29	Traf.Sig.Engr. or Tech.
Indiana	Maint. Worker III	Silk Screen Oper. Inc.In Title #30	Maint. Worker IV	Elec. Tech. I & II
Iowa	-	Sign Shop Worker	-	Traf. Sig. Tech. I
Kansas	-	Sign Shop Worker	-	-
Kentucky	Inc.In Title #36	Inc.In Title #27	Lt.Equip.Oper.& Laborers -Hwy.	Elec. Tech. I-V
Louisiana	Statewide Sign Foreman	-	Statewide Sign Tradesman	Statewide Sig. Tradesman
Maine	Hwy. Maint. Man IV	Sign Painter	Sign Shop Tech.	Traf.Sig. & Lt. Tech.
Maryland	Supv.-Road Maint.	Sign Fab. III	-	Traf. Control Elec. II
Massachusetts	Traf. Sect. Foreman	Sign Painter Letterer	Sign Shop Foreman (Fab) Traf.Sect.Foreman	Traf. Elec.
Michigan	Sign Mech. III	Sign Mech. II & III	Sign Mech. III	Elec. III,IV & V
Minnesota	Inc.In Title #6	Inc.In Title #9	Inc.In Title #36	Hwy.Signal & Elec. Tech.
Mississippi	Hwy. Maint. Supt. II	Silk Screen Painter	-	Elec. Equip. Tech. II
Missouri	Inc.In Title #8	Silk Screen Oper.	Sign Painter	Sig. Elec.
Montana	-	Painter	-	Traf. Engr. III,Engineer I & II, Design Tech.
Nebraska	-	Sign Painter	Inc.In Title #27	Elec. Tech.
Nevada	Hwy. Maint. Foreman	Sign Painter	Silk Screen Oper.	-
New Hampshire	Dist.Sign Supv. Hwy.Sign Maint. Foreman	Sign Fab. Sign Letterer	Trades Helper	Traf. Sig. Technicians I & II
New Jersey	Inc.In Title #29	Sign Fab.	Hwy. Worker	Elec. Mech. I
New Mexico	Inc.In Title #6	Sign Tech. I & II	-	Traf. Elec. Tech.I,II,III
New York	Laborer Supv.	Sign Shop Worker	-	Elec. Maint. Asst. Elec.
North Carolina	Traf. Sign Erector	-	Gen. Utility Worker	Traf. Control Tech. I
North Dakota	-	Sign Fab.	-	-
Ohio	Routeman 2	Sign Metal Worker Sign Worker 2	Routeman 2	Sig. Elec. I
Oklahoma	Sign Foreman	Sign Maker I & II	-	-
Oregon	Sign Crew Supv.	Inc.In Titles #16 & 17	-	Inc.In Title #11
Pennsylvania	Hwy. Foreman III	Sign Tech. II	Sign Tech. I or II	Civil Engr. II Traf. Control Spec. I
Rhode Island	-	Sign Painter	-	Elec. Equip. Mech.
South Carolina	Inc.In Title #6	Inc.In Titles #10 & 11	-	Elec. Trades Helper
South Dakota	Hwy. Maint. Foreman Hwy. Maint. Worker III	Traf. Sign Fab. II	-	-
Tennessee	-	-	-	-
Texas	-	-	-	-
Utah	-	-	-	-
Vermont	Sign Crew Leader	Sign Painter	Inc.In Title #26	Inc.In Title #28
Virginia	Hwy. Foreman	Hwy. Sign Fab.	-	Hwy. Equip. Elec.
Washington	-	Dist. Sign Fab., Hwy.	Sign Installation Tech.	Traf. Sig. Tech.
West Virginia	Traf. Tech. III	-	-	Elec. Tech. II & III
Wisconsin	Signing Crew Chief HT 1	HT2,HT1,SA2	Sign Tech. HT1,SA2	Elec.
Wyoming	Dist. Sign Foreman	-	-	-

(34)	OTHER RELATED PERSONNEL (35)	(36)	
Striper Technician	Chief Engineer	Project Engineer	State
-	Admin. Engr.	Civil Engr. I, II, III	Alabama
Equip. Oper. & Laborers	-	-	Alaska
Hwy.Maint.Worker II	State Hwy Engr.	Res. Engr. or Chief Proj. Engr.	Arizona
Signman II	Deputy Dir. & Chief Engr.	Civil Engr. IV & V	Arkansas
Hwy. Maint. Landworker	Chief Engr.	Res. Engr.	California
Hwy. Equip. Oper. -	Chief Engr.	Res. Engr.	Colorado
DOT Maintenance 3,4,& 5	Chief Engr.	-	Connecticut
-	Chief Engr.	-	Delaware
Hwy. Maint. Foreman I	-	-	Florida
Maint. Equip. Oper.	Asst.State Hwy. Engr.	Proj. Engr.	Georgia
Traf. Striping Mech. Oper.	Chief,Land Transp.Fac.Div.	Area Engr.	Hawaii
Hwy. Maint. Oper.	State Hwy. Engr.	Proj.Engr. Engr.Proj.Coord.	Idaho
Lan.In Title #19	Dir. of Hwy.	Proj.Engr. Res.Const.Engr.	Illinois
Lan.In Title #32	Chief,Hwy.Engr.	Proj.Engr.	Indiana
Equip. Oper. 2 & 3	Chief Engr.Hwy.Div.	Res.Const.Engr.	Iowa
-	State Transp.Engr.	Res.Engr.	Kansas
Hwy. Equip. Oper.	State Hwy. Engr.	Res.Const.Engr.	Kentucky
Striping Mech. Oper.	Chief Engr.	Proj. Engr.	Louisiana
Striper Tech.	-	-	Maine
Mower Equip. Oper. II	Chief Engr.	Proj. Engr.	MaryLand
Spray Painter Working Foreman Sign Mech. III	Chief Engr.	Sr. Civil Engr.	Massachusetts
	-	-	Michigan
Lan.In Title #9	Dep.Comm.Bureau of Oper.	-	Minnesota
Equip. Oper. II	Chief Engr.	Proj. Engr.	Mississippi
Lan.In Title #17	Chief Engr.	Res. Engr.	Missouri
-	Dir. of Hwys.	-	Montana
Lan. In Title #8	Dep. State Engr.	Hwy. Proj. Mgr.	Nebraska
Maint. Spec. Striping & Sign	State Hwy. Engr.	Hwy. Engr. III	Nevada
Carriage Oper. Trades Helper	Dep.Comm.& Chief Engr.	Proj. Engr.	New Hampshire
Lan.In Title #32	Dir. of Engr. & Oper.	Proj. Engr.	New Jersey
Lan.In Title #8	Chief Hwy. Admin.	-	New Mexico
Const. Equip. Oper.	Chief Engr.	Sr. Civil Engr.	New York
-	Chief Engr.	Res. Engr.	North Carolina
Equip. Oper. I	Chief Engr.	Proj. Engr. Sr. Engr.	North Dakota
Roadmaster I	-	Proj. Engr. 2	Ohio
-	Asst. Dir. Traf. Services	Res. Engr.	Oklahoma
Lan.In Titles #16 & 17	Asst. Dir.-ODOT Oper.	Res. Engr.	Oregon
Equip. Oper. I, II, III	Chief Hwy. Engr.	Civil Engr. II or III T.C. Mgr. I or II	Pennsylvania
Traf. Line Painter	-	-	Rhode Island
Lan.In Titles 10 & 11	State Hwy. Engr.	Assoc. Res. Const. Engr. Res. Const. Engr.	South Carolina
-	Dir. & State Hwy. Engr.	Res. Engr.	South Dakota
-	Dir., Bureau of Hwy.	Engr. 2	Tennessee
-	Engr. - Dir.	Engr. IV & V	Texas
-	Asst. Dir. UDOT	-	Utah
Marker Crew Leader A	Dir. of Engr. & Const.	Res. Engr.	Vermont
-	Hwy. Chief Engr.	Hwy. Const. Proj. Engr.	Virginia
-	Dep. Secretary	Proj. Engr.	Washington
Center Line Paint Mech. Oper.	State Hwy. Engr.	-	West Virginia
Marking Tech. ZT1,ZA2	-	Proj. Engr	Wisconsin
Striper Tech. I & II	Supt. & Chief Engr.	Res. Engr.	Wyoming

MONTHLY SALARIES OF HIGHWAY PERSONNEL (as of July 1, 1978)

MAINTENANCE PERSONNEL

State	(1) State Maintenance Engineer No.	Min	Max	Avgr	(2) Assistant State Maintenance Engineer No.	Min	Max	Avgr	(3) District Engineer No	Min	Max	Avgr	(4) District Maintenance Engineer No	Min	Max	Avgr	(5) Assistant District Maintenance Engineer No.	Min	Max	Avgr
Alabama	1	2022	2680	2680	3	1397	2219	1979	9	1864	2470	2613	9	1157	2219	1777	9	870	1286	1159
Alaska	1	3708	5163	3982	1	3104	4448	3678	5	3367	4086	3600	5	2821	3930	3300	6	2434	3392	3200
Arizona	1	2175	2933	2776	1	1986	2612	2444	7	2175	2933	2988	7	1398	2250	2023	-	-	-	-
Arkansas	1	1631	2375	2375	1	1404	2065	2065	10	1555	2266	2266	10	1178	1711	1711	10	1207	1495	1495
California	1	2559	3310	3009	2	2374	2870	2608	11	2376	3310	2737	11	1876	2608	2490	33	1556	2365	2160
Colorado	1	2294	3073	3073	-	-	-	-	7	2344	3141	3141	9	1982	2655	2655	9	1722	2294	2294
Connecticut	1	2012	2475	2243	1	1835	2231	2033	4	1835	2231	2033	-	-	-	-	6	1409	1861	1669
Delaware	1	1794	2504	2434	-	-	-	-	3	1971	2745	2606	-	-	-	-	2	1641	2276	2067
Florida	1	1840	2493	2357	1	1724	2338	2372	5	1962	2650	2659	5	1616	2190	2242	5	1423	1927	1791
Georgia	1.	1831	2733	2498	2	1331	2286	2109	7	1831	2733	2498	7	1442	2071	1940	7	1283	1915	1805
Hawaii	1	1797	2833	2803	1	1715	2736	2736	6	1715	2096	2723	1	1361	2494	2276	-	-	-	-
Idaho	2	2089	2968	2585	1	1652	2461	2089	6	2009	2968	2563	6	1499	2234	1831	-	-	-	-
Illinois	1	2465	3355	2985	3	1850	3058	2300	9	2465	3635	2946	9	1860	2800	2330	-	-	-	-
Indiana	1	2067	2762	2630	1	1811	2390	2390	6	1811	2390	2134	6	1670	2275	2126	6	1540	1974	1657
Iowa	1	1863	2622	2360	1	1692	2377	2377	6	1775	2580	2459	6	1535	2158	2138	-	-	-	-
Kansas	1	2090	3046	2635	1	1775	2636	2428	6	2030	3044	2645	6	1775	2636	2431	1	1563	2321	1962
Kentucky	1	1882	2915	2333	5	1707	2776	2399	12	1882	2915	2582	12	1549	2538	2277	23	1406	2285	1782
Louisiana	1	1611	2487	2181	6	1313	2294	1794	10	1611	2487	2183	18	1500	2296	2107	4	1313	1936	1939
Maine	1	1627	2167	2167	1	1436	1980	1980	7	1142	1517	1379	-	-	-	-	-	-	-	-
Maryland	1	1962	2532	2492	1	1665	2100	2100	7	1943	2758	2635	7	1542	2025	2005	-	-	-	-
Massachusetts	1	1936	2632	-	2	1784	2243	-	8	1936	2432	-	8	1646	2089	-	8	1422	1779	-
Michigan	1	2434	2973	2783	1	2025	2531	2278	9	2025	2531	2278	9	1894	2368	2131	5	1653	2080	1861
Minnesota	1	2085	2840	2467	3	1792	2434	2037	9	2085	2840	2741	16	1953	2528	2435	4	1792	2434	2268
Mississippi	1	1675	2870	2335	-	1515	2420	-	6	1675	2870	2520	5	1515	2420	2209	6	1373	2195	1886
Missouri	1	2225	2833	2670	1	1767	2239	2239	10	2090	2593	2487	10	1511	2071	2061	18	1329	1826	1744
Montana	1	1970	2349	2340	1	1520	1867	1582	-	-	-	-	11	1649	2013	1735	-	-	-	-
Nebraska	1	1697	2367	2085	1	1419	1970	1726	8	1697	2367	1886	8	1338	1856	1488	-	-	-	-
Nevada	1	1842	2562	2562	1	1679	2330	2330	6	1842	2562	2562	-	-	-	-	6	1679	2330	2330
New Hampshire	1	1702	2094	2094	1	1491	1834	1034	7	2491	1834	1834	-	-	-	-	7	1240	1519	1519
New Jersey	1	2639	3562	3109	1	1969	2650	2314	4	2280	3077	2679	4	1969	2650	2314	4	1620	2187	1986
New Mexico	1	-	-	-	-	-	-	-	5	1806	2467	2344	5	1637	2308	2198	-	-	-	-
New York	1	3440	3885	3761	1	2803	3188	3080	10	3268	3669	3536	9	2093	2867	2737	40	1353	1915	1789
North Carolina	1	2051	2864	2864	1	1864	2603	2603	14	1864	2063	2543	14	1617	2255	2200	35	1406	1956	1911
North Dakota	1	1968	2637	2470	1	1700	2277	2200	8	1968	2637	2366	6	1700	2277	2144	-	-	-	-
Ohio	1	1937	2466	2466	-	-	-	-	12	1903	2553	2200	12	1324	1680	1500	12	1205	1456	1350
Oklahoma	1	1730	2700	2600	1	1575	2500	1730	8	1730	2700	2200	8	1575	2500	2000	8	1305	2100	1575
Oregon	1	-	-	-	-	-	-	-	5	2120	2706	2655	-	-	-	-	4	1830	2337	2300
Pennsylvania	1	2378	2916	2725	2	1902	2489	2173	11	2489	3125	2856	11	1821	2378	2082	22	1397	1821	1586
Rhode Island	1	1816	2208	2208	-	-	-	-	1	1273	1725	1725	-	-	-	-	-	-	-	-
South Carolina	1	1803	2578	2436	2	1560	2218	2111	7	1560	2210	2111	7	1367	1944	1851	-	-	-	-
South Dakota	1	1685	2647	2095	1	1425	2215	1868	5	1330	2426	1988	5	1425	2215	1787	-	-	-	-
Tennessee	1	1636	2370	2158	1	1492	2158	1792	6	1636	2370	2262	4	1363	1967	1793	8	1308	1722	1508
Texas	1	2538	2530	2538	-	-	-	-	5 21	2558 2516	2558 2516	2558 2516	23	2170	2434	2320	16	1574	1999	1782
Utah	1	2236	3265	2945	-	-	-	-	6	1999	2918	2697	5	1466	2306	2051	-	-	-	-
Vermont	1	1891	2984	-	1	1510	2362	-	-	-	-	-	9	1510	2362	-	9	1282	1842	-
Virginia	1	1864	2441	2441	2	1491	1950	1950	8	1708	2233	2233	15	1491	1950	1950	-	-	-	-
Washington	1	2504	3196	2829	1	2272	2899	2566	6	2629	3357	2971	6	2060	2629	2328	6	1820	2213	2057
West Virginia	1	2263	3523	2629	1	1869	3043	2060	10	1614	2629	2144	10	1464	2385	1812	-	-	-	-
Wisconsin	1	2616	3382	3136	4	2034	2848	2580	9	2416	3382	2900	9	2004	2848	2475	30	1712	2398	2040
Wyoming	1	2169	2905	2390	-	-	-	-	5	2169	2905	2390	5	1874	2520	2169	-	-	-	-
1978 Average			2824	2601			2463	2245			2709	2497			2350	2131			2060	1877
1944 Average			434				341				-				292				264	
% increase 1944-78			551				622				-				705				673	
% increase 1977-78			7.6				9.2				5.7				8.0				5.6	

(6) Residenc Maintenance Engineer				(7) Area Supervisor				(8) Gang Foreman				(9) Sectionman				(10) Laborer				
No.	Min.	Max.	Aver.	No.	Min.	Max.	Aver.	No.	Min.	Max.	Aver.	No.	Min.	Max.	Aver.	No.	Min.	Max.	Aver	State
48	1397	1783	1590	46	929	1191	1092	19	725	899	856	11	606	749	731	270	522	656	561	Alabama
15	2434	3392	3200	-	-	-	-	35	1898	2232	2100	-	-	-	-	30	1288	1981	1750	Alaska
-	-	-	-	46	1190	1565	1500	-	-	-	-	46	1030	1318	1318	23	708	895	797	Arizona
-	-	-	-	86	951	1382	1382	46	951	1382	1382	126	682	980	984	198	465	680	497	Arkansas
-	-	-	-	74	1630	1967	1967	475	1180	1485	1418	679	1076	1352	1294	648	692	1076	983	California
-	-	-	-	38	1532	2081	2010	16	1361	1798	1750	379	1158	1552	1525	10	784	1050	952	Colorado
-	-	-	-	29	1208	1441	1324	59	1094	1317	1285	150	903	1102	1082	374	720	868	784	Connecticut
3	1348	1835	1550	4	1131	1542	1353	13	967	1295	1288	88	637	984	859	-	-	-	-	Delaware
22	1186	1694	1639	105	842	1110	978	188	734	991	874	286	718	980	829	1999	589	760	675	Florida
																	650	863	747	
45	1177	1751	1618	-	-	-	-	238	861	1228	998	-	-	-	-	612	557	736	634	Georgia
-	-	-	-	4	1634	2189	1750	19	1086	1533	1255	16	687	1494	918	92	633	873	696	Hawaii
-	-	-	-	50	1118	1652	1350	-	-	-	-	44	576	1295	1088	-	565	835	-	Idaho
-	-	-	-	39	1450	2180	1950	286	-	-	1275	1793	-	-	1225	-	-	-	-	Illinois
18	1365	1760	1478	37	1208	1540	1305	39	1018	1310	1059	144	869	1188	1060	-	-	-	-	Indiana
24	1417	1957	1910	2	1153	1536	1498	125	1069	1460	1278	23	955	1296	1086	7	689	988	856	Iowa
-	-	-	-	35	976	1476	1405	44	847	1282	1219	115	847	1282	1219	-	-	-	-	Kansas
-	-	-	-	44	782	1274	998	211	710	1155	862	133	643	1048	782	928	637	745	556	Kentucky
-	-	-	-	63	720	1111	1057	288	567	1085	923	-	-	-	-	517	589	737	566	Louisiana
-	-	-	-	20	1035	1372	1308	169	786	1037	966	53	603	796	693	332	587	663	579	Maine
23	1328	1745	1734	34	1063	1396	1360	184	886	1048	1042	-	-	-	-	176	536	710	571	Maryland
-	-	-	-	32	1036	1271	-	96	987	1111	-	93	830	996	-	525	705	883	-	Massachusetts
-	-	-	-	13	1386	1870	1528	45	1294	1543	1419	56	1153	1320	1236	39	852	1035	963	Michigan
-	-	-	-	35	1272	1933	1768	181	1225	1399	1324	1477	1039	1133	1129	28	821	1133	921	Minnesota
-	-	-	-	27	805	1285	1123	121	615	1055	813	262	520	790	671	416	660	720	517	Mississippi
-	-	-	-	99	1067	1420	1358	30	936	1266	1209	359	839	1134	1056	-	-	-	-	Missouri
-	-	-	-	22	1526	1612	1526	-	-	-	-	139	1320	1377	1349	5	979	1050	985	Montana
-	-	-	-	30	995	1367	1167	83	887	1210	970	-	-	-	-	-	-	-	-	Nebraska
-	-	-	-	6	1273	1758	1758	28	1063	1460	1415	49	972	1332	1306	-	-	-	-	Nevada
10	952	1106	1106	10	916	1117	1117	21	797	964	922	98	797	964	880	265	550	632	611	New Hampshire
4	1333	1799	1566	27	1151	1594	1393	118	994	1342	1168	128	902	1218	1060	601	769	866	818	New Jersey
2	1637	2303	2060	5	1221	1719	1671	135	787	1221	1126	-	-	-	-	74	686	716	582	New Mexico
66	1835	2351	2141	-	-	-	-	211	1021	1330	1113	688	787	907	847	1890	677	787	737	New York
80	978	1341	1160	165	858	1171	1051	667	722	1070	896	77	634	858	746	1358	557	754	656	North Carolina
-	-	-	-	9	1209	1619	1529	4	994	1332	1209	74	967	1269	1020	-	-	-	-	North Dakota
20	1205	1456	1300	88	997	1205	1100	324	842	888	850	625	735	804	825	78	688	752	710	Ohio
-	-	-	-	85	820	1305	1030	29	950	1508	1180	-	-	-	-	327	555	855	622	Oklahoma
16	1662	2120	2110	-	-	-	-	163	1122	1783	1250	120	1122	1300	1265	16	699	881	850	Oregon
11	1224	1596	1397	67	1340	1742	1527	867	989	1281	1126	-	-	-	-	3027	742	913	823	Pennsylvania
2	990	1406	1406	8	860	1116	1116	26	749	999	999	3	696	944	944	284	393	712	650	Rhode Island
47	974	1706	1466	-	-	-	-	283	637	1163	912	-	-	-	-	876	496	667	550	South Carolina
1	1311	2023	1425	9	1206	1847	1344	7	1109	1686	1254	95	1020	1539	1202	-	-	-	-	South Dakota
23	1216	1613	1457	95	697	1000	920	18	880	1216	1125	326	591	880	808	1793	475	734	623	Tennessee
-	-	-	-	50	1437	1771	1612	15	1130	1151	1140	-	-	-	-	2163	375	654	543	Texas
								126	1267	1489	1391					44	508	696	595	
-	-	-	-	6	1170	2030	1700	16	1147	1537	1404	70	1147	1537	1404	28	630	1282	857	Utah
-	-	-	-	9	962	1461	-	9	758	1140	-	126	613	985	-	213	556	830	-	Vermont
								39	721	1086	-									
47	1306	1708	1708	50	1094	1429	1306	622	860	1000	916	-	-	-	-	267	512	586	586	Virginia
-	-	-	-	24	1518	1938	1716	67	1250	1594	1412	174	1133	1446	1281	16	805	1028	909	Washington
-	-	-	-	55	899	1616	1226	40	815	1466	937	281	778	952	860	656	628	626	626	West Virginia
-	-	-	-	28	1332	1768	1510	-	-	-	-	-	-	-	-	-	-	-	-	Wisconsin
-	-	-	-	29	1150	1541	1450	30	1062	1398	1250	-	-	-	-	47	671	901	750	Wyoming
		1830	1668			1538	1393			1306	1171			1136	1062			868	734	1978 Average
			-				-				141				152				121	1966 Average
			-				-				826				647				601	% Increase 1966-78
			7 6				8.9				7 8				5.8				9 6	% Increase 1977-78

