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# Digest of A Follow-up Audit of the Department of Transportation

The Utah Department of Transportation (UDOT) has implemented most of the audit recommendations found in Utah Legislative Auditor General reports dating back to 1982. As a result we believe that UDOT is functioning at a higher level of efficiency and effectiveness today than it has in the past. This follow-up audit was conducted at the request of Rep. Byron Harward and Joint Majority Leadership to identify the level of compliance with recommendations of past audits. In total, 70 recommendations were made in the past audits dating back to 1982. Because of time constraint, this follow-up review was only able to examine UDOT compliance with 55 of the 70 recommendations.

This follow-up review examined UDOT's compliance to recommendations reported from eight major audits. The follow-up audit found that UDOT management had generally complied with the recommendations of the four most recent audits. These four audits were reported since 1990 and covered a wide variety of issues such as fleet management, building construction, and research of new products.

In addition, the follow-up audit examined the extent of UDOT compliance with four maintenance audits completed 7 to 12 years ago. We found the implementation of some of these audit recommendations more difficult to review because of significant changes in funding and agency operations. In our opinion, the more important recommendations of the maintenance audits have been implemented. However, some of the recommendations have become obsolete because of organizational changes and others were not implemented because management did not agree with the recommendation.

This follow-up audit has been subdivided into three issue areas of past audit work: new product testing and research, fleet management and building construction, and road surface maintenance. The following summaries briefly address our conclusions in each of these areas:

**Research and Materials Operations Are More Directed.** The adoption of new product and research recommendations are important because they add to product development controls which can prevent situations like Syn-crete from happening again. This group within UDOT is receiving greater support from departmental management and is staffed with well-qualified personnel. As a result of recommendation implementation, all new products are tested and qualified by this central office. Outside expertise is also better

utilized. Our only concern is that not all products are tested according to UDOT's new products testing policy or, in lieu of that, full documentation of their success is provided elsewhere.

**Fleet Management and Building Construction Issues Are Being Resolved.** UDOT's Maintenance Division has made an effort to comply with past audit recommendations to improve the efficiency of equipment fleet management and to reduce the cost of future maintenance station construction. While efforts have been made to control the equipment fleet, there have also been delays in the implementation of a recommendation to improve vehicle utilization with a method called dual-rate charging. These delays are in spite of the fact that other state agencies have been able to implement similar programs. Audit recommendations for new building construction have all been implemented.

**Maintenance Audits Have Been Partially Implemented.** The most audited portion of UDOT has been its Maintenance Division. Since 1982 there have been four major legislative audits of the division calling for increased use of contracted maintenance, reduction of overweight truck via increased fees and fines, and contingency budgeting. Recommendations calling for increased contracted maintenance were slowly implemented for the first few years but implementation has accelerated in the last six years. This change has occurred because road construction has diminished as road preservation has increased in a natural progression. Recommendations for controlling overweight trucking have followed the same course. These recommendations were not well received in 1982 but, in 1994, increased fine levels have been implemented and are three times higher than recommended. Contingency budgeting has not been implemented but a similar effect can be found in the use of non-lapsing funding from non-standard sources.

# Chapter I

## Introduction

The Utah Department of Transportation (UDOT) has been the object of eight major audits by the Office of the Utah Legislative Auditor General (ULAG) since 1982. These audits were initiated because of legislative concerns and have primarily reviewed maintenance and support functions which account for approximately 20 percent of UDOT's budget. In total, 70 recommendations were made in the eight audits to improve the efficiency and effectiveness of UDOT. This audit was conducted to identify the level of UDOT's compliance with these past audit recommendations. Overall, UDOT has implemented most audit recommendations and appears to be functioning at a higher level of efficiency and effectiveness than it has in the past.

Our review of past audit recommendations has shown that their implementation is often obscured by changes in the organization. Since this follow-up reviews audits dated as early as 1982, the review, by necessity, must deal with organizational changes resulting from the previous audits and non-audit related circumstances. The transportation industry and UDOT have had to adjust to the maturation of road systems. This has meant a number of internal changes in UDOT directions and systems. Unfortunately, this change also makes it difficult to follow-up on specific recommendations and maintain data comparability. Figure I lists the major audits on which follow-up was done for this report along with the number of recommendations found in each audit.