Appendix -

MONTHLY SALARIES OF RAILWAY PERSONNEL (as of July 1, 1978)

MAINTENANCE PERSONNEL (cont'd)

State	(11) Skilled Craftsmen No.	Min.	Max.	Aver.	(12) Shop Superintendent No.	Min.	Max.	Aver.	(13) Garage or Shop Foreman No.	Min.	Max.	Aver.	(14) Mechanic No.	Min.	Max.	Aver.	(15) Mechanic Helper No.	Min.	Max.	Aver.
Alabama	49	809	993	870	9	1397	1783	1637	36	993	1291	1056	347	869	1086	963	19	678	838	707
Alaska	10	1550	2981	1850	12	1898	2252	2100	-	-	-	-	15	1288	2252	1888	-	-	-	-
Arizona	29	733	1232	950	1	1852	2184	2515	13	1028	1353	1350	95	862	2232	1090	20	653	937	865
Arkansas	106	600	930	877	11	951	1382	1382	10	826	1200	1200	99	661	938	930	-	-	-	-
California	6	1076	1352	1200	24	1630	2160	2060	50	1418	1708	1556	315	1294	1418	1352	26	983	1076	1030
Colorado	-	-	-	-	8	1532	2081	2081	9	1361	1798	1798	86	1050	1600	1341	15	907	1216	1050
Connecticut	56	862	1055	956	14	1096	1317	1205	17	903	1102	1002	146	862	1055	958	35	766	936	851
Delaware	34	552	726	673	4	1131	1562	1600	2	967	1295	1265	52	663	1097	896	7	613	814	744
Florida	-	862	1110	1033	26	889	1176	1032	115	889	1176	1032	23	718	939	874	49	563	723	643
Georgia	- 134	798 625	1049 877	1002 782	5	1127	1675	1421	9	994	1465	1254	- 116	798 777	1049 1127	923 923	35	720	1035	771
Hawaii	30	868	1232	1060	4	1054	1429	1331	2	969	1187	1187	18	988	1343	1165	8	710	873	770
Idaho	8	920	1360	1084	-	-	-	-	6	1274	1735	1345	57	986	1438	1087	13	721	1155	783
Illinois	-	-	-	-	-	-	-	-	-	-	-	-	29	-	-	1436	-	-	-	-
Indiana	79	849	1106	887	43	1010	1318	1051	-	-	-	-	131	787	986	741	35	621	776	629
Iowa	-	-	-	-	-	-	-	-	-	-	-	-	162	1001	1086	1079	20	885	960	952
Kansas	-	-	-	-	6	921	1407	1309	7	867	1282	1205	98	738	1115	1082	32	572	867	731
Kentucky	40	530	1185	643	-	-	-	-	30	676	1100	906	160	530	821	745	13	457	663	536
Louisiana	118	604	1111	871	18	686	1137	1089	-	-	-	-	159	567	966	799	184	515	747	683
Maine	41	646	851	775	8	989	1310	1138	13	786	1037	946	132	646	851	741	14	693	781	567
Maryland	651	586	756	727	7	919	1286	1286	30	886	1068	996	31	756	982	899	21	682	882	763
Massachusetts	-	-	-	-	1	1646	2059	-	8	979	1195	-	18	838	986	-	46	734	856	-
Michigan	42	972	1129	1050	1	1386	1670	1528	15	1296	1545	1419	78	1153	1320	1236	5	878	1087	982
Minnesota	18 128	1153 1235	1320 1398	1236 1273	5	1373	1933	1868	18	1322	1792	1722	168	1272	1350	1317	30	757	1289	966
Mississippi	2	560	870	645	6	735	1165	965	2	670	1055	828	75	480	1365	716	372	470	720	519
Missouri	-	-	-	-	9	1188	1503	1480	10	936	1266	1202	50	795	1071	965	23	673	900	762
Montana	324	1150	1150	1150	12	1526	1612	1526	11	1320	1320	1320	56	1263	1263	1263	8	1029	1029	1029
Nebraska	-	-	-	-	1	1055	1450	1277	5	791	1076	937	81	748	1015	873	36	667	900	731
Nevada	227	816	1112	1096	1	1332	1862	1862	8	1163	1602	1602	69	1017	1395	1367	-	-	-	-
New Hampshire	112	709	860	772	1	1203	1476	1476	8	821	1025	995	23	703	860	860	5	568	653	653
New Jersey	132	902	1218	1060	8	1333	1799	1566	1 38	722 1044	877 1409	877 1227	5 128	674 902	796 1218	796 1060	53	733	825	779
New Mexico	27	680	1109	885	14	860	1415	1296	-	-	-	-	78	648	1056	852	-	-	-	-
New York	470	752	1060	837	10	1351	1567	1459	19	1024	1196	1109	272	914	1070	990	47	752	867	809
North Carolina	130	634	978	806	15	1283	1779	1531	139	897	1341	1119	453	822	1119	971	28	691	936	814
North Dakota	3	673	902	681	8	994	1332	1266	-	-	-	-	7	818	1096	920	-	-	-	-
Ohio	106	862	888	888	1	1324	1680	1500	17	1405	1456	1380	22 144	902 901	1209 997	1015 930	22	787	862	800
Oklahoma	18	630	985	815	8	940	1500	1213	-	-	-	-	66	750	1305	908	3	690	1080	710
Oregon	20	1238	1434	1375	4	1238	1500	1565	5	1300	1434	1425	89	1179	1347	1320	7	881	1122	1050
Pennsylvania	268	882	1126	989	-	-	-	-	67	1126	1459	1281	495	967	1226	1077	134	742	913	823
Rhode Island	20	630	782	725	1	759	1133	1133	-	-	-	-	1	722	1008	1008	1	593	785	785
South Carolina	1308	505	832	672	-	-	-	-	44	828	1143	1092	174	608	976	807	44	535	726	670
South Dakota	5	835	1241	996	9	1109	1686	1232	-	-	-	-	14	713	1036	855	4	699	861	657
Tennessee	45	560	841	736	4	880	1216	1125	31	697	1000	920	24 156	835 591	1241 880	996 906	12 -	713 -	1036 -	860 -
Texas	3598	838	1128	981	27	1302	2190	1582	12	1170	1345	1229	-	-	-	-	-	-	-	-
Utah	50 37	838 966	1128 1658	976 1235	1	1321	1928	1800	12	1347	1537	1458	62	946	1267	1348	7	714	1051	887
Vermont	18	686	1036	-	1	1269	1963	-	1	962	1641	-	28	686	1036	-	-	-	-	-
Virginia	-	-	-	-	8	1306	1708	1708	76	1000	1250	1194	332	764	1000	836	66	612	764	732
Washington	18	1017	1298	1219	6	1538	1938	1716	7	1313	1674	1482	83 42	1133 1189	1446 1518	1281 1345	21	932	1189	1053
West Virginia	144	816	856	860	10	921	1464	1179	10	815	1205	977	419	664	856	801	-	-	-	-
Wisconsin	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Wyoming	-	-	-	-	5	1331	1784	1550	21	1094	1619	1285	29	992	1331	1120	10	777	1042	865
1978 Average			1097	957			1621	1469			1323	1215			1141	1019			910	793
1964 Average				155			-				206				172				136	
% Increase 1964-78				608			-				542				563				569	
% Increase 1977-78				9 6			4 6				2.8				5 9				5 4	

(16) Equipment Operator I				(17) Equipment Operator II				(18) Equipment Operator III				(19) Timekeeper or Clerk				
No.	Min.	Max.	Aver.	No.	Min.	Max.	Aver.	No.	Min.	Max.	Aver.	No.	Min.	Max.	Aver.	State
478	606	749	696	324	725	899	887	290	838	1024	998	100	630	929	866	Alabama
40	1542	1891	1800	320	1583	2023	1900	30	1700	2135	2050	-	-	-	-	Alaska
262	786	1006	888	309	902	1312	1140	-	-	-	-	29	525	835	730	Arizona
397	485	704	652	875	535	780	756	188	641	929	896	10	683	990	965	Arkansas
-	-	-	-	1522	1126	1235	1180	-	-	-	-	88	932	1116	1067	California
-	-	-	-	818	1050	1408	1277	34	1158	1532	1510	-	-	-	-	Colorado
746	766	905	836	296	791	934	863	108	817	967	891	-	-	-	-	Connecticut
125	596	788	659	44	637	849	730	36	719	966	835	11	573	814	657	Delaware
1999	589 650	780 863	675 767	121	683	890	767	150	718	939	829	38	718	939	829	Florida
1017	579	768	683	392	602	808	722	227	777	1127	874	39	584	889	708	Georgia
72	640	873	773	68	743	1035	918	15	888	1146	1092	4	756	1186	1039	Hawaii
32	687	1014	716	-	-	-	-	317	795	1174	951	6	757	1118	859	Idaho
-	-	-	1225	72	-	-	1319	17	-	-	1239	-	-	-	-	Illinois
1085	621	776	668	276	707	926	875	83	849	1106	964	21	520	676	531	Indiana
880	735	960	899	239	787	1045	1000	128	817	1086	1044	-	-	-	-	Iowa
847	572	847	720	439	622	931	859	174	677	1019	975	29	622	931	862	Kansas
1070	457	745	556	834	530	862	676	73	583	951	821	112	530	862	643	Kentucky
759	515	747	648	569	551	871	802	202	606	926	887	56	535	855	630	Louisiana
636	534	746	670	190	603	794	662	147	646	851	775	-	-	-	-	Maine
310	622	802	784	180	663	856	851	46	783	987	912	44	707	917	861	Maryland
749	724	856	-	-	-	-	-	86	820	986	-	35	679	790	-	Massachusetts
48	878	1087	982	373	972	1129	1030	-	-	-	-	22	929	1082	1005	Michigan
-	-	-	-	13	1235	1272	1272	-	-	-	-	-	-	-	-	Minnesota
219	440	655	574	242	520	793	671	85	560	870	738	46	670	720	567	Mississippi
2057	639	862	758	900	710	958	913	7	795	1071	975	22	699	967	857	Missouri
47	1150	1195	1180	35	1200	1264	1262	-	-	-	-	12	1162	1489	1243	Montana
267	633	853	682	-	-	-	-	519	703	954	802	28	539	721	633	Nebraska
-	-	-	-	-	-	-	-	76	890	1217	1184	6	972	1333	1321	Nevada
145	591	689	655	53	632	730	706	-	-	-	-	6	612	710	710	New Hampshire
433	744	909	842	144	742	1001	872	39	902	1218	1056	7 -	674 -	796 -	735 -	New Jersey
282	560	787	637	406	617	868	770	118	714	1005	891	32	508	714	611	New Mexico
1179	717	817	782	376	752	887	812	102	916	1067	998	149	607	895	737	New York
842	580	787	686	390	636	838	746	1152	641	1023	842	106	557	858	708	North Carolina
26	673	902	711	210	859	1151	907	-	-	-	-	7	610	818	748	North Dakota
656	787	862	800	123	862	888	565	68	901	997	940	134	752	862	800	Ohio
510	580	895	717	209	660	1030	815	69	720	1135	898	101	580	895	735	Oklahoma
672	924	1068	1060	266	1020	1122	1115	36	1048	1179	1175	-	-	-	-	Oregon
602	796	989	882	1946	851	1077	967	279	912	1177	1032	67	742	913	823	Pennsylvania
127	703	810	775	17	672	845	835	22	721	952	930	3	609	703	705	Rhode Island
-	-	-	-	-	-	-	-	-	-	-	-	128	676	917	725	South Carolina
33	609	861	672	314	713	1036	864	112	772	1132	991	5 9	1020 796	1539 1171	1187 882	South Dakota
262	560	841	736	73	591	880	808	-	-	-	-	68	531	886	772	Tennessee
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Texas
122	839	1125	921	174	894	1180	1110	99	966	1267	1165	-	-	-	-	Utah
-	-	-	-	1	582	882	-	39	686	1034	-	9	652	984	-	Vermont
2858	612	764	670	896	670	836	752	85	732	956	836	209	640	808	708	Virginia
134	887	1133	1006	446	980	1250	1106	100	1079	1378	1219	36	750	958	846	Washington
434	664	706	678	1099	740	778	753	488	816	856	833	107	666	723	681	West Virginia
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Wisconsin
64	777	1062	860	149	901	1208	1060	40	992	1331	1180	-	-	-	-	Wyoming
		891	798			1009	937			1096	1013			926	809	1978 Average
			-				-				-				142	1964 Average
			-				-				-				522	% Increase 1964-78
			7 1				7 7				6.3				5 4	% Increase 1977-78

MONTHLY SALARIES OF HIGHWAY PERSONNEL (as of July 1, 1978)

TRAFFIC OPERATIONS PERSONNEL

State	(33) State Traffic Engineer				(31) Assistant State Traffic Engineer				(32) State Traffic Maintenance Engineer				(23) District Traffic Engineer				(24) Assistant District Traffic Engineer			
	No.	Min.	Max.	Aver.	No.	Min.	Max.	Aver.	No.	Min.	Max.	Aver.	No.	Min.	Max.	Aver.	No.	Min.	Max.	Aver.
Alabama	1	1709	2219	2118	1	1367	1720	1703	-	-	-	-	9	1052	1636	1349	-	-	-	-
Alaska	-	-	-	-	-	-	-	-	-	-	-	-	3	2434	3392	2900	5	2102	2928	2708
Arizona	1	2175	2932	2932	1	1924	2696	2532	-	-	-	-	3	1396	2250	2112	-	-	-	-
					1	1924	2696	2532												
Arkansas	1	1555	2266	2266	1	1605	2245	2045	-	-	-	-	-	-	-	-	-	-	-	-
California	1	2559	3310	3009	2	2160	2870	2620	-	-	-	-	16	1876	2608	2374	52	1630	2265	1967
Colorado	1	2366	3141	3141	1	1927	2504	2504	-	-	-	-	5	1478	1982	1950	-	-	-	-
Connecticut	1	1931	2381	2156	1	1750	2165	1947	5	1733	2090	1912	3	1201	1587	1444	6	1266	1569	1387
Delaware	1	1796	2506	2456	-	-	-	-	-	-	-	-	2	1464	2020	1836	2	1340	1835	1383
Florida	1	1840	2493	2435	3	1616	2199	1834	1	1616	2190	2118	5	1616	2190	1855	-	1423	1987	1675
Georgia	1	1831	2733	2733	2	1532	2206	2206	-	-	-	-	7	1283	1813	1752	7	1235	1531	1465
Hawaii	1	1561	2496	2496	1	1434	2271	2072	-	-	-	-	-	-	-	-	-	-	-	-
Idaho	1	1822	2692	2325	1	1652	2461	2199	-	-	-	-	4	1499	2214	1827	-	-	-	-
Illinois	1	2135	3105	2900	1	1860	2880	2365	-	-	-	-	9	1635	2880	2225	16	1290	2100	1775
Indiana	1	2067	2762	2762	1	1811	2398	2201	1	1870	2175	2051	6	1560	1974	1684	6	1365	1760	1561
Iowa	-	-	-	-	-	-	-	-	1	1536	2138	2138	-	-	-	-	-	-	-	-
Kansas	1	1563	2321	2321	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Kentucky	1	1882	2915	2515	2	1787	2776	2465	6	1569	2518	2127	11	1485	2285	2224	7	1255	1882	1560
Louisiana	1	1611	2487	2488	1	1611	2487	2195	-	-	-	-	9	1402	2025	1834	-	-	-	-
Maine	1	1436	1909	1909	1	1527	1764	1764	-	-	-	-	5	1193	1585	1312	-	-	-	-
Maryland	1	1962	2552	2492	1	1665	2188	2188	1	1665	2188	2188	5	1431	1880	1858	7	1233	1620	1615
Massachusetts	1	1936	2432	-	1	1784	2243	-	1	1646	2089	-	8	1422	1779	-	8	1162	1438	-
Michigan	1	2434	2973	2702	1	2246	2743	2493	1	2025	2531	2279	9	1759	2185	1971	5	1529	1879	1703
Minnesota	1	2085	2840	2742	3	1933	2528	2322	-	-	-	-	9	1792	2434	2228	-	-	-	-
Mississippi	1	1675	2670	2240	1	1375	2195	2035	-	-	-	-	-	-	-	-	-	-	-	-
Missouri	-	-	-	-	1	1767	2239	2239	-	-	-	-	3	1418	1952	1890	14	1240	1696	1586
Montana	1	1649	2013	1786	1	1510	1867	1639	-	-	-	-	5	1162	1489	1271	-	-	-	-
Nebraska	1	1598	2229	2028	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nevada	1	1679	2331	2331	1	1602	2223	2223	-	-	-	-	2	1217	1679	1679	-	-	-	-
New Hampshire	1	1396	1725	1725	1	1240	1519	1519	-	-	-	-	-	-	-	-	-	-	-	-
New Jersey	1	2639	3562	3100	1	2068	2791	2430	1	1781	2297	1999	8	1399	1889	1644	21	1151	1554	1353
New Mexico	1	1805	2540	2442	1	1348	1896	1574	-	-	-	-	5	1485	2089	1962	-	-	-	-
New York	1	3122	3512	3317	1	2816	3183	3000	-	-	-	-	10	2058	2359	2208	-	-	-	-
North Carolina	1	1866	2603	2603	2	1617	2255	2255	-	-	-	-	14	1283	1779	1531	-	-	-	-
North Dakota	1	1968	2637	2490	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ohio	1	1938	2667	2667	-	-	-	-	-	-	-	-	12	1324	1680	1550	12	1205	1456	1400
Oklahoma	1	1730	2700	2100	1	1575	2500	1730	-	-	-	-	8	1305	2100	1586	-	-	-	-
Oregon	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pennsylvania	1	2173	2854	2489	2	1596	2082	1821	1	1906	2489	2173	11	1596	2082	1821	40	1397	1821	1596
Rhode Island	-	-	-	-	-	-	-	-	1	989	1167	1152	-	-	-	-	-	-	-	-
South Carolina	1	1803	2578	2303	1	1560	2218	2019	-	-	-	-	4	1151	1946	1769	-	-	-	-
South Dakota	1	1425	2215	1945	1	1311	2023	1787	2	1206	1847	1514	5	1311	2023	1570	-	-	-	-
					1	1311	2023	1716	1	1109	1686	1361								
Tennessee	1	1634	2370	1876	2	1692	2158	1944	4	1363	1967	1692	-	-	-	-	-	-	-	-
Texas	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Utah	1	1999	2918	2543	1	1805	2635	2376	1	1805	2635	2635	6	1321	2379	1858	-	-	-	-
Vermont	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Virginia	1	1884	2641	2461	3	1691	1950	1950	-	-	-	-	8	1386	1788	1633	16	1184	1598	1366
Washington	1	2060	2629	2345	-	-	-	-	-	-	-	-	5	2060	2629	2345	6	1399	1735	1567
West Virginia	1	1869	2760	2385	1	1614	2385	2060	-	-	-	-	3	1328	1962	1570	1	1093	1614	1348
Wisconsin	1	2026	2837	2721	3	1970	2759	2340	-	-	-	-	6	1721	2759	2250	8	1721	2367	2073
Wyoming	1	1874	2510	2277	1	1699	2277	1874	-	-	-	-	5	1541	2066	1699	-	-	-	-
1978 Average			2616	2468			2328	2124			2133	1928			2092	1848			1822	1603
1964 Average				-				-				-				-				-
% Increase 1964-78				-				-				-				-				-
% Increase 1977-78				7.3				9.6				8.2				6.0				3.2

(25) Traffic Supervisor				(26) Sign Supervisor				(27) Sign Shop Foreman				(28) Traffic Signal & Lighting Foreman				(29) Striper Foreman				State
No.	Min.	Max.	Aver.	No.	Min.	Max.	Aver.	No.	Min.	Max.	Aver.	No.	Min.	Max.	Aver.	No.	Min.	Max.	Aver.	
-	-	-	-	1	1288	1636	1636	1	993	1191	1092	1	1204	1636	1575	-	-	-	-	Alabama
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8	2102	2928	2500	Alaska
7	1101	1450	1269	1	1390	1863	1863	1	1188	1488	1418	17	1198	2847	1593	10	1029	1319	1298	Arizona
-	-	-	-	1	1289	1993	1983	1	991	1382	1382	-	-	-	-	2	951	1382	1312	Arkansas
-	-	-	-	9	1235	1485	1418	-	-	-	-	23	1418	1708	1630	18	1235	1485	1418	California
8	1361	1798	1798	-	-	-	-	1	1888	2081	2081	6	1361	1798	1712	-	-	-	-	Colorado
-	-	-	-	1	1382	1868	1311	1	1852	1259	1150	-	-	-	-	-	-	-	-	Connecticut
2	1348	1835	1588	-	-	-	-	1	866	1182	935	-	-	-	-	-	-	-	-	Delaware
-	1259	1696	1477	-	-	-	-	1	1034	1403	1213	-	-	-	-	10	842	1118	976	Florida
-	-	-	-	1	1482	2091	2082	1	951	1482	1177	1	1127	1751	1331	9	861	1288	1055	Georgia
-	-	-	-	3	1888	1287	1278	-	-	-	-	1	1948	1588	1568	1	836	1077	1058	Hawaii
-	-	-	-	-	-	-	-	1	1009	1576	1388	1	1295	1913	1574	3	1118	1652	1297	Idaho
28	1085	1700	1398	-	-	-	-	8	993	1789	1296	-	-	-	-	19	1275	1525	1388	Illinois
-	-	-	-	7	984	1348	1236	6	849	1188	886	6	1018	1348	1083	10	849	1188	886	Indiana
1	1192	1618	1396	1	1293	1775	1698	1	871	1192	1192	1	1891	1396	1354	6	1049	1417	1230	Iowa
-	-	-	-	-	-	-	-	1	810	1248	1248	-	-	-	-	6	847	1282	1219	Kansas
11	710	1135	1056	11	643	1048	862	8	530	862	745	36	457	1274	782	10	643	1048	782	Kentucky
8	646	988	955	28	583	903	774	5	583	903	896	2	720	1111	1084	9	696	1085	1087	Louisiana
-	-	-	-	-	-	-	-	1	706	1037	998	1	820	1085	942	1	706	1037	998	Maine
7	1145	1504	1374	1	1145	1504	1502	1	806	1048	1048	1	1083	1396	1396	7	806	1048	1048	Maryland
8	1036	1271	-	1	1220	1519	-	1	979	1195	-	1	979	1195	-	33	987	1111	-	Massachusetts
				33	927	1111	-													
1	1608	1969	1786	11	1386	1670	1529	11	1190	1436	1306	1	1529	1879	1703	14	1153	1328	1247	Michigan
5	1171	2170	1742	18	1086	1933	1393	-	-	-	-	1	1322	1792	1599	-	-	-	-	Minnesota
-	-	-	-	-	-	-	-	1	805	1285	1123	1	805	1285	1190	6	670	1055	-	Mississippi
-	-	-	-	-	-	-	-	1	991	1363	1162	6	934	1256	1260	-	-	-	-	Missouri
-	-	-	-	-	-	-	-	1	1283	1354	1354	-	-	-	-	-	-	-	-	Montana
-	-	-	-	1	993	1367	1105	1	740	1015	960	1	1338	1856	1397	-	-	-	-	Nebraska
-	-	-	-	1	1217	1679	1629	-	-	-	-	-	-	-	-	7	972	1332	1332	Nevada
1	865	1085	1085	-	-	-	-	1	702	860	860	1	821	995	995	8	703	860	860	New Hampshire
-	-	-	-	1	1351	1554	1353	1	1086	1409	1227	28	1066	1409	1227	6	994	1342	1168	New Jersey
6	787	1221	1000	-	-	-	-	1	698	986	966	2	1109	1539	1297	-	-	-	-	New Mexico
10	869	1923	1446	1	1201	1649	1386	1	1026	1199	1109	11	1026	1196	1109	20	787	987	867	New York
14	978	1341	1160	28	787	1070	929	-	-	-	-	14	897	1227	1062	28	787	1070	929	North Carolina
-	-	-	-	-	-	-	-	8	967	1269	1090	-	-	-	-	-	-	-	-	North Dakota
12	908	1096	1000	1	1093	1326	1275	1	901	997	997	16	997	1205	1205	31	842	888	860	Ohio
5	893	1630	1167	-	-	-	-	-	-	-	-	-	-	-	-	6	750	1190	950	Oklahoma
-	-	-	-	-	-	-	-	1	1230	1580	1580	2	1580	1743	1725	8	1122	1388	1285	Oregon
-	-	-	-	11	1177	1527	1340	1	957	1226	1077	11	1224	1596	1397	21	912	1177	1032	Pennsylvania
2	990	1605	1405	-	-	-	-	-	-	-	-	1	845	912	1181	1	749	886	936	Rhode Island
-	-	-	-	-	-	-	-	7	637	1143	912	6	828	1143	965	8	637	1143	912	South Carolina
-	-	-	-	1	906	1359	1253	1	835	1241	1131	-	-	-	-	2	713	1034	846	South Dakota
																5	772	1132	991	
1	1261	1722	1613	5	880	1218	1048	-	-	-	-	-	-	-	-	-	-	-	-	Tennessee
-	-	-	-	2	1168	1535	1359	-	-	-	-	-	-	-	-	-	-	-	-	Texas
1	1466	2139	1998	1	1321	1928	1928	1	1077	1462	1408	4	1170	1709	1637	6	1147	1537	1454	Utah
-	-	-	-	1	952	1451	-	-	-	-	-	1	853	1274	-	7	721	1086	-	Vermont
44	1044	1366	1250	8	800	1000	916	9	800	1000	916	8	916	1250	1144	8	800	1000	916	Virginia
-	-	-	-	-	-	-	-	-	-	-	-	4	1313	1674	1855	-	-	-	-	Washington
-	-	-	-	-	-	-	-	1	899	1328	991	1	1093	1614	1537	6	739	1093	962	West Virginia
3	1389	1826	1498	1	1447	1904	1745	11	1234	1620	1366	1	1447	1904	1828	17	1006	1253	1160	Wisconsin
-	-	-	-	-	-	-	-	1	1094	1448	1448	1	1541	2064	1784	5	1094	1448	1235	Wyoming
		1549	1379			1509	1389			1274	1161			1498	1379			1232	1125	1978 Average
			-				-				-				-				-	1966 Average
			-				-				-				-				-	% Increase 1966-78
			4.7				16.7				8.3				7.3				10.0	% Increase 1977-78

MONTHLY SALARIES OF HIGHWAY PERSONNEL (as of July 1, 1978)

TRAFFIC OPERATIONS PERSONNEL (cont'd)

State	(30) Sign Erection Foreman No.	Min.	Max.	Aver.	(31) Sign Fabricator No.	Min.	Max.	Aver.	(32) Sign Technician No.	Min.	Max.	Aver.	(33) Traffic Signal & Lighting Technician No.	Min.	Max.	Aver.
Alabama	-	-	-	-	2	809	993	850	10	582	725	719	23	780	1206	1113
Alaska	-	-	-	-	-	-	-	-	-	-	-	-	15	1542	2252	1850
Arizona	3	1029	1319	1154	7	903	1152	1115	22	843	1077	1005	33	903	1450	1325
Arkansas	1	951	1382	1382	5	488	737	654	2	682	990	888	-	-	-	-
California	-	-	-	-	-	-	-	-	-	-	-	-	161	1294	1554	1418
Colorado	-	-	-	-	5	1050	1341	1158	-	-	-	-	20	1000	1478	1350
Connecticut	-	-	-	-	10	862	1035	959	-	-	-	-	18	903	1102	1002
Delaware	3	947	1295	1190	7	663	1051	826	5	613	816	650	13	691	1619	928
Florida	47	756	991	874	3	718	939	926	10	650	843	747	-	891	1376	1032
Georgia	10	841	1228	1035	15	625	877	751	88	625	877	751	11	720	1035	878
Hawaii	-	-	-	-	5	860	1065	1006	-	-	-	-	7	900	1252	1108
Idaho	6	1118	1652	1411	4	757	1118	972	-	-	-	-	1	920	1360	835
Illinois	-	-	-	-	14	1292	1525	1292	-	-	-	-	6	1065	1925	1475
Indiana	34	707	926	761	-	-	-	-	68	621	776	668	37	849	1311	871
Iowa	-	-	-	-	12	745	1000	828	-	-	-	-	2	871	1192	1074
Kansas	-	-	-	-	5	707	1084	1037	-	-	-	-	-	-	-	-
Kentucky	-	-	-	-	-	-	-	-	163	457	745	589	5	643	1349	918
Louisiana	1	567	887	639	-	-	-	-	11	515	747	519	20	515	747	550
Maine	5	646	851	811	1	646	851	811	-	696	918	729	1	897	1190	1033
Maryland	30	806	1068	1042	9	754	982	812	-	-	-	-	13	806	1068	1003
Massachusetts	33	927	1111	-	5	872	1046	-	1 33	979 927	1195 1111	- -	16	872	1046	-
Michigan	32	972	1129	1077	13	878	1129	1056	40	972	1129	1077	30	972	1436	1247
Minnesota	-	-	-	-	-	-	-	-	-	-	-	-	8	1350	1392	1392
Mississippi	3	805	1285	-	4	560	870	763	-	-	-	-	5	735	1165	923
Missouri	-	-	-	-	2	673	909	866	1	639	862	746	31	885	1193	1042
Montana	-	-	-	-	2	1206	1266	1266	-	-	-	-	7	977	1734	1270
Nebraska	-	-	-	-	5	667	900	722	-	-	-	-	7	837	1143	939
Nevada	2	972	1332	1332	2	1113	1529	1529	1	1017	1395	1395	-	-	-	-
New Hampshire	6	703	840	840	1	634	760	760	7	568	653	633	5	703	922	840
New Jersey	-	-	-	-	11	742	1001	872	37	787	954	831	112	902	1218	1060
New Mexico	-	-	-	-	7	532	827	667	-	-	-	-	6	751	1415	1064
New York	63	787	907	847	16	752	867	807	-	-	-	-	103	752	1070	895
North Carolina	103	634	858	746	-	-	-	-	156	557	754	656	28	754	1023	889
North Dakota	-	-	-	-	15	818	1096	960	-	-	-	-	-	-	-	-
Ohio	31	842	888	860	10	735	804	785	31	842	888	860	10	952	1096	1000
Oklahoma	7	750	1190	967	5	580	985	738	-	-	-	-	-	-	-	-
Oregon	16	1122	1238	1230	-	-	-	-	-	-	-	-	-	-	-	-
Pennsylvania	67	989	1281	1126	2	794	989	882	10	794	989	882	11	1224	1996	1397
Rhode Island	1	672	727	916	-	722	776	882	-	-	-	-	2	749	805	871
South Carolina	-	-	-	-	-	-	-	-	-	-	-	-	22	535	1031	829
South Dakota	5 3	1020 772	1539 1132	1202 991	3	772	1132	976	-	-	-	-	-	-	-	-
Tennessee	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Texas	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Utah	2	1147	1537	1396	3	785	1188	1066	-	-	-	-	17	785	1362	1219
Vermont	4	652	984	-	1	686	1884	-	-	-	-	-	-	-	-	-
Virginia	8	800	1000	916	37	670	836	766	-	-	-	-	33	732	956	876
Washington	-	-	-	-	6	1250	1446	1348	19	1155	1313	1223	16	1313	1518	1416
West Virginia	1	899	1328	1285	-	-	-	-	-	-	-	-	4	899	1484	1139
Wisconsin	39	980	1213	1082	24	964	1289	1120	39	930	1138	1080	10	-	-	1568
Wyoming	5	1042	1398	1268	7	817	1094	1030	4	858	1150	1012	2	992	1331	1290
1978 Average			1150	1067			1037	939			958	862			1288	1100
1944 Average			-				-				-				-	
% Increase 1944-78			-				-				-				-	
% Increase 1977-78			4.8				7.2				6.6				9.0	

(34) Striper Technician				OTHER RELATED PERSONNEL (35) Chief Engineer				(36) Project Engineer				
No.	Min.	Max.	Aver.	No.	Min.	Max.	Aver.	No.	Min.	Max.	Aver.	State
-	-	-	-	1	2022	2679	2679	150	1057	1636	1421	Alabama
7	1208	1981	1650	-	-	-	-	-	-	-	-	Alaska
17	903	1152	1027	1	2863	3889	3635	27	1396	2250	1960	Arizona
3	506	736	736	1	-	-	2905	35	1252	1935	1896	Arkansas
90	1126	1352	1235	1	2952	3310	3310	208	1630	1967	1876	California
-	-	-	-	1	2409	3227	3227	77	1647	2232	2190	Colorado
-	-	-	-	1	2477	2742	3086	-	-	-	-	Connecticut
-	-	-	-	1	2174	3012	3012	-	-	-	-	Delaware
-	756	991	874	-	-	-	-	-	-	-	-	Florida
21	728	1035	881	1	2091	3475	3475	388	1035	1331	1465	Georgia
4	743	914	869	1	1797	2883	2883	6	1434	2286	2126	Hawaii
9	795	1174	951	1	-	3151	-	49	1233	1882	1436	Idaho
-	-	-	-	1	2883	3985	3410	-	1430	2180	1950	Illinois
-	-	-	-	1	2762	3687	3186	98	1365	1740	1548	Indiana
15	787	1086	956	1	2266	3183	2989	18	1417	1957	1917	Iowa
-	-	-	-	1	-	-	3100	28	1363	2050	2000	Kansas
24	530	862	705	1	-	-	3000	74	1068	1787	1626	Kentucky
25	551	924	736	1	1888	2684	2472	21	1224	2296	1885	Louisiana
-	897	1198	1083	-	-	-	-	-	-	-	-	Maine
7	663	856	851	1	2950	2950	2950	60	1165	1504	1502	Maryland
18	872	1046	-	1	2562	2972	-	89	1285	1606	-	Massachusetts
22	972	1129	1077	-	-	-	-	-	-	-	-	Michigan
-	-	-	-	1	-	-	3075	-	-	-	-	Minnesota
6	470	720	-	1	2035	3250	2595	40	1265	1995	1808	Mississippi
-	-	-	-	1	3333	3333	3333	56	1329	1926	1780	Missouri
-	-	-	-	1	2815	2815	2815	-	-	-	-	Montana
-	-	-	-	2	2061	2877	2292	64	995	1638	1342	Nebraska
6	890	1217	1198	1	3080	3080	3080	11	1395	1930	1930	Nevada
5	632	730	706	1	-	2598	2598	80	1270	1519	1325	New Hampshire
6	560	653	653									
-	-	-	-	1	3208	4330	3769	25	1620	2187	1904	New Jersey
-	-	-	-	1	3333	-	3333	-	-	-	-	New Mexico
56	752	867	812	1	-	-	3691	-	1667	1923	1795	New York
-	-	-	-	1	2255	3005	3005	61	1404	1956	1680	North Carolina
1	673	902	707	1	2391	3205	2890	34	1469	1968	1780	North Dakota
								10	1700	2277	2056	
80	735	806	785	-	-	-	-	20	1205	1456	1350	Ohio
-	-	-	-	1	1905	2900	2500	25	1430	2300	1789	Oklahoma
-	-	-	-	1	-	-	-	55	1367	2018	1975	Oregon
123	851	1077	967	1	2725	3332	3117	308	1397	1821	1596	Pennsylvania
7	696	767	931	-	-	-	-	-	-	-	-	Rhode Island
-	-	-	-	1	3291	3291	3291	68	873	1704	1653	South Carolina
-	-	-	-	1	-	-	2232	24	1311	2023	1612	South Dakota
-	-	-	-	1	2158	3141	2996	125	1210	1613	1502	Tennessee
-	-	-	-	1	3661	3661	3661	178	2135	2260	2211	Texas
								78	2312	2634	2376	
-	-	-	-	1	2504	3655	3079	25	1466	2139	1979	Utah
6	613	925	-	1	1891	2984	-	30	803	1841	-	Vermont
-	-	-	-	1	2333	3033	3033	39	1094	1429	1308	Virginia
-	-	-	-	1	3357	4284	3792	52	1651	2107	1879	Washington
10	817	856	837	1	2629	3884	2760	-	-	-	-	West Virginia
40	930	1138	1057	-	-	-	-	185	1667	2267	1765	Wisconsin
19	817	1268	970	1	2905	3892	3203	29	1899	2277	1876	Wyoming
		1012	930			3266	3051			1946	1765	1978 Average
			-				-				-	1964 Average
			-				-				-	% Increase 1964-78
			4.8				8.3				5.6	% Increase 1977-78

MAINTENANCE QUESTIONNAIRE ON POLICIES AFFECTING MAINTENANCE AND TRAFFIC OPERATIONS PERSONNEL (as of July 1, 1978)

Questions asked the various State Highway Departments are answered in the table below. The numbers at the head of each column of the table refer to the question numbers.

CIVIL SERVICE OR MERIT SYSTEM

1. Are your maintenance and operations employees under a civil service plan, merit system, or some other comparable plan?
   a. All
   b. All but Temporary
   c. Supervisory only
   d. None

RETIREMENT PLAN

2. Are your maintenance and operations employees included in any State-sponsored or controlled retirement plan?
3. Are your maintenance and operations employees included in a Federal Social Security retirement plan?
4. Do you have a compulsory retirement age? If answer is "Yes", indicate the following:
   a. Is it established by policy or statute?
   b. Compulsory retirement age?
5. Is voluntary retirement possible after a prescribed number of years? If answer is "Yes", indicate the following:
   a. Minimum years of service at which voluntary retirement is possible?
   b. Minimum age at which voluntary retirement is possible?

VACATIONS

6. Do maintenance and operations employees receive an annual vacation on full pay?
7. What is your annual vacation schedule for maintenance and operations personnel (working hours per year per years of service)?

	CIVIL SERVICE or MERIT SYSTEM				RETIREMENT PLAN								VACATION					
											Voluntary Retirement			Annual Vacation Schedule					
														Minimum		Maximum		
State	(1a)	(1b)	(1c)	(1d)	State Plan (2)	Fed. Soc. Sec. (3)	Compulsory Retirement (4)	(4a)	(4b)	(5)	Min.Yrs. Service (5a)	Minimum Age (5b)	(6)	Hrs. /Yr.	Yrs.of Service	Hrs. /Yr.	Yrs. of Service	Cumulative (7)	Maximum (8)
Alabama	-	x	-	-	Yes	Yes	Yes	Statute	70	Yes	30	55	Yes	104	1 to 5	234	25+	Yes	480
Alaska	-	-	x	-	Yes	Yes	No	-	-	Yes	5	50	Yes	75	1 to 2	225	10+	Yes	450
Arizona	x	-	-	-	Yes	Yes	Yes	Statute	70	Yes	10	60	Yes	96	0 to 3	168	15+	Yes	240
Arkansas	-	-	-	x	Yes	Yes	Yes	Policy	67	Yes	10 35	65 53	Yes	96	1 to 3	176	20+	Yes	216
California	x	-	-	-	Yes	Yes	No	-	-	Yes	5	50	Yes	80	0 to 3	160	24+	Yes	320
Colorado	-	x	-	-	Yes	No	Yes	Policy	65	Yes	20	55	Yes	96	1 to 5	168	15+	Yes	336
Connecticut	x	-	-	-	Yes	Yes	Yes	Statute	70	Yes	10	55	Yes	70	0 to 5	140	20+	Yes	280
Delaware	-	x	-	-	Yes	Yes	Yes	Statute	70	Yes	30 10	Any Age 60	Yes	112½	0 to 10	157½	15+	Yes	315
Florida	-	x	-	-	Yes	Yes	No	-	-	Yes	10	-	Yes	104	0 to 5	156	10+	Yes	240
Georgia	-	-	x	-	Yes	Yes	Yes	Policy	65	Yes	34	Any Age	Yes	120	1 to 5	168	10+	Yes	360
Hawaii	x	-	-	-	Yes	Yes	Yes	Statute	70	Yes	5	55	Yes	168	Any	168	Any	Yes	720
Idaho	x	-	-	-	Yes	Yes	Yes	Statute	65	Yes	30	60	Yes	96	0 to 5	168	15+	Yes	336
Illinois	-	x	-	-	Yes	Yes	No	-	-	Yes	8	60	Yes	80	1 to 7	160	15+	Yes	160
Indiana	-	-	x	-	Yes	Yes	Yes	Policy	70	Yes	15	50	Yes	96	1 to 10	160	20+	Yes	Unlimited
Iowa	x	-	-	-	Yes	Yes	Yes	Policy	65	Yes	-	55	Yes	80	0 to 5	200	25+	Yes	400
Kansas	-	x	-	-	Yes	Yes	Yes	Policy	70	No	-	-	Yes	96	0 to 5	144	15+	Yes	192
Kentucky	-	x	-	-	Yes	Yes	No	-	-	Yes	30	Any Age	Yes	96	1 to 5	168	15+	Yes	430
Louisiana	-	x	-	-	Yes	No	Yes	Policy	65	Yes	30	55	Yes	96	1 to 3	192	15+	Yes	Unlimited
Maine	x	-	-	-	Yes	No	No	-	-	Yes	10	50	Yes	96	0 to 5	192	20+	Yes	240
Maryland	-	x	-	-	Yes	Yes	Yes	Statute	70	Yes	25	Any Age	Yes	80	1 to 5	200	20+	Yes	280
Massachusetts	x	-	-	-	Yes	No	No	-	-	Yes	20	55	Yes	80	1 to 5	160	10+	Yes	160
Michigan	x	-	-	-	Yes	Yes	Yes	Statute	70	Yes	10 30	60 55	Yes	104	0 to 1	248	30+	Yes	240
Minnesota	x	-	-	-	Yes	Yes	Yes	Statute	70	Yes	10	62	Yes	104	0 to 5	208	25+	Yes	224
Mississippi	x	-	-	-	Yes	Yes	Yes	Statute	65	Yes	30	-	Yes	120	1 to 5	144	5+	Yes	360
Missouri	x	-	-	-	Yes	Yes	Yes	Statute	70	Yes	15	55	Yes	120	0 to 10	168	15+	Yes	336
Montana	x	-	-	-	Yes	Yes	No	-	-	Yes	5	55	Yes	120	0 to 10	192	20+	Yes	384
Nebraska	x	-	-	-	Yes	Yes	Yes	Statute	65	Yes	20	60	Yes	96	1 to 5	200	16+	Yes	200
Nevada	x	-	-	-	Yes	No	No	-	-	Yes	10	55	Yes	120	½ to 10	168	15+	Yes	240
New Hampshire	x	-	-	-	Yes	Yes	Yes	Statute	70	Yes	30	60	Yes	120	½ to 17	144	17+	Yes	288
New Jersey	x	-	-	-	Yes	Yes	Yes	Policy	70	Yes	25	Any Age	Yes	96	0 to 1	200	20+	Yes	200
New Mexico	x	-	-	-	Yes	Yes	No	-	-	Yes	30	Any Age	Yes	120	1 to Any	120	1+	Yes	240
New York	x	-	-	-	Yes	Yes	Yes	Statute	70	Yes	10	55	Yes	104	1 to 7	160	8+	Yes	320
North Carolina	-	-	-	x	Yes	Yes	Yes	Statute	70	Yes	20	50	Yes	80	1 to 2	192	20+	Yes	240
North Dakota	-	-	-	x	Yes	Yes	No	-	-	Yes	10	55	Yes	96	1 to 3	192	19+	Yes	240
Ohio	x	-	-	-	Yes	No	Yes	Statute	70	Yes	5 30	60 Any Age	Yes	80	1 to 7	200	25+	Yes	600
Oklahoma	-	x	-	-	Yes	Yes	Yes	Policy	65	Yes	10	62	Yes	120	1 to 5	144	5+	Yes	384
Oregon	-	x	-	-	Yes	Yes	Yes	Statute	65	Yes	30	60	Yes	96	0 to 5	192	20+	Yes	250
Pennsylvania	-	-	-	x	Yes	Yes	No	-	-	Yes	10	-	Yes	112½	2 to 15	150	15+	Yes	337½
Rhode Island	-	x	-	-	Yes	Yes	Yes	Statute	70	Yes	10	55	Yes	56	0 to ½	176	20+	Yes	176
South Carolina	x	-	-	-	Yes	Yes	Yes	Statute	72	Yes	30	60	Yes	120	1 to 10	240	22+	Yes	360
South Dakota	-	x	-	-	Yes	Yes	Yes	Policy	70	Yes	5	55	Yes	120	1 to 15	160	15+	Yes	320
Tennessee	x	-	-	-	Yes	Yes	Yes	Policy	65	Yes	30	60	Yes	96	0 to 5	192	20+	Yes	336
Texas	-	-	x	-	Yes	Yes	Yes	Policy	70	Yes	10	50	Yes	84	0 to 2	168	20+	Yes	336
Utah	x	-	-	-	Yes	Yes	Yes	Statute	70	Yes	30	-	Yes	96	1 to 4	144	10+	Yes	240
Vermont	-	x	-	-	Yes	Yes	Yes	Statute	70	Yes	10 30	55 Any Age	Yes	96	0 to 5	168	20+	Yes	360
Virginia	-	x	-	-	Yes	Yes	Yes	Statute	70	Yes	5	55	Yes	96	0 to 5	168	20+	Yes	336
Washington	-	x	-	-	Yes	No	Yes	Policy	70	Yes	5	-	Yes	96	0 to 1	176	26+	Yes	247
West Virginia	-	-	x	-	Yes	Yes	No	-	-	Yes	5	60	Yes	120	0 to 5	192	15+	Yes	240
Wisconsin	x	-	-	-	Yes	Yes	No	-	-	Yes	-	55	Yes	80	1 to 5	200	25+	No	-
Wyoming	x	-	-	-	Yes	Yes	Yes	Policy	70	Yes	5	50	Yes	96	0 to 4	192	19+	Yes	240

8. Are your annual vacations cumulative? If answer is "Yes", what amount of vacation may be carried over into a new year? (Do not include any unearned vacation).

SICK LEAVE

9. Do you grant sick leave with pay to maintenance and operations employees?
10. What is your annual sick leave schedule for maintenance and operations personnel (working hours per year per years of service)?
11. Is your sick leave cumulative? If answer is "Yes", what is the maximum?

SICK LEAVE							
	Annual Sick Leave Schedule						
	Minimum		Maximum				
	Hrs. /Yrs.	Yrs.of Service	Hrs. /Yrs.	Yrs of Service	Cumulative	Maximum	
(9)	(10)				(11)		State
Yes	104	1 to Any	104	1+	Yes	1200	Alabama
Yes	75	1 to Any	75	1+	Yes	Unlimited	Alaska
Yes	96	1 to Any	96	Any	Yes	Unlimited	Arizona
Yes	96	-	96	-	Yes	720	Arkansas
Yes	96	-	96	-	Yes	Unlimited	California
Yes	120	1 to Any	120	1+	Yes	Unlimited	Colorado
Yes	105	-	105	-	Yes	Unlimited	Connecticut
Yes	112½	0 to Any	135	-	Yes	675	Delaware
Yes	104	0 to Any	104	Any	Yes	Unlimited	Florida
Yes	120	-	120	-	Yes	720	Georgia
Yes	168	0 to Any	168	Any	Yes	Unlimited	Hawaii
Yes	96	0 to Any	96	Any	Yes	Unlimited	Idaho
Yes	96	1 to Any	96	1+	Yes	Unlimited	Illinois
Yes	96	1 to 5	96	1+	Yes	Unlimited	Indiana
Yes	240	0 to Any	240	Any	Yes	720	Iowa
Yes	96	0 to 5	96	5+	Yes	Unlimited	Kansas
Yes	96	0 to Any	96	Any	Yes	Unlimited	Kentucky
Yes	96	1 to 3	192	15+	Yes	Unlimited	Louisiana
Yes	96	0 to Any	96	-	Yes	720	Maine
Yes	120	0 to Any	120	Any	Yes	Unlimited	Maryland
Yes	120	0 to Any	120	Any	Yes	Unlimited	Massachusetts
Yes	104	0 to Any	104	Any	Yes	Unlimited	Michigan
Yes	104	0 to 1	104	1+	Yes	900	Minnesota
Yes	120	1 to Any	120	Any	Yes	960	Mississippi
Yes	120	0 to Any	120	Any	Yes	Unlimited	Missouri
Yes	96	1 to Any	96	1+	Yes	Unlimited	Montana
Yes	96	1 to 5	240	15+	Yes	1440	Nebraska
Yes	120	-	-	-	Yes	Unlimited	Nevada
Yes	120	½ to Any	120	Any	Yes	900	New Hampshire
Yes	96	0 to 1	120	1+	Yes	Unlimited	New Jersey
Yes	96	1 to Any	96	1+	Yes	Unlimited	New Mexico
Yes	104	-	104	-	Yes	1350	New York
Yes	80	1 to Any	80	1+	Yes	Unlimited	North Carolina
Yes	96	0 to Any	96	Any	Yes	Unlimited	North Dakota
Yes	120	1 to Any	-	-	Yes	Unlimited	Ohio
Yes	-	-	120	½+	Yes	360	Oklahoma
Yes	96	1 to Any	-	-	Yes	Unlimited	Oregon
Yes	-	-	112½	1+	Yes	1500	Pennsylvania
Yes	120	0 to Any	120	Any	Yes	960	Rhode Island
Yes	120	-	120	-	Yes	720	South Carolina
Yes	112	-	112	-	Yes	Unlimited	South Dakota
Yes	96	0 to Any	96	Any	Yes	Unlimited	Tennessee
Yes	96	0 to Any	96	Any	Yes	Unlimited	Texas
Yes	96	0 to Any	96	Any	Yes	Unlimited	Utah
Yes	96	0 to 5	168	20+	Yes	Unlimited	Vermont
Yes	120	0 to Any	120	Any	Yes	Unlimited	Virginia
Yes	96	0 to Any	96	Any	Yes	Unlimited	Washington
Yes	144	0 to Any	144	Any	Yes	Unlimited	West Virginia
Yes	104	½ to Any	104	½+	Yes	Unlimited	Wisconsin
Yes	96	0 to Any	96	Any	Yes	Unlimited	Wyoming

MAINTENANCE QUESTIONNAIRE ON POLICIES AFFECTING MAINTENANCE AND TRAFFIC OPERATIONS PERSONNEL (cont'd)

INSURANCE

12. Are your maintenance and operations employees protected by a wholly or partially state-financed hospitalization plan?
    a. If answer is "Yes", indicate whether plan is wholly state-financed or partially state-financed
    b. Is participation optional or mandatory with employee?
13. Are your maintenance and operations employees protected by a wholly or partially state-financed life insurance plan?
    a. If answer is "Yes", indicate whether plan is wholly state-financed or partially state-financed
    b. Is participation optional or mandatory with employee?
14. Are your maintenance and operations employees protected against lawsuit by a state-financed public liability plan?
    a. All
    b. All but Temporary
    c. Supervisory only
    d. None

UNIONIZATION

15. Do maintenance and operations employees have collective bargaining rights: Supervisory and Non-Supervisory
16. Are your maintenance and operations employees organized by the following and if so, is membership mandatory or voluntary?
    Supervisory or Non-Supervisory
    a. National union
    b. Local union or employee association

SERVICE AWARDS

17. Do your maintenance and operations departments give any type of recognition, such as pins or tokens, to employees serving a certain length of time with the department.

State	INSURANCE										UNIONIZATION					
	Hospitalization			Life Insurance			Public Liability				Supervisory	Non-Supervisory	Supervisory			
	(12)	(12a)	(12b)	(13)	(13a)	(13b)	(14a)	(14b)	(14c)	(14d)	(15)		National Union (16a)		Local Union (16b)	
Alabama	Yes	Wholly	Mandatory	No	-	-	-	-	-	x	No	No	No	-	No	-
Alaska	Yes	Wholly	Mandatory	Yes	Wholly	Mandatory	x	-	-	-	Yes	Yes	-	-	Yes	Mandatory
Arizona	Yes	Wholly	Optional	Yes	Wholly	Optional	-	-	-	x	No	No	-	-	Yes	Voluntary
Arkansas	Yes	Partially	Optional	Yes	Partially	Optional	-	-	-	x	No	No	No	-	No	-
California	Yes	Partially	Optional	Yes	Wholly	Mandatory	x	-	-	-	No	Yes	-	-	Yes	Voluntary
Colorado	Yes	Partially	Optional	Yes	Partially	Optional	x	-	-	-	No	-	No	-	Yes	Voluntary
Connecticut	Yes	Wholly	Optional	Yes	Partially	Optional	x	-	-	-	Yes	Yes	No	-	Yes	Voluntary
Delaware	Yes	Partially	Optional	No	-	-	-	-	-	x	Yes	Yes	Yes	Mandatory	No	-
Florida	Yes	Partially	Optional	Yes	Partially	Optional	-	x	-	-	Yes	Yes	Yes	Mandatory	No	-
Georgia	Yes	Partially	Optional	Yes	Partially	Mandatory	x	-	-	-	No	No	No	-	No	-
Hawaii	Yes	Partially	Optional	Yes	Wholly	Optional	-	-	-	x	Yes	Yes	No	-	Yes	Voluntary
Idaho	Yes	Partially	Mandatory	Yes	Wholly	Mandatory	x	-	-	-	No	No	NO	-	No	-
Illinois	Yes	Wholly	Mandatory	Yes	Wholly	Mandatory	x	-	-	-	No	Yes	No	-	No	-
Indiana	Yes	Partially	Optional	Yes	Partially	Optional	x	-	-	-	No	No	No	-	Yes	Voluntary
Iowa	Yes	Wholly	Optional	Yes	Wholly	Mandatory	x	-	-	-	No	Yes	No	-	No	--
Kansas	Yes	Partially	Optional	Yes	Wholly	Mandatory	x	-	-	-	No	Yes	No	-	No	-
Kentucky	Yes	Both	Mandatory	Yes	Wholly	Mandatory	-	-	-	x	No	No	No	-	No	-
Louisiana	Yes	Partially	Optional	Yes	Partially	Optional	-	-	-	x	No	Yes	No	-	No	-
Maine	Yes	Wholly	Optional	No	-	-	-	-	-	x	Yes	Yes	No	-	Yes	Voluntary
Maryland	Yes	Partially	Optional	No	-	-	-	-	-	x	No	No	Yes	Voluntary	Yes	Voluntary
Massachusetts	Yes	Partially	Optional	Yes	Partially	Optional	-	-	-	x	Yes	Yes	Yes	Mandatory	-	-
Michigan	Yes	Partially	Optional	Yes	Partially	Optional	x	-	-	-	No	No	No	-	Yes	Voluntary
Minnesota	Yes	Wholly	Optional	Yes	Wholly	Optional	-	-	-	x	No	Yes	No	-	Yes	Voluntary
Mississippi	Yes	Wholly	Optional	Yes	Partially	Optional	-	-	-	x	No	No	No	-	Yes	Voluntary
Missouri	Yes	Partially	Optional	Yes	Wholly	Mandatory	x	-	-	-	No	Yes	No	-	Yes	Voluntary
Montana	Yes	Partially	Optional	Yes	Partially	Optional	x	-	-	-	Yes	Yes	No	-	Yes	Mandatory
Nebraska	Yes	Partially	Optional	Yes	Wholly	Optional	-	-	-	x	Yes	Yes	No	-	No	-
Nevada	Yes	Wholly	Mandatory	Yes	Wholly	Mandatory	x	-	-	-	No	No	No	-	Yes	Voluntary
New Hampshire	Yes	Wholly	Optional	Yes	Partially	Optional	-	-	-	x	Yes	Yes	Yes	Voluntary	Yes	Voluntary
New Jersey	Yes	Wholly	Optional	Yes	Both	Mandatory	-	-	-	-	Yes	Yes	Yes	Voluntary	Yes	Voluntary
New Mexico	Yes	Partially	Optional	Yes	Partially	Optional	x	-	-	-	No	Yes	No	-	No	-
New York	Yes	Partially	Optional	No	-	-	x	-	-	-	Yes	Yes	No	-	Yes	Voluntary
North Carolina	Yes	Wholly	Optional	Yes	Wholly	Mandatory	x	-	-	-	No	No	No	-	Yes	Voluntary
North Dakota	Yes	Partially	Optional	Yes	Wholly	Mandatory	-	-	-	x	No	Yes	No	-	No	-
Ohio	Yes	Partially	Optional	Yes	Wholly	Mandatory	x	-	-	-	No	No	Yes	Voluntary	Yes	Voluntary
Oklahoma	Yes	Wholly	Mandatory	Yes	Wholly	Mandatory	-	-	-	x	No	No	No	-	No	-
Oregon	Yes	Partially	Optional	No	-	-	x	-	-	-	No	Yes	No	-	Yes	Voluntary
Pennsylvania	Yes	Wholly	Optional	Yes	Wholly	Mandatory	x	-	-	-	Yes	Yes	No	-	Yes	Voluntary
Rhode Island	Yes	Partially	Optional	Yes	Wholly	Optional	-	-	-	x	Yes	Yes	Yes	Mandatory	No	-
South Carolina	Yes	Wholly	Mandatory	Yes	Wholly	Mandatory	-	-	-	x	No	No	No	-	Yes	Voluntary
South Dakota	Yes	Wholly	Mandatory	No	-	-	x	-	-	-	-	Yes	No	-	Yes	Voluntary
Tennessee	Yes	Partially	Optional	Yes	Partially	Optional	-	-	-	x	No	No	No	-	No	-
Texas	Yes	Wholly	Optional	Yes	Wholly	Optional	-	x	-	-	No	No	No	-	Yes	Voluntary
Utah	Yes	Partially	Optional	Yes	Partially	Optional	x	-	-	-	No	No	No	-	Yes	Voluntary
Vermont	Yes	Partially	Optional	Yes	Partially	Optional	-	-	-	x	Yes	Yes	No	-	Yes	Voluntary
Virginia	Yes	Wholly	Optional	Yes	Partially	Mandatory	x	-	-	-	No	No	No	-	No	-
Washington	Yes	Wholly	Optional	Yes	Partially	Optional	x	-	-	-	No	Yes	No	-	No	-
West Virginia	Yes	Both	Optional	Yes	Both	Optional	x	-	-	-	No	No	No	-	No	-
Wisconsin	Yes	Partially	Optional	Yes	Partially	Optional	x	-	-	-	No	Yes	No	-	No	-
Wyoming	Yes	Wholly	Optional	Yes	Partially	Optional	-	-	-	x	No	No	No	-	Yes	Voluntary

WORKING CONDITIONS

18. Check which of your maintenance and operations field employees are paid on a salaried basis and which are paid on an hourly basis.
    a. All
    b. Permanent field employees (exclusive of supervisory)
    c. Supervisory
    d. Temporary
19. Standard number of hours worked by each permanent field employee per day and per week.

Non-Supervisory				SERVICE AWARDS	WORKING CONDITIONS						
National Union (16a)		Local Union (16b)		(17)	Salary Basis (18a)	(18b)	(18c)	(18d)	Working Hrs. per Day (19)	per Week (19)	State
No	-	No	-	Yes	-	Salaried	Salaried	Hourly	8	40	Alabama
-	-	Yes	Mandatory	Yes	-	Hourly	Hourly	Hourly	7½	37½	Alaska
No	-	Yes	Voluntary	Yes	Salaried	-	-	-	8	40	Arizona
No	-	Yes	Voluntary	Yes	Salaried	-	-	-	8	40	Arkansas
No	-	Yes	Voluntary	Yes	Salaried	-	-	Hourly	8	40	California
No	-	Yes	Voluntary	Yes	-	Salaried	Salaried	Hourly	8	40	Colorado
No	-	Yes	Voluntary	No	-	Hourly	Salaried	Hourly	7	35	Connecticut
Yes	Mandatory	No	-	Yes	-	Hourly	Salaried	Hourly	7½	37½	Delaware
Yes	Voluntary	No	-	Yes	-	Salaried	Salaried	Hourly	8	40	Florida
No	-	No	-	Yes	Salaried	-	-	-	8	40	Georgia
No	-	Yes	Voluntary	Yes	Salaried	-	-	-	8	40	Hawaii
No	-	No	-	Yes	-	Salaried	Salaried	Hourly	8	40	Idaho
Yes	Voluntary	-	-	Yes	-	Salaried	Salaried	Both	8	40	Illinois
No	-	Yes	Voluntary	Yes	-	Hourly	Salaried	Hourly	8	40	Indiana
Yes	Voluntary	-	-	Yes	-	Salaried	Salaried	Hourly	8	40	Iowa
Yes	Voluntary	Yes	Voluntary	Yes	-	Salaried	Salaried	Hourly	8	40	Kansas
No	-	No	-	Yes	-	Hourly	Salaried	Salaried	8	40	Kentucky
Yes	Voluntary	Yes	Voluntary	Yes	-	Salaried	Salaried	Hourly	8	40	Louisiana
No	-	Yes	Voluntary	Yes	-	Hourly	Salaried	Hourly	9	43½	Maine
Yes	Voluntary	Yes	Voluntary	Yes	-	Salaried	Salaried	Hourly	8	40	Maryland
Yes	Mandatory	Yes	Mandatory	No	Hourly	-	-	-	8	40	Massachusetts
No	-	Yes	Voluntary	Yes	Hourly	Hourly	Hourly	Hourly	8	40	Michigan
Yes	Voluntary	Yes	Voluntary	Yes	-	Salaried	Salaried	Hourly	8	40	Minnesota
No	-	Yes	Voluntary	Yes	Salaried	Salaried	Salaried	Hourly	8	40	Mississippi
Yes	Voluntary	Yes	Voluntary	Yes	-	Salaried	Salaried	Hourly	8	40	Missouri
Yes	Mandatory	-	-	Yes	Salaried	-	-	-	8	40	Montana
No	-	Yes	Voluntary	Yes	Hourly	Hourly	Hourly	Hourly	8	40	Nebraska
No	-	Yes	Voluntary	Yes	Salaried	Salaried	Salaried	Salaried	8	40	Nevada
Yes	Voluntary	Yes	Voluntary	Yes	Hourly	Hourly	Both	Hourly	8	40	New Hampshire
Yes	Voluntary	Yes	Voluntary	Yes	Salaried	-	-	-	8	40	New Jersey
Yes	Voluntary	-	-	Yes	Salaried	Salaried	Salaried	Hourly	8	40	New Mexico
No	-	Yes	Voluntary	No	Salaried	-	-	-	8	40	New York
No	-	Yes	Voluntary	Yes	-	Salaried	Salaried	Hourly	8	40	North Carolina
Yes	Voluntary	-	-	Yes	Salaried	-	-	-	8	40	North Dakota
Yes	Voluntary	Yes	Voluntary	No	Hourly	-	-	-	8	40	Ohio
No	-	No	-	Yes	Salaried	-	-	-	8	40	Oklahoma
No	-	Yes	Voluntary	Yes	Salaried	-	-	-	8	40	Oregon
No	-	Yes	Voluntary	Yes	-	Salaried	Salaried	Hourly	7½	37½	Pennsylvania
Yes	Mandatory	No	-	Yes	Hourly	-	-	-	8	40	Rhode Island
No	-	Yes	Voluntary	Yes	-	Hourly	Salaried	Hourly	8	40	South Carolina
Yes	Voluntary	Yes	Voluntary	Yes	-	Hourly	Salaried	Hourly	8	40	South Dakota
No	-	No	-	Yes	Salaried	-	-	-	8	40	Tennessee
No	-	Yes	Voluntary	Yes	-	Hourly	Salaried	Hourly	8	40	Texas
No	-	Yes	Voluntary	Yes	Salaried	-	-	-	8	40	Utah
No	-	Yes	Voluntary	Yes	Salaried	-	-	-	8	40	Vermont
No	-	No	-	Yes	-	Salaried	Salaried	Hourly	8	40	Virginia
Yes	Mandatory	No	-	Yes	Salaried	Salaried	Salaried	Hourly	8	40	Washington
No	-	No	-	No	-	Hourly	Salaried	Hourly	8	40	West Virginia
No	-	Yes	Voluntary	Yes	Hourly	-	-	-	8	40	Wisconsin
No	-	Yes	Voluntary	Yes	-	Salaried	Salaried	Hourly	8	40	Wyoming

WORKING CONDITIONS (cont'd)

20 Is any allowance or adjustment made for overtime work? If answer is "Yes", indicate basis of payment for overtime (straight time, time and a half, compensatory time, none) for:
- a Permanent Field Employees (exclusive of supervisory)
- b Supervisory
- c. Temporary

21. Are your field employees required to report at an assembly point, such as a headquarters' garage or shop, preparatory to their day's work?
- a If answer to Question 21 is "Yes", are they paid from the time they leave this assembly point until they return at the close of the day's work (portal to portal)?

22. Are maintenance and operations employees furnished any type of protective clothing as indicated below:
- a Hard hats and safety vests
- b Welding Goggles and Helmets
- c. Other Protective Clo. . for Specialized Operations (Bituminous Work, Shop Mechanics, etc.)
- d. Normal operations (rain outfits, insulated undergarments, etc.)

23. Do you have automatic or automatic-recommended salary advancement?
24. Do you, by law or policy, require a formalized job classification plan?
25. Do you use convict labor?
26. Do you pay any travel expenses for maintenance and operations employees when they are away from the home station over night? If answer is "Yes", is payment for meals and lodging respectively based on:
- a. Actual b. Actual with a maximum c. Per Diem

WORKING CONDITIONS (Continued)

State	Adjustment for Overtime (20)	(20a)	(20b)	(20c)	Travel Time (21)	(21a)	Protective Clothing (22a)	(22b)	(22c)	(22d)	(23)	(24)	Travel Expenses Meals (25)	(26)	(26a)	Lodging (26b)	(26b)	(26c)	Moving Expenses (27a)	(27b)	(27c)
Alabama	Yes	1½	Comp.	1½	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	-	-	x	-	-	x	-	x	-
Alaska	Yes	1½	1½	1½	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	No	Yes	-	-	x	-	-	x	x	-	-
Arizona	Yes	1½	-	1½	Yes	Yes	Yes	Yes	Yes	No	No	Yes	No	Yes	-	x	-	-	x	-	:	:	-
Arkansas	Yes	1½	1½	1½	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	No	Yes	-	x	-	-	x	-	-	x	-
California	Yes	1½	1½ Str.	1½	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	-	-	x	-	-	x	-	x	-
Colorado	Yes	1½	-	1½	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	No	Yes	-	-	x	-	x	-	-	x	-
Connecticut	Yes	1½	1½	1½	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No	-	-	-	-	-	-	-	-	x
Delaware	Yes	1½	1½ Str	1½	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	-	x	-	x	-	-	-	-	x
Florida	Yes	1½	-	-	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	-	x	x	-	x	x	x	-	-
Georgia	Yes	1½	Comp.	-	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	x	-	-	x	-	-	-	x	-
Hawaii	Yes	1½	1½	1½	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	-	-	x	-	-	x	-	x	-
Idaho	Yes	1½	Str	1½	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	No	Yes	-	-	x	x	-	-	-	x	-
Illinois	Yes	1½ 2	1½	1½ 2	Yes	Yes	Yes	Yes	Yes	No	No	Yes	No	Yes	-	-	x	-	x	-	-	x	-
Indiana	Yes	1½	Str	1½	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	No	Yes	-	-	x	-	x	-	-	x	-
Iowa	Yes	1½	-	1½	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	No	Yes	-	x	-	-	x	-	-	x	-
Kansas	Yes	1½	-	1½	Yes	Yes	Yes	Yes	No	No	Yes	Yes	No	Yes	-	-	x	-	-	x	x	-	-
Kentucky	Yes	1½	Comp.	-	Yes	Yes	Yes	Yes	No	No	Yes	Yes	No	Yes	-	-	x	-	-	x	-	x	-
Louisiana	Yes	1½	Comp.	-	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	-	x	-	-	x	-	x	-	-
Maine	Yes	1½	-	1½	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	-	x	-	-	x	-	x	-	-
Maryland	Yes	1½	Comp.	1½	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	-	x	-	x	-	-	x	-	-
Massachusetts	Yes	1½	1½	1½	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	-	x	-	x	-	-	-	-	x
Michigan	Yes	1½	1½	1½	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	-	x	x	-	x	-	-	x	-
Minnesota	Yes	1½	Str.	1½	Yes	Yes	Yes	Yes	No	No	No	Yes	No	Yes	-	x	-	x	-	-	-	x	-
Mississippi	No	-	-	-	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	No	Yes	-	x	-	-	x	-	-	-	x
Missouri	Yes	1½	Str.	1½	Yes	Yes	Yes	Yes	Yes	No	No	Yes	No	Yes	x	-	-	x	-	-	x	-	-
Montana	Yes	1½	-	1½	Yes	Yes	Yes	Yes	No	No	Yes	Yes	No	Yes	-	-	x	-	x	-	-	x	-
Nebraska	Yes	1½	Str.	1½	Yes	Yes	Yes	Yes	No	No	Yes	Yes	No	Yes	-	x	-	-	x	-	x	-	-
Nevada	Yes	1½	1½ Str	1½	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	No	Yes	-	-	x	-	-	x	-	x	-
New Hampshire	Yes	1½	Str. Comp.	1½	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	-	x	-	-	-	x	-	-	x
New Jersey	Yes	1½	1½	-	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	-	x	-	-	x	-	-	-	x
New Mexico	Yes	1½	Str.	1½	Yes	Yes	Yes	Yes	Yes	No	No	Yes	No	Yes	-	-	x	-	-	x	-	x	-
New York	Yes	1½	1½	1½	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	No	Yes	-	-	x	-	-	x	-	x	-
North Carolina	Yes	1½	-	1½	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	-	-	x	-	-	x	-	x	-
North Dakota	Yes	-	-	-	Yes	Yes	Yes	Yes	No	No	No	Yes	No	Yes	-	-	x	-	x	-	-	x	-
Ohio	Yes	1½	Comp.	-	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	No	Yes	-	x	-	-	x	-	x	-	-
Oklahoma	Yes	1½	-	1½	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	-	-	x	-	x	-	-	x	-
Oregon	Yes	1½	-	1½	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	No	Yes	-	-	x	-	-	x	-	x	-
Pennsylvania	Yes	1½	-	1½	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	-	-	x	-	-	x	x	-	-
Rhode Island	Yes	1½	1½	-	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	x	-	-	x	-	-	-	-	x
South Carolina	Yes	1½	Comp.	1½	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	No	Yes	-	x	-	-	x	-	-	-	-
South Dakota	Yes	1½	Comp.	1½	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	No	Yes	-	-	x	-	x	-	-	x	-
Tennessee	Yes	1½	-	-	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	No	No	-	-	-	-	-	-	-	-	x
Texas	Yes	Comp.	-	Comp	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	No	Yes	-	-	x	-	-	x	-	-	x
Utah	Yes	1½	Comp.	1½	Yes	Yes	Yes	No	Yes	No	Yes	Yes	No	Yes	-	-	x	-	-	x	-	x	-
Vermont	Yes	1½	Str. Comp.	-	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	No	Yes	-	x	-	x	-	-	x	-	-
Virginia	Yes	1½	1½	1½	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	x	-	-	x	-	-	-	x	-
Washington	Yes	1½	1½	1½	Yes	Yes	Yes	Yes	No	No	Yes	Yes	No	Yes	-	-	x	-	-	x	-	x	-
West Virginia	Yes	1½	Str.	1½	No	-	Yes	Yes	Yes	Yes	No	No	No	Yes	-	x	-	x	-	-	-	x	-
Wisconsin	Yes	Str. 1½	Comp Str.	1½	No	-	Yes	Yes	No	No	Yes	Yes	No	Yes	-	x	-	-	x	-	x	-	-
Wyoming	Yes	1½	-	1½	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	No	Yes	x	-	-	x	-	-	x	-	-

Appendix I

27. Does your policy provide reimbursem[illegible] of expenses incurred when a maintenance or operations employee is required to change residence which necessitates his moving his family and furniture?
a. Total b. Limited c. None

29. Are garage or shop operations for vehicle maintenance under the jurisdiction of the Highway Department? If answer is "Yes", which of the following do you maintain?
a. Highway Department Vehicles only
b. Vehicles for Several State Agencies
c. Vehicles for all State Agencies

MAINTENANCE RESPONSIBILITY

28. Is the physical placement and maintenance of signing and marking the responsibility of the Maintenance Division?
a. Original Placement of Highway Signs
b. Replacement and Maintenance of Highway Signs
c. Pavement Marking

MAINTENANCE RESPONSIBILITY							
Signing & Marking Responsibility			Vehicle Maintenance				
(28a)	(28b)	(28c)	(29)	(29a)	(29b)	(29c)	State
No	Yes	Yes	Yes	-	-	x	Alabama
No	Yes	Yes	Yes	x	x	x	Alaska
Yes	Yes	Yes	Yes	x	-	-	Arizona
No	Yes	No	Yes	x	-	-	Arkansas
No	Yes	Yes	Yes	x	-	-	California
No	Yes	Yes	Yes	x	-	-	Colorado
No	Yes	Yes	Yes	-	x	-	Connecticut
No	No	No	Yes	x	-	-	Delaware
No	Yes	Yes	Yes	x	-	-	Florida
Yes	Yes	Yes	Yes	x	-	-	Georgia
No	Yes	Yes	Yes	x	-	-	Hawaii
Yes	Yes	Yes	Yes	-	x	-	Idaho
No	No	No	No	-	-	-	Illinois
No	Yes	No	Yes	x	-	-	Indiana
Yes	Yes	Yes	Yes	-	x	-	Iowa
Yes	Yes	Yes	Yes	x	-	-	Kansas
No	No	No	Yes	x	-	-	Kentucky
No	Yes	No	-	-	x	-	Louisiana
No	Yes	No	Yes	-	x	-	Maine
Yes	Yes	Yes	Yes	x	-	-	Maryland
Yes	Yes	Yes	Yes	x	-	-	Massachusetts
No	No	No	Yes	x	-	-	Michigan
No	Yes	Yes	Yes	-	x	-	Minnesota
No	Yes	Yes	Yes	x	-	-	Mississippi
No	Yes	Yes	Yes	x	-	-	Missouri
No	Yes	Yes	Yes	-	-	x	Montana
Yes	Yes	Yes	Yes	x	-	-	Nebraska
Yes	Yes	Yes	Yes	x	-	-	Nevada
No	No	No	Yes	x	-	-	New Hampshire
Yes	Yes	Yes	Yes	x	x	-	New Jersey
No	Yes	Yes	Yes	x	-	-	New Mexico
Yes	Yes	Yes	Yes	x	-	-	New York
No	Yes	Yes	Yes	x	-	-	North Carolina
Yes	Yes	Yes	Yes	x	-	-	North Dakota
Yes	Yes	Yes	Yes	-	-	x	Ohio
Yes	Yes	Yes	Yes	x	-	-	Oklahoma
No	Yes	Yes	Yes	x	-	-	Oregon
Yes	Yes	No	Yes	x	-	-	Pennsylvania
No	Yes	Yes	No	-	-	-	Rhode Island
Yes	Yes	Yes	Yes	-	x	-	South Carolina
Yes	Yes	Yes	Yes	-	-	x	South Dakota
No	Yes	Yes	Yes	x	-	-	Tennessee
Yes	Yes	Yes	Yes	x	-	-	Texas
No	Yes	Yes	Yes	-	x	-	Utah
Yes	Yes	Yes	Yes	-	x	-	Vermont
No	Yes	Yes	Yes	-	-	x	Virginia
No	Yes	Yes	Yes	x	-	-	Washington
No	Yes	Yes	Yes	x	-	-	West Virginia
No	No	No	No	-	-	-	Wisconsin
No	Yes	No	Yes	x	-	-	Wyoming

LANE MILES

30. Number of lane miles maintained by state forces on the following systems, a lane mile being defined as any single driving lane:
    a. Interstate and Freeways
    b. Primary and Secondary
    c. County, Township, Municipal and Service Roads
    d. Total Lane Miles
31. What is your average number of Maintenance and Traffic Operations Field Employees?
    a. Permanent
    b. Temporary
    c. Total
32. Average lane miles per man using information from Questions 30 and 31?

BASIS OF OPERATIONS

33. Have you changed or do you contemplate changing to a maintenance management system or maintenance performance budget method of operations?
    a. Contemplate changing
    b. Have changed
    c. Are in the process of changing
    d. Not under consideration
34. If answer to Question 33 is (b) or (c), for what percentage of your total maintenance work functions has this change been made?
35. If answer to Question 33 is (b) or (c), what percentage of your maintenance work function cost is based on the use of a maintenance management system or maintenance performance budget?

	RELATIONSHIP, MILES TO NUMBER OF EMPLOYEES													
	Lane Miles				Average Number of Employees				Maintenance Management System					
State	(30a)	(30b)	(30c)	(30d)	(31a)	(31b)	(31c)	(32)	(33a)	(33b)	(33c)	(33d)	(34)	(35)
Alabama	3,463	23,460	21,966	48,870	1,755	100	1,855	30.0	-	-	-	x	-	-
Alaska	-	-	-	10,444	530	60	590	17.7	x	-	-	-	-	-
Arizona	4,888	9,958	1,073	15,919	862	11	873	18.2	-	x	-	-	100%	94%
Arkansas	3,006	31,235	-	34,241	2,238	41	2,279	15.0	-	x	-	-	80%	80%
California	23,525	23,666	-	47,189	5,350	312	5,662	8.3	-	x	-	-	100%	100%
Colorado	7,490	17,488	-	24,978	1,351	50	1,401	18.2	-	x	-	-	95%	88%
Connecticut	3,026	7,056	-	10,082	1,730	-	1,730	5.8	-	-	x	-	100%	-
Delaware	224	2,576	6,913	9,713	401	12	413	23.5	-	x	-	-	100%	100%
Florida	6,803	27,562	-	34,363	2,827	-	2,827	-	-	x	-	-	100%	-
Georgia	4,900	34,465	367	39,732	3,047	200	3,247	12.2	-	x	-	-	95%	95%
Hawaii	296	1,893	-	2,189	341	-	341	6.4	x	-	-	-	-	-
Idaho	2,206	9,193	-	11,399	526	100	626	18.0	-	x	-	-	90%	95%
Illinois	6,857	31,585	1,254	39,697	2,994	20	3,014	13.2	x	-	-	-	-	-
Indiana	4,763	28,856	-	29,619	2,367	447	2,814	10.5	-	x	-	-	100%	100%
Iowa	3,507	21,160	-	24,667	1,450	81	1,531	16.1	-	x	-	-	100%	100%
Kansas	2,462	20,087	-	22,549	1,666	68	1,734	13.0	-	-	x	-	100%	100%
Kentucky	4,987	23,190	25,267	53,444	4,041	335	4,376	12.2	-	x	-	-	100%	100%
Louisiana	3,051	19,150	15,358	37,559	3,765	-	3,765	10.0	-	x	-	-	100%	100%
Maine	971	7,006	13,613	21,590	1,335	75	1,410	15.2	-	-	x	-	100%	100%
Maryland	1,961	12,596	4,288	18,825	1,666	55	1,721	10 9	-	x	-	-	100%	100%
Massachusetts	2,921	8,036	481	11,438	1,979	-	1,979	-	-	-	x	-	100%	100%
Michigan	2,496	4,394	-	6,890	829	19	848	8.3	-	x	-	-	38%	44%
Minnesota	3,524	24,931	-	28,455	1,784	28	1,812	15.7	x	-	-	-	-	-
Mississippi	2,537	19,747	352	22,637	1,800	25	1,825	12.4	-	-	x	-	98%	98%
Missouri	5,073	64,006	3,215	72,296	3,495	78	3,573	20.1	-	-	-	x	-	-
Montana	3,905	14,188	-	18,094	520	30	550	33.3	-	-	-	x	-	-
Nebraska	2,540	19,167	-	21,707	962	24	986	22.5	-	x	-	-	100%	100%
Nevada	2,845	9,160	285	12,270	391	80	471	-	-	x	-	-	100%	100%
New Hampshire	883	7,852	413	9,148	735	93	828	10.9	x	-	-	-	-	-
New Jersey	2,330	7,805	862	10,997	1,654	10	1,664	6.1	-	x	-	-	100%	100%
New Mexico	4,065	16,296	7,440	27,801	1,167	8	1,175	23.7	-	x	-	-	99%	99%
New York	3,688	34,343	1,428	39,459	5,356	36	5,392	7.3	-	-	x	-	100%	90%
North Carolina	2,445	143,524	11,302	157,071	7,100	267	7,367	21.3	-	x	-	-	100%	95%
North Dakota	2,220	13,238	-	15,457	362	45	407	38.0	-	x	-	-	100%	100%
Ohio	6,324	35,707	-	42,031	2,339	-	2,339	17.9	-	x	-	-	100%	100%
Oklahoma	2,699	23,733	-	26,432	1,510	25	1,535	17.3	-	x	-	-	100%	100%
Oregon	3,600	15,600	-	19,200	1,250	5	1,255	15.0	-	x	-	-	All	98%
Pennsylvania	5,400	63,000	-	68,400	7,351	227	7,578	9.0	-	x	-	-	100%	75%
Rhode Island	434	2,600	-	3,034	-	-	-	-	-	-	x	-	75%	60%
South Carolina	2,807	79,191	-	81,908	2,768	-	2,768	29.6	x	-	-	-	-	-
South Dakota	3,024	15,058	-	18,082	609	15	624	29.0	-	x	-	-	100%	100%
Tennessee	4,624	19,829	-	24,453	2,683	-	2,683	9.1	-	x	-	-	100%	100%
Texas	20,578	150,152	-	170,730	7,792	202	7,994	21.4	x	-	-	-	-	-
Utah	3,496	10,238	-	13,734	715	41	756	18.2	-	x	-	-	100%	100%
Vermont	1,434	4,389	-	5,823	509	39	548	10.6	-	-	x	-	25%	25%
Virginia	11,562	99,370	-	110,912	5,565	553	6,018	18.4	-	x	-	-	100%	100%
Washington	4,966	11,710	-	16,676	1,208	62	1,270	13.1	-	x	-	-	All	All
West Virginia	2,800	65,000	-	67,800	3,329	-	3,329	20 4	-	x	-	-	90%	80%
Wisconsin	2,380	23,810	-	26,390	68	-	68	388 0	-	-	-	x	-	-
Wyoming	3,643	10,811	700	15,154	400	50	450	33 0	-	x	-	-	80%	95%

36. Average long miles covered by each general maintenance crew working out of one location (gang or section headquarters)?
37. Average travel distance for each general maintenance crew from gang or section headquarters to farthest point of work?
38. Do you have special crews for traffic signs and striping; and if so, what are the lane miles handled by each crew?
    a. Some Crew Handles Traffic Signs and Striping
    b. Traffic Signs
    c. Striping

BASIS OF OPERATIONS

Basis of Crew Operations								
(36)	(37)	(38a)		(38b)		(38c)		State
1,020	20	No	-	Yes	1,020	Yes	5,430	Alabama
200	-	Yes	4,000	Yes	4,000	-	-	Alaska
346	34	No	-	Yes	1,602	Yes	3,306	Arizona
400	30	No	-	Yes	2,250	Yes	6,870	Arkansas
98	30	No	-	Yes	4,020	Yes	3,000	California
65	20	Yes	3,122	-	- -	-	-	Colorado
74	15	No	-	Yes	2,500	Yes	2,500	Connecticut
400	40	No	-	Yes	1,022	Yes	Contr.	Delaware
-	30	No	-	Yes	-	Yes	-	Florida
235	35	No	-	Yes	880	Yes	4,950	Georgia
-	28	Yes	416	Yes	508	Yes	508	Hawaii
141	23	No	-	Yes	1,900	Yes	3,800	Idaho
300	20	Yes	4,000	Yes	1,800	Yes	4,000	Illinois
267	30	No	-	Yes	1,647	Yes	3,000	Indiana
170	20	No	-	No	-	Yes	4,111	Iowa
200	20	No	-	No	-	Yes	3,758	Kansas
450	15	No	4,454	Yes	4,454	Yes	4,454	Kentucky
606	40	No	-	Yes	3,756	Yes	4,695	Louisiana
300	18	No	-	Yes	1,000	Yes	3,500	Maine
110	-	No	-	Yes	600	Yes	2,700	Maryland
123	20	Yes	270	-	-	-	-	Massachusetts
206	25	No	-	Yes	710	Yes	1,950	Michigan
45	23	No	-	Yes	1,700	Yes	3,400	Minnesota
250	25	No	-	Yes	250	Yes	3,600	Mississippi
200	-	No	-	No	-	Yes	4,104	Missouri
129	30	-	-	-	-	Yes	4,000	Montana
165	25	No	-	Yes	Varies	Yes	3,500	Nebraska
150	27	Yes	950	Yes	950	Yes	950	Nevada
92	12+	No	-	Yes	1,501	Yes	1,802	New Hampshire
133	12	-	-	-	-	Yes	2,068	New Jersey
327	42	No	-	Yes	5,560	Yes	6,950	New Mexico
250	20	No	-	Yes	1,000	Yes	3,000	New York
350	15	No	-	Yes	1,600	Yes	11,200	North Carolina
197	30	No	-	Yes	1,932	Yes	7,729	North Dakota
478	20	Yes	3,503	Yes	3,503	Yes	2,335	Ohio
300	30	No	-	Yes	3,200	Yes	3,200	Oklahoma
220	30	No	-	Yes	1,200	Yes	3,800	Oregon
150	30	No	-	Yes	1,128	Yes	3,168	Pennsylvania
187	6	No	-	Yes	750	Yes	1,500	Rhode Island
-	20	No	-	Yes	-	Yes	-	South Carolina
204	45	Yes	2,000	-	-	-	-	South Dakota
250	25	Yes	3,800	-	-	-	-	Tennessee
26	25	No	-	Yes	-	Yes	-	Texas
200	40	Yes	2,200	-	-	-	-	Utah
156	25	No	-	Yes	1,561	Yes	1,656	Vermont
440	18	No	-	Yes	1,800	Yes	4,500	Virginia
124	25	No	-	Yes	600	Yes	2,285	Washington
-	300	Yes	2,000	-	-	-	-	West Virginia
35	10	Yes	1,500	Yes	2,000	No	-	Wisconsin
44	50	No	-	Yes	3,000	Yes	3,000	Wyoming

Appendix K

MAINTENANCE EQUIPMENT UTILIZATION SURVEY

Introduction:

At its February 14, 1980, meeting, the A.C.R. 30 subcommittee voted to narrow the focus of its highway maintenance study and concentrate on maintenance equipment utilization within the Nevada Department of Transportation. The individual members of the subcommittee were to visit the district offices and maintenance yards within their geographic areas to talk with district staff personnel and gather additional information about equipment utilization and departmental efficiency.

In conjunction with these visits, staff prepared an equipment utilization survey using the methodology employed in a similar study conducted by the Virginia Department of Highways. The study examined a representative sample of maintenance equipment units; derived average usage per sampled unit by maintenance district; and calculated a proposed "standard" of utilization through averaging the districts' average utilization rate and the district usage representing the highest utilization rate.

Although the Virginia study included an estimation of dollar savings to be gained, a difference in the equipment rental systems between the two states prevented such a similarity from being drawn in the Nevada review. Some dollar savings should, however, be realized through increased utilization of maintenance equipment.

Nevada Survey:

In fiscal year 1978-79, the Nevada Department of Transportation had 1,767 separate pieces of equipment which had a total value, based upon original purchase price, of $16,951,276. For purposes of review, 1,024 units were studied which represented 57.9% of the total units owned. (The survey included only the major maintenance equipment items--sedans, pickups, and miscellaneous maintenance units were excluded.) The total value of the sample units was $12,901,439 or 76.1% of total value of all equipment items.

Chart A shows a cumulative listing of the sampled units and their original purchase price value. For example, in fiscal year 1978-79, 90 utility trucks were assigned to the six maintenance districts, the total value of which based upon original purchase price, equaled $738,932. In reviewing these value figures, the tremendous increase in equipment costs in recent years should also be kept in mind. An equipment cost comparison (Chart B) as presented by the Department of Transportation, is included for your review of current equipment prices.

CHART A

Class Code	Item	District Maint. Eqpt. Units Statewide	District Maint. Eqpt. Value Statewid
11	Utility Trucks	90	738,932
12	Single Axle Dump Trucks	173	2,209,126
13	Tandem Axle Dump Trucks	65	1,696,095
14	Tractor Trucks	13	333,196
15	A.W.D. Trucks	32	684,045
21	Line Striper	4	93,761
23	Traction Broom	54	148,222
24	Street Sweeper	11	198,799
25	Water Trucks	8	263,594
28	Distributors	13	308,905
30	Maintenance Distributors	27	87,527
31	Motor Graders	53	1,331,834
33	Pulvimixer	17	165,107
35	Loaders	77	1,648,668
37	Conveyors	31	248,839
40	Patcheaters & Crack Fillers	30	230,863
41	Mowers	18	56,200
42	Rotary Plows	16	686,760
45	Steel Wheeled Rollers	22	250,658
47	Pneumatic Rollers	12	115,056
48	Shovel & Backhoe Comb.	2	59,969
54	Indust. Tractors w/Attach.	32	313,680
55	Crawler Tractors	18	489,850
60	Cargo Tilt Trailer	69	321,508
63	Arrow Bds. & Sign Trailers	127	87,452
66	Chip Spreaders	5	69,815
68	Screening Plants	5	62,978
		1,024	12,901,439

CHART B

EQUIPMENT REPLACEMENT COST COMPARISON

Class Code	DESCRIPTION	1975-76		1976-77		1977-78		1978-79		1979-80	
		Amount	Cost	Amount	Cost	Amount	Cost	Amount	Cost	Amount	Cost
11	9.5 H GVH Dump	0	6,114	0	6,124	15	6,922	12	7,276	9	9,067
12	27 H GVH	23	11,846	17	12,669	31	15,006	21	14,722	11	20,500
13	46 H GVH Dump	9	26,322	12	27,655	5	31,864	0	31,926	19	42,958
14	46 H GVH Tractor Trk	1	28,572	1	29,872	4	31,995	2	36,320	-	-
15	41 H GVH AWD Dump	-	-	-	-	-	-	4	41,066	2	45,812
23	Tow Type Broom	2	3,325	18	3,014	0	5,694	1	6,186	2	7,179
24	Street Sweeper S.P.	1	29,060	1	32,000	1	32,000	1	37,249	1	40,370
25	Water Trucks	2	36,477	2	36,662	2	38,707	2	44,626	-	-
31	Motor Grader	4	34,632	4	34,047	4	43,093	4	46,741	4	46,741
35	Loader 1½ Cu. Yd.	1	26,664	7	26,707	4	29,179	2	29,367	1	41,489
35	Loader 2½ Cu. Yd.	2	30,660	6	34,466	4	37,488	-	-	3	51,461
45	Steel Wheel Roller	1	17,644	3	10,663	2	10,362	-	-	1	29,027
47	Pneu. Tired Roller	1	16,720	-	-	2	16,926	-	-	3	24,000
54	Industrial Tractor	-	-	3	8,029	2	10,012	3	11,408	-	-
60	17 Ton Tilt Trailer	6	5,694	6	6,096	6	6,612	2	8,252	-	-
63	Arrow Sign Board	2	2,667	3	2,724	2	2,362	2	2,431	-	-
	Sander 8 Cu. Yd.	9	2,450	0	2,603	4	2,830	8	2,029	18	3,573
	Snow Plow	-	-	-	-	4	2,496	3	2,550	5	3,150

Chart C shows the average utilization per unit by hours in each of the six maintenance districts during fiscal year 1978-79. This information was taken from the Maintenance Management System Summary of Equipment Hours and NDOT Equipment Listing by Class and District. The figures were derived by dividing the total number of hours each equipment class was used in each district by the total number of units assigned to that district during fiscal year 1978-79. For example, District I used Equipment Class 11--utility trucks--a total of 38,482 hours last fiscal year. During the year, 30 trucks were assigned to the district making the average annual usage per unit 1,283 hours. Please note where no utilization is shown, no units in that class were assigned. This comparison shows an interesting contrast in terms of utilization between districts. The subcommittee may want to delve into this area more deeply keeping in mind there may be some valid reasons for the differences.

Chart D presents the proposed "standard" hours of utilization per unit by equipment class. The "standard" is derived by averaging the hours used on the average for all districts with the hours utilized by the district with the highest use. The proposed "standards" are then compared with the current district average to determine the increased utilization percentage that could be attained. For example, for the utility truck class, the district average was 1,148 hours of use in fiscal year 1978-79. District II had the highest usage with 1,472 hours. The proposed standard of utilization equals 1,310 hours (the average between 1,148 and 1,472 hours). If all districts could meet this standard, it would represent a 14.1% increase over the current district average of 1,148 hours.

Based upon the above methodology, it is estimated that the Department could increase its utilization of maintenance equipment by 15% if the proposed "standards" were set and achieved. That is to say that if the proposed "standards" were met, then on an overall basis the Department could perform 15% more work with existing equipment or current work with 15% less equipment.

Once again, it should be realized that the proposed "standards" recommended as a product of this survey are meant as standards to be aimed for by the Department in increasing its equipment utilization. The utilization figures used in determining the standards have already been achieved by at least one district and should serve as a gauge for all districts in improving equipment utilization.

CHART C

Class Code	Item	I	II	III	IV	V	VI	Average
11	Utility Trucks	1,283	1,472*	1,093	874	1,110	1,053	1,148
12	Single Axle Dump Trucks	842	1,219*	1,218	1,093	1,121	1,069	1,094
13	Tandem Axle Dump Trucks	950	1,150*	1,002	1,020	1,057	752	989
14	Tractor Trucks	154	389	405	395	423*	300	344
15	A.W.D. Trucks	510	1,183*	522	257	390	418	547
21	Line Striper	930	1,118*	637			915	900
23	Traction Broom	286	320*	219	146	280	230	247
24	Street Sweeper	1,101*	855	260	274	139	248	480
25	Water Trucks	601	1,174*	531	285	493		617
28	Distributors	114	582*	337	404	468	313	370
30	Maintenance Distributors	25	186	212	193	348*	287	209
31	Motor Graders	675	725	494	777*	562	626	643
33	Pulvimixer		113	233	247*	63	135	158
35	Loaders	796	913	991*	968	809	724	867
37	Conveyors	8	64	322	873*	372	265	317
40	Patcheaters & Crack Fillers		140	218*	168	18	206	150
41	Mowers	349	215	399*	317	88	313	280
42	Rotary Plows		91*	36	53			60
45	Steel Wheeled Rollers	149	301	213	226	304	332*	254
47	Pneumatic Rollers	79	559*	324	140	353	369	304
48	Shovel & Backhoe Comb.		344*	259				302
54	Indust. Tractors w/Attach.	386	398	324	434*	149	319	335
55	Crawler Tractors	731	260	380	900*	456	151	480
60	Cargo Tilt Trailer	280	384	341	324	443*	294	344
63	Arrow Bds. & Sign Trailers	178	340*	326	152	248	324	261
66	Chip Spreaders	87	702*	337	240		239	321
68	Screening Plants			368	965*	132	96	390

* District High

CHART D

Class Code	Item	Hours Used Dist. Avg.	Hours Used Dist. High	Percent Diff. Between High and Average	Total Hours	Proposed Standard Hours	% Proposed Greater Than Dist. Avg.
11	Utility Trucks	1,148	1,472	28.2	2,620	1,310	14.1
12	Single Axle Dump Trucks	1,094	1,219	11.4	2,313	1,157	5.8
13	Tandem Axle Dump Trucks	989	1,150	16.3	2,139	1,070	8.2
14	Tractor Trucks	344	423	23.0	767	384	11.6
21	Line Striper**	900	1,118	24.2	2,018	1,009	12.1
23	Traction Broom	247	320	29.6	567	284	15.0
24	Street Sweeper	480	1,101	129.3	1,581	791	64.8
25	Water Trucks***	617	1,174	90.8	1,791	896	45.2
28	Distributors	370	582	57.3	952	476	28.6
30	Maintenance Distributors	209	348	66.5	557	279	33.5
31	Motor Grader	643	777	20.8	1,420	710	10.4
33	Pulvimixer***	158	247	56.3	405	203	28.9
35	Loaders	867	991	14.3	1,858	929	7.1
37	Conveyors	317	873	175.3	1,190	595	87.7
40	Patcheaters & Crack Fillers***	150	218	45.3	368	184	22.7
41	Mowers	280	399	42.5	679	340	21.4
45	Steel Wheeled Rollers	254	332	30.7	586	293	15.4
47	Pneumatic Rollers	304	559	83.9	863	432	42.1
48	Shovel & Backhoe Comb.*	302	344	13.9	646	323	7.0
54	Indust. Tractors w/Attach.	335	434	29.6	769	385	14.9
55	Crawler Tractors	480	900	87.5	1,380	690	43.8
60	Cargo Tilt Trailer	344	443	28.8	787	394	14.5
63	Arrow Bds. & Sign Trailers	261	340	30.3	601	301	15.3
66	Chip Spreaders***	321	702	118.7	1,023	512	59.5
68	Screening Plants**	390	965	147.4	1,355	678	73.8

* Two Districts
** Four Districts
*** Five Districts

In addition, a comparison of actual versus potential usage has also been prepared. Chart E is a copy of one of the utilization charts transmitted to the subcommittee on April 24. The chart compares the actual usage of equipment to the potential usage of equipment of all equipment assigned to the maintenance districts.

It should be noted that maintenance utilization varies from a high of 59.3% for utility trucks to a low of 7% for pulvimixers. A private industry equipment rental firm indicates that 60% is the break even point for purchase versus rental decisions.

The subcommittee should review this chart with caution, as there may be valid reasons for the low utilization percentages, such as, age of equipment, seasonal conditions, project and manpower schedules.

This report also contains additional areas for further investigation in the subcommittee's equipment utilization studies which follow.

Equipment Rental Rates

One of the possible areas that the subcommittee may want to investigate in its continuing survey of equipment utilization is the Nevada Department of Transportation's equipment rental procedures.

As mentioned earlier in this report, the Nevada Department of Transportation's hourly rental schedule differs from the flexible equipment rental system used in Virginia. According to Department equipment personnel, Nevada's system provides the same rental rate for equipment classes to all districts. Although the rental rates vary with equipment classes and encompass the total cost of the equipment, insurance, depreciation and overhead, the rates charged to all districts are the same and the districts are not charged for use of the equipment unless it is actually used, regardless of whether or not the equipment is assigned to a specific district. The fact that the rate is the same for all districts and not charged unless equipment is activated, can result in few attempts at user control of equipment or increased equipment utilization.

On the other hand, the Virginia Highway Department has a flexible rental schedule that encompasses total cost of equipment, insurance, depreciation, overhead and utilization; therefore, equipment rental rates charged to districts are not the same. Those districts with higher utilization are, in effect, charged lower rental rates, subsequently, equipment users play a more active role in equipment operational cost decisions.

CHART E

TOTAL HIGHWAY EQUIPMENT ASSIGNED TO DISTRICTS

Equip. Class Code	Equipment Description	# of Units	Total Hours Used FY 1978-79	Total Hours Available FY 1978-79	Percentage Utilizatio FY 1978-79
11	Utility Trucks	90	110,958	187,200	59.3%
12	Single Axle Dump Trucks	173	197,161	359,840	54.8%
13	Tandem Axle Dump Trucks	65	65,271	135,200	48.3%
14	Tractor Trucks	13	4,285	27,040	15.8%
21	Line Striper	4	3,600	8,320	43.3%
23	Traction Broom	54	13,730	112,320	12.2%
24	Street Sweeper	11	7,892	22,880	34.5%
25	Water Trucks	8	4,946	16,640	29.7%
28	Distributors	13	5,013	27,040	18.5%
30	Maintenance Distributors	27	5,674	56,160	10.1%
31	Motor Grader	53	34,039	110,240	30.9%
33	Pulvimixer	17	2,484	35,360	7.0%
35	Loaders	77	67,287	160,160	42.0%
40	Patcheaters & Crack Fillers	30	4,896	62,400	7.8%
41	Mowers	18	5,419	37,440	14.5%
45	Steel Wheeled Rollers	22	6,004	45,760	13.1%
47	Pneumatic Rollers	12	3,646	24,960	14.6%
48	Shovel & Backhoe Comb.	2	659	4,160	15.8%
54	Indust. Tractor w/ Attach.	32	11,380	66,560	17.1%
55	Crawler Tractor	18	7,687	37,440	20.5%
60	Cargo Tilt Trailers	69	24,159	143,520	16.8%
63	Arrow Bds. & Sign Trailers	127	35,985	264,160	13.6%
	Seasonal and/or Special Use Equipment				
15	A.W.D. Trucks	32	27,546	N/A	N/A
42	Rotary Plows	16	1,198	N/A	N/A
	Other Equipment				
37	Conveyers	31	11,046	64,480	17.1%
66	Chip Spreaders	5	1,872	10,400	18.0%
68	Screening Plant	5	2,013	10,400	19.4%

Discussions with NDOT equipment personnel, indicated that consideration is currently underway to change the current equipment rental plan. The new procedure would establish a dual rental rate system which would charge rental rates based upon miles or hours of use and equipment unit assignment. Under the new system, therefore, districts will be charged one rate for equipment assigned to the district and another rate for using the equipment. It is foreseen that this rental method could result in increased equipment utilization and a subsequent reduction in overall operational costs.

The subcommittee may want to investigate this proposal further as a means of increasing departmental equipment utilization efficiency.

Equipment Division Organization

Another area the subcommittee may want to review is the organization of the Equipment Division within the Department and the role that Division plays in equipment utilization, acquisition, maintenance and replacement decisions.

Discussion with Highway equipment personnel indicated that while the Equipment Division has accountability for record maintenance and accounting for all departmental equipment, the Division does not--other than in an advisory capacity--have control over the placement of equipment in districts, the maintenance of utilization standards, or direct line control over district equipment personnel. As shown on the attached organizational chart, the equipment personnel in the districts report directly to the district engineers and not to the State Highway Equipment Superintendent. Information also indicates that the Division does have input into the drawing up of specifications for new maintenance equipment, does do the "make ready" work on new equipment received by the Department, conducts ongoing training of district equipment personnel, and is responsible for monitoring of equipment parts inventory purchases and maintenance within the districts.

The subcommittee may want to delve further into the role that it feels the Equipment Division should play particularly in the areas of equipment assignment and utilization rate monitoring and control. In addition, the subcommittee may want to discuss with departmental personnel the reasons for the district equipment personnel reporting structure as it is now established and investigate the possibility of increased efficiency in the department equipment operations through a transfer of authority for these positions to the Equipment Division.

Rental of Maintenance Equipment

The subcommittee may want to explore the feasibility of recommending increased rental of certain equipment where low utilization

ASSISTANT DIRECTOR OPERATIONS
HIGHWAY EQUIPMENT SUPERINTENDENT
ASSISTANT HIGHWAY EQUIPMENT SUPERINTENDENT
DEPT SIGN SHOP
SIGN SHOP SUPERVISOR
SIGN PAINTER (2)
SIGN FABR. (2)
SLK. SCRN OPR (1)
SPECIAL PROJECTS
SENIOR AUDITOR
ACCOUNTANT (1)
DIST.2 SHOP RENO
SUPV. EQUIP. MEC 2
EQUIP. MEC. 3 (4)
EQUIP. MEC. 2 (22)
EQUIP MEC. 1 (1)
SP EQUIP OPR (2)
WELDER (2)
AUTO BDYMN (1)
MACHINIST (1)
CUST. WKR. (4)
GAR. SVCMN. (3)
CARSON MOTOR POOL
GAR. SVCMN. FRMN.
SUPV GARAGE SERVICEMAN (1)
GAR. SVCMN (3)
ACCOUNTING OFFICE
ACCOUNTANT
MGMT. ASST. I (1)
ADMIN. AID 2 RG B (1)
ADMIN AID 2 RG A (2)
EQUIP. SPECIF. ANALYST
EQUIP. DIVISION STOCKROOMS CHIEF STOREKEEPER
EQUIP PARTS MANAGER 2
EQUIP. PARTS STOREKEEPER (5)
DISTRICT ENGINEER DISTRICT 1 LAS VEGAS
DISTRICT 1 SHOP SUPV EQUIPMENT MECHANIC 2
EQUIP. MEC 3 (2)
EQUIP. MEC 2 (9)
EQUIP MEC 1 (1)
WELDER (1)
AUTO BDYMN (1)
GAR. SVCMN. (1)
EQUIP PARTS MANAGER 1
EQUIP. PARTS STOREKEEPER (2)
DISTRICT ENGINEER DISTRICT 2 RENO
CARSON SHOP SUPV EQUIPMENT MECHANIC 2
EQUIP MEC 3 (1)
EQUIP. MEC. 2 (6)
EQUIP. PARTS MANAGER 1
EQUIP PARTS STOREKEEPER (1)
FALLON SHOP
EQUIP MEC 3 (1)
DISTRICT ENGINEER DISTRICT 3 ELKO
DISTRICT 3 SHOP SUPV EQUIPMENT MECHANIC 2
EQUIP MEC. 3 (2)
EQUIP MEC 2 (8)
WELDER (1)
GAR SVCMN (1)
EQUIP PARTS MANAGER 1
EQUIP. PARTS STOREKEEPER (2)
DISTRICT ENGINEER DISTRICT 4 ELY
DISTRICT 4 SHOP SUPV. EQUIPMENT MECHANIC 2
EQUIP. MEC 3 (1)
EQUIP. MEC 2 (7)
WELDER (1)
GAR SVCMN (1)
EQUIP. PARTS MANAGER 1
EQUIP PARTS STOREKEEPER (2)
DISTRICT ENGINEER DISTRICT 5 TONOPAH
DISTRICT 5 SHOP SUPV EQUIPMENT MECHANIC 2
EQUIP MEC. 3 (1)
EQUIP MEC 2 (5)
WELDER (1)
GAR SVCMN (1)
EQUIP PARTS MANAGER 1
EQUIP PARTS STOREKEEPER (1)
DISTRICT ENGINEER DISTRICT 6 WINNEMUCCA
DISTRICT 6 SHOP SUPV. EQUIPMENT MECHANIC 2
EQUIP. MEC. 3 (1)
EQUIP MEC 2 (6)
WELDER (1)
GAR SVCMN (1)
EQUIP PARTS MANAGER 1
EQUIP PARTS STOREKEEPER (2)

rates would warrant such action. In considering such action, however, the subcommittee should be advised that in the past, the Department has indicated the types of equipment required were not available for rent; however, the downturn in the economic situation may be more favorable to the Department in its efforts in this area in the future. The possibility of an advance agreement with some contractors could also be researched.

Conclusions:

In conclusion, this report contains some possible ideas the subcommittee may want to consider in its deliberations concerning maintenance equipment utilization studies. Some of the possible proposals include:

1. Development of equipment utilization standards as targets to shoot for in increasing equipment utilization efficiency.

2. Adoption of an equipment rental system that encourages increased equipment user participation and utilization incentives.

3. Review of the current organizational structure as it affects equipment utilization efficiency.

4. Consideration for increased equipment rental should the proper equipment be available.

The ever increasing value of highway maintenance equipment makes maximum utilization of that equipment a top priority. The utilization issue is sure to become a much more important issue in the future particularly if additional General Fund appropriations are required to aid the ailing Highway Fund.

District I Equipment Utilization

Equip. Class Code	Equipment Description	# of Units	Total Hours Used FY 1978-79	Total Hours Available FY 1978-79	Percentage Utilization FY 1978-79
11	Utility Trucks	30	38,482	62,400	61.7%
12	Single Axle Dump Trucks	12	10,109	24,960	40.5%
13	Tandem Axle Dump Trucks	14	13,296	29,120	45.7%
14	Tractor Trucks	3	462	6,240	7.4%
21	Line Striper	1	930	2,080	44.7%
23	Traction Broom	8	2,286	16,640	13.7%
24	Street Sweeper	4	4,405	8,320	52.9%
25	Water Trucks	4	2,404	8,320	28.9%
28	Distributors	2	227	4,160	5.5%
30	Maintenance Distributors	4	100	8,320	1.2%
31	Motor Grader	9	6,077	18,720	32.5%
35	Loaders	12	9,554	24,960	38.3%
41	Mowers	4	1,396	8,320	16.8%
45	Steel Wheeled Rollers	2	298	4,160	7.2%
47	Pneumatic Rollers	2	157	4,160	3.8%
54	Indust. Tractor w/ Attach.	7	2,703	14,560	18.6%
55	Crawler Tractor	3	2,194	6,240	35.2%
60	Cargo Tilt Trailers	13	3,644	27,040	13.5%
63	Arrow Bds. & Sign Trailers	19	3,385	39,520	8.6%
	Seasonal Equipment				
15	A.W.D. Trucks	2	1,020	N/A	N/A
	Other				
37	Conveyors	1	8	2,080	0.0%
66	Chip Spreaders	1	87	2,080	4.2%

Source: Fiscal Analysis Division with information supplied by the NDOT Equipment Listing Class and District - 6/30/79 and from the MMS Summary of Equipment Hours - 7/78 thru 6/79.

District II Equipment Utilization

Equip. Class Code	Equipment Description	# of Units	Total Hours Used FY 1978-79	Total Hours Available FY 1978-79	Percentage Utilization FY 1978-79
11	Utility Trucks	24	35,325	49,920	70.8%
12	Single Axle Dump Trucks	58	70,692	120,640	58.6%
13	Tandem Axle Dump Trucks	19	21,850	39,520	55.3%
14	Tractor Trucks	2	778	4,160	18.7%
21	Line Striper	1	1,118	2,080	53.8%
23	Tractor Broom	12	3,843	24,960	15.4%
24	Street Sweeper	3	2,566	6,240	41.1%
25	Water Trucks	1	1,174	2,080	56.4%
28	Distributors	3	1,745	6,240	28.0%
30	Maintenance Distributors	5	932	10,400	9.0%
31	Motor Grader	12	8,704	24,960	34.9%
33	Pulvimixer	5	565	10,400	5.4%
35	Loaders	19	17,350	39,520	43.9%
40	Patcheaters & Crack Fillers	10	1,398	20,800	6.7%
41	Mowers	1	215	2,080	10.3%
45	Steel Wheeled Rollers	10	3,011	20,800	14.5%
47	Pneumatic Rollers	2	1,118	4,160	26.9%
48	Shovel & Backhoe Comb.	1	344	2,080	16.5%
54	Indust. Tractor w/ Attach.	7	2,789	14,560	19.2%
55	Crawler Tractor	4	1,038	8,320	12.5%
60	Cargo Tilt Trailers	16	6,148	33,280	18.5%
63	Arrow Bds. & Sign Trailers	32	10,880	66,560	16.3%
	Seasonal Equipment				
15	A.W.D. Trucks	18	21,293	N/A	N/A
42	Rotary Plows	11	1,000	N/A	N/A
	Other Equipment				
37	Conveyers	3	193	6,240	3.1%
66	Chip Spreaders	1	702	2,080	33.8%
77	Line Striper, Freeway	1	872	2,080	41.9%

Source: Fiscal Analysis Division with information supplied by the NDOT Equipment Listing Class and District - 6/30/79 and from the MMS Summary of Equipment Hours - 7/78 thru 6/79.

District IV Equipment Utilization

Equip. Class Code	Equipment Description	# of Units	Total Hours Used FY 1978-79	Total Hours Available FY 1978-79	Percentage Utilization FY 1978-79
11	Utility Trucks	9	7,864	18,720	42.0%
12	Single Axle Dump Trucks	28	30,600	58,240	52.5%
13	Tandem Axle Dump Trucks	7	7,143	14,560	49.1%
14	Tractor Trucks	2	790	4,160	19.0%
23	Tractor Broom	8	1,169	16,640	7.0%
24	Street Sweeper	1	274	2,080	13.2%
25	Water Trucks	1	285	2,080	13.7%
28	Distributors	2	808	4,160	19.4%
30	Maintenance Distributors	4	770	8,320	9.3%
31	Motor Grader	7	5,440	14,560	37.4%
33	Pulvimixer	2	490	4,160	11.8%
35	Loaders	10	9,667	20,800	46.5%
40	Patcheaters & Crack Fillers	4	672	8,320	8.1%
41	Mowers	4	1,269	8,320	15.3%
45	Steel Wheeled Rollers	2	451	4,160	10.8%
47	Pneumatic Rollers	2	280	4,160	6.7%
54	Indust. Tractor w/ Attach.	4	1,734	8,320	20.8%
55	Crawler Tractors	2	1,799	4,160	43.2%
60	Cargo Tilt Trailers	10	3,244	20,800	15.6%
63	Arrow Bds. & Sign Trailers	12	1,829	24,960	7.3%
	Seasonal Equipment				
15	A.W.D. Trucks	2	514	N/A	N/A
42	Rotary Plows	1	53	N/A	N/A
	Other Equipment				
37	Conveyers	4	3,490	8,320	4.2%
66	Chip Spreaders	1	240	2,080	11.5%
68	Screening Plant	1	965	2,080	46.4%

Source: Fiscal Analysis Division with information supplied by the NDOT Equipment Listing Class and District - 6/30/79 and from the MMS Summary of Equipment Hours - 7/78 thru 6/79.

District V Equipment Utilization

Equip. Class Code	Equipment Description	# of Units	Total Hours Used FY 1978-79	Total Hours Available FY 1978-79	Percentage Utilization FY 1978-79
11	Utility Trucks	8	8,877	16,640	53.3%
12	Single Axle Dump Trucks	27	30,268	56,160	53.9%
13	Tandem Axle Dump Trucks	8	8,453	16,640	50.8%
14	Tractor Trucks	2	846	4,160	20.3%
23	Tractor Broom	11	3,076	22,880	13.4%
24	Street Sweeper	1	139	2,080	6.7%
25	Water Trucks	1	493	2,080	23.8%
28	Distributors	2	935	4,160	22.5%
30	Maintenance Distributors	5	1,738	10,400	16.7%
31	Motor Grader	10	5,620	20,800	27.0%
33	Pulvimixer	3	188	6,240	3.0%
35	Loaders	14	11,322	29,120	38.9%
40	Patcheaters & Crack Fillers	3	53	6,240	1.0%
41	Mowers	2	176	4,160	4.2%
45	Steel Wheeled Rollers	2	608	4,160	14.6%
47	Pneumatic Rollers	2	706	4,160	17.0%
54	Indust. Tractor w/ Attach.	2	297	4,160	7.1%
55	Crawler Tractor	2	912	4,160	21.9%
60	Cargo Tilt Trailers	12	5,313	24,960	21.2%
63	Arrow Bds. & Sign Trailers	12	2,976	24,960	11.9%
	Seasonal Equipment				
15	A.W.D. Trucks	3	1,170	N/A	N/A
	Other Equipment				
37	Conveyers	7	2,605	14,560	17.9%
68	Screening Plant	1	132	2,080	6.3%

Source: Fiscal Analysis Division with information supplied by the NDOT Equipment Listing Class and District - 6/30/79 and from the MMS Summary of Equipment Hours - 7/78 thru 6/79.

NEVADA DEPARTMENT OF HIGHWAYS 3/15/79

PROPOSED REPLACEMENT EQUIPMENT FY. 1979 - 80

Class Code	Description	Quantity	Unit Cost	Total Cost
1	Sedans	27	$ 4,963	$ 134,000
3	Pickups	50	6,000	300,000
8	Trench Filler Mixiel 600	2	14,000	28,000
11	9500 GVW Truck W/GVAB. Compact	1	15,000	15,000
11	9500 GVW C&C Truck	3	6,000	18,000
11	9500 GVW Dump Truck	3	8,300	24,900
11	27,500 GVW C&C W/1500 Cal Weeder	1	30,000	30,000
12	27,500 GVW C&C Truck	18	18,500	333,000
13	46,000 GVW Tandem Dump Truck	14	36,000	504,000
15	41,000 GVW AWD Truck	2	46,000	92,000
23	Road Broom - Tow Type	2	6,900	13,800
24	Self Propelled Street Sweeper	1	46,300	46,300
24	Sweepster Model TP-60 Sweeper	2	12,000	24,000
31	Motor Grader	4	56,000	224,000
35	Loader 2½ Cu Yo W/4 in 1 Bucket	3	50,000	150,000
35	Small Loader With Trencher	1	25,000	25,000
35	Loader -1.5 Cu. Yo.,	1	37,500	37,500
37	Conveyor 30" X 70' - Gas Operated	1	26,500	26,500
40	Crack Filler - Trailer Mounted	1	11,200	11,200
40	Paver, Asphalt, Towed W/Auger	1	12,000	12,000
41	Trash Shredder - Trailer Mounted	1	5,000	5,000
41	15 FT Rotary Mower	1	6,200	6,200
47	Pneumatic Roller 3-10 Ton	2	24,000	48,000
54	Industrial Tractor With Drag Blade	1	10,000	10,000
	Non Rental Equip. (Compressors, Generators, and Other Non-Motored Equipment)			$ 381,600
	Department Total	143 Units		2,500,000

PROPOSED ADDITONAL EQUIPMENT FOR FISCAL YEAR 1979-80
(Not replacement for older equipment)

	Quantity	Class Code	Description	Amount
District 1	1	24	Street Sweeper, SP	$ 46,300.00
	1	54	Tractor W/Drag Blade Small	10,000.00
	1	35	Loader, Small Bob Cat Trencher & Small Hoe	25,000.00
	1	41	Trash Shredder, trlr mtd	5,000.00
District 2	1	23	Road Broom, Tow Type	6,900.00
	1	47	Pneumatic Roller	24,000.00
	1	66	Paver, Self Propelled	100,000.00
District 3	1	25	Truck Water 3600 Gal Cap.	49,600.00
	1	40	Paver, Asphalt, Towed w/Auger (Layton)	12,000.00
	1	45	Roller 8-12 Ton Steel Wheel	37,000.00
District 4	1	8	Trench Filler Model 600	14,000.00
District 5	1	45	Roller, Steel Wheel 8-12 Ton	37,000.00
	1	47	Roller, Pneumatic Tired	24,000.00
	1	8	Trench Filler Model 600	14,000.00

1XX LAS VEGAS
2XX RENO
3XX ~~RENO~~. ELKO
4XX ELY
5XX TONAPAH
6XY WINNEMUCCA
7XX EQUIP DIV - STATEWIDE + MTR POOLS

NEVADA DEPARTMENT OF HIGHWAYS

PROPOSED REPLACEMENT EQUIPMENT FOR 1980-81

CODE	DESCRIPTION	QUANTITY	UNIT COST	TOTAL
1	Sedans	25	5360.	134,(
3	Pickups	45	6666.	300,(
8	Trench Filler, Model 600	2	14000.	28,(
11	9500 GVW Truck, W/Gbg. Comp.	1	15000.	15,(
11	9500 GVW C&C Truck	3	6000.	18,(
11	9500 GVW Dump Truck	3	8300.	24,9
12	27,000 GVW C&C Truck	18	18500.	333,(
13	46,000 GVW Tandem Axle Dump Truck	14	36000.	504,(
15	41,000 GVW AWD Truck	2	50000.	100,(
24	Self-Propelled Street Sweeper	2	75000.	150,(
24	Sweepster, Mdl TP-60 Sweeper	2	12000.	24,(
37	Conveyor 30" 70' - Gas Operated	2	30000.	60,(
40	Re-Cycle Machines	3	12000.	36,(
40	Paver, Asphalt, towed w/auger	1	12000.	12,(
41	15 Ft. Rotary Mower	1	6100.	6,1(
42	Rotary Plow	1	175000.	175,(
67	Road Planer	1	150000.	150,(
78	Pugmill Asphalt Plant	2	75000.	150,(
	Non-Rental Equipment (Compressor, Generators, and other Non-Motored Equipment)			280,00
	Department Total 128 Units			2,500.00

Appendix L

STATE	CURRENT TAX PER GALLON	LAST DATE OF CHANGE	TAXATION OF GASOHOL	NOTES
ALABAMA	11¢	8/80	Effective 7/80, tax is 3¢/gal. less than gasoline tax.	
ALASKA	8¢	7/61	Effective 1/81, exempt entirely.	--
ARIZONA	8¢	9/74		
ARKANSAS	9.5¢	7/79	Effective 7/79, gasohol manufactured in-state is exempt.	
CALIFORNIA	7¢	9/69		Levies an additional 4.75% sales tax.
COLORADO	7¢	6/69	Taxed at 2¢/gal. until 7/85. CO also provides a reduced property valuation (1980-84) for property used in the production of gasohol.	
CONNECTICUT	11¢	6/76	Effective 7/79, tax is 10¢/gallon.	Proposal to shift to a tax of 11% of the wholesale price failed during 1980 session.
DELAWARE	9¢	9/78		
FLORIDA	8¢	7/71	7/80-7/83, taxed at 3¢/gal.; 7/83-7/85, exempt from 4¢ of prevailing gasoline tax; 7/85-7/87, exempt from 2¢ of prevailing gasoline tax.	
GEORGIA	7.5¢	7/79		Levies an additional sales tax of 3% of the retail price, less the 7.5¢ tax.
HAWAII	8.5¢	5/75	7/80-6/85, exempt entirely.	Levies an additional 4% sales tax.
IDAHO	9.5¢	7/76		

STATE	CURRENT TAX PER GALLON	LAST DATE OF CHANGE	TAXATION OF GASOHOL	NOTES
ILLINOIS	7.5¢	8/69	Currently taxed at prevailing gasoline rate.	Levies an additional 4% sales tax.
INDIANA	8.5¢*	3/80	Exempt from all taxes.	*Rate set semi-annually at 8% of the average retail price (before taxes). A ceiling is imposed of 12¢/gal. in 1980; 14¢/gal. in '81; 16¢/gal. thereafter. A 4% sales tax is also levied.
IOWA	10¢	7/79	Currently exempt from all taxes except a 3% sales tax. Beginning 5/81, gasohol will be taxed at 5¢/gal. through 1983 & exempt from the sales tax.	All motor fuel taxes are required by the Iowa Constitution to go to the highway fund; state sales tax revenue (from gasoline sales) go to general revenue.
KANSAS	8¢	7/76	Effective 7/80, gasohol tax increased from 3¢/gal. to 4¢/gal. Tax will increase 1¢/gal. each year until it reaches 8¢/gallon.	
KENTUCKY	9¢*	7/80		*Tax changed from 9¢/gal. to 9% of the average wholesale price, eff. 7/1/80. Rate is set quarterly.
LOUISIANA	8¢	1/69	From 10/79-10/89, gasohol produced in-state is exempt.	
MAINE	9¢	7/71		
MARYLAND	9¢	7/72	Effective 5/80-5/81, taxed @ 5¢/gal. Thereafter, taxed at 1¢/gal. less than prevailing gasoline tax.	A proposed shift to taxing at 9% of the average retail price failed during the 198C session.

STATE	CURRENT TAX PER GALLON	LAST DATE OF CHANGE	TAXATION OF GASOHOL	NOTES
MASSACHUSETTS	10¢*	8/80	Entirely exempt.	*Rate changed from 8.5¢/gal. to 10% of the average wholesale price, eff. 8/1/80. The 10¢ rate is in effect through 10/30/80 No-ceiling imposed.
MICHIGAN	11¢	1/79		A bill to increase the tax to 12¢/gal. failed during the 1980 session
MINNESOTA	11¢	5/80	Effective 5/80, tax was reduced from 9¢/gal. to 5¢/gal. for in-state production.	
MISSISSIPPI	9¢	7/73		Levies an additional 5% sales tax.
MISSOURI	7¢	8/72		
MONTANA	9¢*	7/79	Taxed @ 2¢/gal. until 3/85; 4¢/gal. from 4/85-3/87; 6¢/gal. from 4/87-3/89. Law terminates on 4/1/89.	*Rate in effect from 7/1/79 until 6/30/83.
NEBRASKA	10.5¢*	6/79	Effective 6/79, tax is 5.5¢/gal. Beginning 7/83, the reduced rate will apply only to in-state production.	*Effective 10/1/80, the tax will increase by adding an additional tax of 2% of the statewide average cost of fuel. A second, additional tax of 1¢/gal. will also be imposed.
NEVADA	6¢	7/55		
NEW HAMPSHIRE	11¢	7/79	Effective 8/79-6/83, taxed at 5¢ less than prevailing gasoline tax.	
NEW JERSEY	8¢	7/72		

STATE	CURRENT TAX PER GALLON	LAST DATE OF CHANGE	TAXATION OF GASOHOL	NOTES
NEW MEXICO	8¢*	7/80	Effective 7/80-6/85, exempt.	*For every 10¢ increas in the wholesale price the tax will increase 1¢, with a ceiling imposed of a 1¢/gal/year increase.
NEW YORK	8¢	2/72		Also levies a sales tax of 4%.
NORTH CAROLINA	9¢	7/69	From 1/81-6/81, taxed at 5¢/gal. Will increase 1¢/year until 1984.	
NORTH DAKOTA	8¢	7/77	Taxed at 4¢/gal. (eff. 7/79)	
OHIO	7¢	5/59		
OKLAHOMA	6.58¢	12/49	Gasohol produced in-state is exempt from 6.5¢ of gasoline tax.	An additional tax of 1.42¢/gal. failed to pass during the 1980 session.
OREGON	7¢	10/67	Provides a property tax exemption for property used in gasohol production.	
PENNSYLVANIA	11¢	7/79		
RHODE ISLAND	10¢	6/75		
SOUTH CAROLINA	10¢*	9/79	Effective 10/80, will be exempt until 1/85.	*Effective 10/1/80, tax will increase to 11¢/gallon.
SOUTH DAKOTA	12¢	4/80	Effective 4/80, tax was increased from 5¢ to 8¢/gal. Will revert to prevailing gasoline tax rate in 7/82.	
TENNESSEE	7¢	6/31		

STATE	CURRENT TAX PER GALLON	LAST DATE OF CHANGE	TAXATION OF GASOHOL	NOTES
TEXAS	5¢	9/56		
UTAH	9¢	7/78	Until 6/85, gasohol produced in part in-state will be taxed at 4¢/gal. On 7/1/85, tax will revert to prevailing gasoline tax rate.	
VERMONT	9¢	5/71		
VIRGINIA	11¢	7/80		Effective 7/1/80, an additional 2% sales tax is levied on fuel sold within a district that is a member of a mass transportation system. An additional 2% tax will be added beginning 7/1/82.
WASHINGTON	12¢*	7/79	Effective 6/80, gasohol is subject to a 4.5% sales & use tax.	*Tax is 21.5% of the average retail price with a minimum of 9¢/gal. & a maximum of 12¢/gal. Rate determined semi-annually.
WEST VIRGINIA	10.5¢	7/79		
WISCONSIN	9¢	4/80		
WYOMING	8¢	3/76	Taxed at 4¢/gal. through 1984. Exempt from WY sales tax.	

Chart prepared by:

Nancy C. Hauswald
National Conference of State Legislatures
1125 - 17th Street - Suite 1500
Denver, Colorado 80202

(303) 623-6600

Appendix M

NEVADA
DEPARTMENT OF TRANSPORTATION

JOSEPH A. SOUZA
Director

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

1263 SOUTH STEWART STREET
CARSON CITY, NEVADA 89712

May 6, 1980

IN REPLY REFER TO

The Honorable Robert List
Governor's Office
Capitol Building
Carson City, Nevada 89710

Dear Governor List:

The accompanying summary is an estimate and projection of Highway Fund and Department of Transportation financial activity for the current and next biennium. It includes two years of actual revenue and expenditure figures for purposes of comparison. The summary portrays total Department of Transportation expenditures by year, deducts Federal-Aid reimbursement and shows the remainder expended (1977-1978 and 1978-1979) or estimated to be needed from State revenue sources. Federal-Aid is shown as a reimbursement rather than revenue since it is received in that manner. State funds are expended on projects and the Federal Government reimburses the Department for its share (generally 95%).

No attempt was made to add increases for inflation in 1980-81 since revenues for that fiscal year are apt to be relatively fixed if our estimates are correct. Anticipated inflationary increases were added in 1981-82 and 1982-83 to show the basic needs of the Department just to keep the doors open.

Revenues are estimated using the best information currently available. No attempt was made to calculate the effects of the President's proposal to add a tax of 10¢ to 14¢ per gallon on gasoline. It is likely that tax will result in fewer gasoline being sold, possibly as much as 3% to 4%.

It is clear that the Department of Transportation and Highway Fund are rapidly approaching a financial crisis with few alternatives available. Either expenditures must be reduced to stay within available revenues or major new sources of support must be found.

The first alternative involves the elimination of between one-fourth and one-third of State-funded programs and employees--up to 300 employees and $4 to $6 million annually in other cost

reductions. The largest impact would be in maintenance programs which account for the lions share of State dollar expenditures.

It is our considered recommendation that we aggressively seek an additional $20 million annually for highway programs. Such an increase would provide only for the cost of inflation and a modest contract maintenance (resurfacing) program and a minimal replacement program for equipment. It would not provide enough money to reduce backlog or deferred maintenance; nor would it provide any relief for buildings and facilities, involving 300 structures, 50% of which are older than 25 years.

The following revenue or taxing alternatives have been considered:

1. Two cent increase in present gas and special fuel tax; $10 to $11 million annually.

2. Double vehicle registration fees ($5.50 to $11.00 for automobiles and corresponding increase for trucks); approximately $8.7 million annually.

3. Extended 3 1/2¢ sales tax to gas and special fuels; approximately $25 million annually (assuming $1.20 per gallon average price of gas).

4. Earmarking sales taxes on motor vehicle and accessories for highway purposes; $16 million annually.

5. Increase motor carrier fees 25%; $2.5 million annually.

6. Should actively oppose reducing taxes on gasahol and other fuel alternatives.

The Department recommends a combination of measures:

1. Two cent increase on gas and special fuels converted to a percentage of wholesale price. Also, it is recommended the existing tax be converted to a percentage of wholesale price, the advantage being inflation responsiveness and an in-place mechanism to collect the tax.

2. An increase in registration fees from $5.50 to $11.00 and a corresponding doubling of pro-rata registrations, truck registrations and title fees. Consideration

should be given to registering automobiles on the basis of weight as well as pickups and trucks. Also, it may be desirable to alter classifications to lessen the impact on non commercial pickups and to consider combining registration and mileage fees on commercial vehicles.

3. An increase of 25% in Motor Carrier and other fees collected by DMV.

The proposed raises would still leave Nevada's fees and registrations below the average of the 50 United States.

We will be prepared to discuss our proposals at the May 13, 1980 Transportation meeting.

Prior to presenting our proposed revenue package to the legislature, we will coordinate with DMV and the Department of Taxation to insure that our proposals are not in conflict with other legislative proposals.

Sincerely,

Gene Phelps

GENE PHELPS
Assistant Director
Administration

GP:rc
Attachment
cc: Honorable Richard Bryan; w/attach.
Honorable Wilson McGowan; w/attach.

DEPARTMENT OF TRANSPORTATION
REVENUE & EXPENDITURE SUMMARY & PROJECTION
for the period 1977-1983

	Actual 1977-78	Actual 1978-79	Estimated 1979-80	Estimated 1980-81	Projection 1981-82	Projection 1982-83
Expenditures:						
Salaries:	$24,920,038	$26,438,471	$28,100,000	$30,900,000	$33,750,000	$35,775,000
Travel:	726,280	714,720	950,000	950,000	1,045,000	985,000
Operating:	9,245,997	11,739,621	13,712,000	14,000,000	15,680,000	17,200,000
Equipment:	3,227,535	2,883,561	960,000	100,000	3,000,000	2,500,000
Cap. Outlay(Fed)	60,501,096	59,424,654	82,000,000	85,000,000	65,000,000	55,000,000
Cap. Outlay(State)	7,582,070	5,631,896	8,325,100	500,000	500,000	500,000
Total Expenditures:	$106,203,016	$106,832,923	$134,047,100	$131,450,000	$118,975,000	$111,960,000
Less Fed-Aid Reim.	$65,528,849	$61,522,610	$88,500,000	$91,800,000	$70,850,000	$59,950,000
Expended or Needed from State Sources	$40,674,167	$45,310,313	$45,547,100	$39,650,000	$48,125,000	$52,010,000
Revenues:						
Gasoline Taxes:	$20,474,011	$22,168,848	$21,503,700	$21,500,000	$22,000,000	$23,000,000
DMV Taxes & Fees:						
Registration:	8,025,269	9,157,345	8,699,000			
Priv. Tax	813,850	994,864	995,000			
Mtr. Carrier:	8,471,477	9,842,416	10,334,000			
PSC Reg.	343,239	407,761	415,000			
Dr. License:	1,158,719	883,181	-	26,000,000	26,500,000	28,000,000
Special Fuel:	4,091,726	4,551,661	4,778,000			
Pen. & Interest:	79,518	70,947	71,000			
Miscellaneous:	4,872,691	4,840,541	7,600,000	4,500,000	4,500,000	4,500,000
Total State Revenue:	$48,330,500	$52,917,564	$54,395,700	$52,000,000	$53,000,000	$55,500,000
Add Reversions:	544,366	556,511	250,000	225,000	225,000	225,000
Deduct DMV Approp.	(10,255,166)	(11,545,214)	(11,991,074)	(12,300,188)	(13,837,000)	(15,525,000)
Deduct Other Depts. Appropriations	(772,710)	(785,668)	(805,090)	(788,354)	(886,900)	(997,800)
Net Avail. to NDOT	$37,846,990	$41,143,193	$41,849,536	$39,136,458	$38,501,100	$39,202,200
Excess of Expenditures or Needs Over Revenues	($2,827,177)	($4,167,120)	($3,697,564)	($ 513,542)*	($ 9,623,900)	($12,807,800)

Revised 3-17-80

Appendix N

Proposed Legislation

SUMMARY--Establishes schedule of fines for overloaded vehicles.
(BDR 43-97)
Fiscal Note: Effect on Local Government: No.
Effect on the State or on Industrial Insurance: No.

AN ACT relating to overweight vehicles; establishing minimum fines and enlarging the jurisdiction of the justices' courts; and providing other matters properly relating thereto.

THE PEOPLE OF THE STATE OF NEVADA, REPRESENTED IN SENATE AND ASSEMBLY, DO ENACT AS FOLLOWS:

Section 1. NRS 484.757 is hereby amended to read as follows:

484.757 1. Every person convicted of a violation of any [weight limitation provision of] <u>limitation of weight imposed by</u> NRS 484.-745 to 484.755, inclusive, [and every person, company, association or corporation, either personally or by his or its agent or employee, who is found guilty of violating any weight limitation of NRS 484.-745 to 484.755, inclusive,] shall be punished by a fine as specified in the following table:

[Pounds of Excess Weight	Fine
2,001- 2,500	$20
2,501- 3,000	25
3,001- 3,500	30
3,501- 4,000	35
4,001- 4,500	40
4,501- 5,000	60

Pounds of Excess Weight	Fine
5,001- 5,500	$80
5,501- 6,000	100
6,001- 6,500	120
6,501- 7,000	150
7,001- 7,500	175
7,501- 8,000	200
8,001- 8,500	225
8,501- 9,000	275
9,001- 9,500	325
9,501-10,000	375
10,001-10,500	400
10,501-11,000	425
11,001-11,500	450
11,501-12,000	475
12,001 and over	500

2. The maximum fine under this section is $500.]

Pounds of Excess Weight	Fine
1 to 2,500	$25
2,501 to 5,000	2 cents per pound of excess weight
5,001 to 10,000	7 cents per pound of excess weigh

Pounds of Excess Weight	Fine
10,001 and above	10 cents per pound of excess weight

2. If the resulting fine is not a whole number of dollars, the nearest whole number above the computed amount must be imposed as the fine.

3. The fines provided in this section are mandatory and must not be reduced under any circumstances by the court.

4. Any bail allowed must not be less than the appropriate fine provided for in this section.

Sec. 2. NRS 4.370 is hereby amended to read as follows:

4.370 1. Justices' courts have jurisdiction of the following actions and proceedings:

(a) In actions arising on contract for the recovery of money only, if the sum claimed, exclusive of interest, does not exceed $750.

(b) In actions for damages for injury to the person, or for taking, detaining or injuring personal property, or for injury to real property where no issue is raised by the verified answer of the defendant involving the title to or possession of the real property, if the damage claimed does not exceed $750.

(c) [In] Except as provided in paragraph (1), in actions for a fine, penalty or forfeiture not exceeding $750, given by statute,

or the ordinance of an incorporated or unincorporated city where no issue is raised by the answer involving the legality of any tax, impost, assessment, toll or municipal fine.

(d) In actions upon bonds or undertakings conditioned for the payment of money, if the sum claimed does not exceed $750, though the penalty may exceed that sum.

(e) In actions upon bonds or undertakings conditioned for the payment of money, if the sum claimed does not exceed $750.

(f) In actions to recover the possession of personal property if the value of such property does not exceed $750.

(g) To take and enter judgment on the confession of a defendant, when the amount confessed, exclusive of interest, does not exceed $750.

(h) Of actions for the possession of lands and tenements where the relation of landlord and tenant exists.

(i) Of actions when the possession of lands and tenements has been unlawfully or fraudulently obtained or withheld, in which case the proceeding must be as prescribed by NRS upon that subject.

(j) Of suits for the collection of taxes, where the amount of the tax sued for does not exceed $750.

(k) Concurrent jurisdiction with the district courts of actions for the enforcement of mechanics' liens, where the amount of the lien sought to be enforced, exclusive of interest, does not exceed $750.

(1) In actions for a fine imposed for a violation of NRS 484.757.

2. The jurisdiction conferred by this section does not extend to civil actions in which the title of real property or mining claims or questions affecting the boundaries of land are involved; and if questions of title to real property are involved, cases involving such questions must be disposed of as provided in NRS.

3. Justices' courts have jurisdiction of the following public offenses, committed within the respective counties in which courts are established:

(a) Petit larceny.

(b) Assault and battery, not charged to have been committed upon a public officer in the discharge of his duties, or with intent to kill.

(c) Breaches of the peace, riots, affrays, committing a willful injury to property, and , except as enlarged by paragraph (d), all misdemeanors punishable by fine not exceeding $500, or imprisonment not exceeding 6 months, or by both such fine and imprisonment.

(d) Violation of any limitation of weight imposed by NRS 484.-745 to 484.755, inclusive, without regard to the amount of the fine to be imposed.

4. Except as provided in subsections 5 and 6, in criminal cases the jurisdiction of justices of the peace extends to the limits of their respective counties.

5. In the case of any arrest made by a member of the Nevada highway patrol pursuant to the duties prescribed by NRS 481.180, or by an inspector or field agent of the motor carrier division of the department of motor vehicles, the jurisdiction of the justices of the peace extends to the limits of their respective counties and to the limits of all counties which have common boundaries with their respective counties.

6. Each justice's court has jurisdiction of any violation of a regulation governing vehicular traffic on an airport within the township in which the court is established.

SUMMARY--Requires unloading of overweight vehicles on second or subsequent offense for operator. (BDR 43-96)
Fiscal Note: Effect on Local Government: No.
Effect on the State or on Industrial Insurance: Yes.

AN ACT relating to overweight vehicles; requiring their unloading on a second or subsequent violation for the operator; and providing other matters properly relating thereto.

THE PEOPLE OF THE STATE OF NEVADA, REPRESENTED IN SENATE AND ASSEMBLY, DO ENACT AS FOLLOWS:

Section 1. NRS 484.755 is hereby amended to read as follows:

484.755 1. As used in this section, "operator" means the person who, for his own account, is paid for transporting the load and controls the weight of the load.

2. Authority for the enforcement of the provisions of NRS 484.745 to 484.757, inclusive, [shall be] is vested in the Nevada highway patrol and in motor carrier field agents under the jurisdiction of the department of motor vehicles.

[2.] 3. Any officer of the Nevada highway patrol or motor carrier field agent having reason to believe that the weight of a vehicle and load is unlawful [is authorized to] may require the driver to stop and submit to a weighing of the [same either] loaded vehicle by means of portable or stationary scales and may require that [such] the vehicle be driven to the nearest public scales, [in the event] if such scales are within 5 miles.

[3.] 4. Whenever an officer or agent upon weighing a vehicle and load as provided in subsection [2] 3 determines that the weight is unlawful, [such] the officer or agent may for the first violation of a limitation on weight by an operator, and shall for a second or subsequent violation, require the driver to stop in a suitable place and remove such portion of the load as may be necessary to reduce the gross weight of such vehicle to those limits permitted under NRS 484.745 to 484.757, inclusive. All materials so unloaded [shall] must be cared for by the carrier of such material and [shall be cared for] at the expense of the carrier. [The officer or agent may allow the driver of the inspected vehicle to continue on his journey if any overload does not exceed by more than 5 percent the limitations prescribed by NRS 484.745 to 484.757, inclusive, but the penalties provided in NRS 484.757 shall be exercised for the overload violation.

4.] 5. Any driver of a vehicle who fails or refuses to stop and submit the vehicle and load to a weighing, or who fails or refuses when directed by an officer of the Nevada highway patrol or motor carrier field agent upon a weighing of the vehicle to stop and otherwise comply with the provisions of NRS 484.745 to 484.757, inclusive, [shall be] is guilty of a misdemeanor.

SUMMARY--Directs study of feasibility of special permits for overloaded vehicles. (BDR 99)

CONCURRENT RESOLUTION--Directing the legislative commission to study the feasibility of allowing special permits for overloaded vehicles as well as excessive height and width.

WHEREAS, The present statutes governing special permits contain an absolute limit upon permissible weight in excess of the normal maximum; and

WHEREAS, The purpose of load limits is to preserve the highways of the state; and

WHEREAS, Emergency situations clearly exist in which an indivisible load exceeds the appropriate limits which have been set, but the most feasible means of transportation is to use the highways of the state; and

WHEREAS, There are few railroad lines within the state and many areas are not served by railroad lines; now, therefore, be it

RESOLVED BY THE OF THE STATE OF NEVADA, THE CONCURRING, That the legislative commission is hereby directed to study the feasibility of issuing special permits for overloaded vehicles without an absolute statutory limit; and be it further

RESOLVED, That the legislative commission submit a report of its findings and recommendations to the 62d session of the Nevada legislature.

SUMMARY--Directs study of possible exemption of certain petroleum-ethanol mixtures from motor vehicle fuel tax. (BDR 98)

CONCURRENT RESOLUTION--Directing the legislative commission to study the reasons for and against an exemption of certain petroleum-ethanol mixtures from taxes on motor vehicle fuel by the state and counties, and its anticipated financial effect.

WHEREAS, The exemption of certain mixtures of petroleum and ethanol was proposed at the last session of the Nevada legislature; and

WHEREAS, The legislature is already faced with a decrease in the amount of revenue available for the repair of highways within the State of Nevada; now, therefore, be it

RESOLVED BY THE OF THE STATE OF NEVADA, THE CONCURRING, That the legislative commission is hereby directed to study the reasons for and against such an exemption, and its anticipated financial effect; and be it further

RESOLVED, That the legislative commission submit a report of its findings to the 62d session of the Nevada legislature.

SUMMARY--Directs study of economic effect of using deteriorated highways. (BDR 100)

CONCURRENT RESOLUTION--Directing the legislative commission to study the cost to various users, by class, to use highways if deterioration occurs.

WHEREAS, The amount of revenue available for the repair of highways in the State of Nevada has declined because consumption of gasoline has decreased and the tax on gasoline is computed per gallon; and

WHEREAS, The legislature is faced with a choice whether to permit the highways of the state to deteriorate or provide additional revenue from another source to maintain them; and

WHEREAS, A factor appropriate to consider in making that choice is the cost which will result to users of the highways if they continue to deteriorate, so that if additional funds are to be provided from those users it can be done equitably in proportion to the benefit each class of user derives from repair of the highways; now, therefore, be it

RESOLVED BY THE OF THE STATE OF NEVADA, THE CONCURRING, That the legislative commission is hereby directed to study the cost to users of highways, to be determined by class, such as passenger cars, commercial haulers and local business if the highways of the state are allowed to deteriorate further; and be it further

RESOLVED, That the legislative commission submit a report of its findings and recommendations to the 62d session of the Nevada legislature.