**Figure I**  
**Reports Reviewed**

Report Title	Year	Number of Recommendations
#82-09 UDOT's Maintenance Division Part I: Improving Road Quality	1982	11
#83-05 UDOT's Maintenance Division Part II: Program Efficiency and Effectiveness	1983	14
#84-06 UDOT's Contractual Maintenance	1984	11
#87-06 UDOT's Contractual Maintenance - II	1987	8
#90-03 DOT's I-15 Syn-crete Resurfacing Project	1990	0
#90-16 DOT Equipment Fleet Management Program	1990	3
#92-01 Research and Development Section of the UDOT	1992	22
#92-02 UDOT Maintenance Buildings	1992	1

There are far too many recommendations to address each individually in this report so a complete list of all the recommendations can be found along with their level of implementation in Appendix A.

The Utah Department of Transportation is an evolving organization and has instituted significant changes over the last twelve years. UDOT has, either through directly addressing or by its evolutionary process, implemented a number of the recommendations found in past ULAG reports. During the course of this follow-up it was found that while significant positive changes have occurred, UDOT has chosen, with reason, to either not address or delay the implementation of some recommendations. We believe the non-implemented recommendation were valid and their implementation would have benefited UDOT.

The following material summarizes UDOT's actions and direction on the major issue areas discussed in the previous reports and highlighted by the primary recommendations of those

reports. A more detailed discussion of UDOT's actions can be found in the succeeding chapters of this report. Issue areas on which we followed-up include control of materials testing and research projects, control of vehicles and building construction, and control of in-house and contractual maintenance.

## **New Product and Research Issues**

UDOT's materials testing and product research section is responsible for testing and approving all road material used by the department. It is an important function because mistakes in material selection and use can be extremely costly. This section has met most of the recommendations concerning its operation made in the past audits. The adoption of these recommendations is important because it adds to product development controls necessary to prevent the occurrence of problems like Syn-crete. Problems identified in the prior audits included properly developing new materials and the selection of research projects.

The new products area has improved its control over new product testing. This has been accomplished through a greater support by department management and through the efforts of the new product engineer. Currently, all the district materials engineers are aware that a new products area exists and that only certain qualified products can be used. In addition, product vendors appear to be introducing their products to the new products engineer directly and not to the district personnel. The only concern remaining is that not every new product is being tested for the required three-year testing period or documented appropriately.

The research section has seen great improvements in how projects are conducted. The section has, through the support of UDOT management, been able to hire highly qualified people to oversee research. The current staff have stronger backgrounds in a variety of research areas, unlike previous research staff. The section is also utilizing Utah's university system to a greater degree. The research staff has been calling on the research abilities of university staff to capitalize on their expertise. This has not only benefitted UDOT but appears to have benefitted Utah's universities. In addition, the types of research projects being conducted are more pertinent to the daily problems faced by UDOT.

## **Fleet Management and Building Construction Issues**

UDOT's maintenance division has made efforts to comply with ULAG audit recommendations regarding their control of equipment usage and the construction of new maintenance stations. While efforts have been made, there have also been delays in

implementation of recommendations dealing with fleet rental charges. UDOT is waiting to modify their rate charging system until the new state financial system is operable and in place. However, fleet users in other state departments have already implemented the recommended dual-rate system. Building construction recommendations, on the other hand, have been fully implemented.

In general, equipment inventories have been reduced and average utilization values have, as a result, improved. Some primary recommendations on the analysis of equipment demand and the charging of vehicle rents have not been effectively implemented by UDOT even though they offer increased efficiency. We cannot identify any valid reason for UDOT's lack of or slow action on these recommendations.

UDOT has followed all of the recommendations for the construction of new maintenance structures. This has resulted in a more cost-efficient design that is acceptable to the Department of Administrative Services' Division of Facilities Construction and Management. UDOT's five-year construction plan shows only lower cost structures are planned in the future.

## **Maintenance Issues**

Most of the audit work performed at UDOT and the resulting recommendations have involved UDOT's Maintenance Division. Many of the more important audit recommendations directed at the maintenance division have been implemented in circuitous ways. Philosophically, the maintenance division has appeared slow to accept change but has been able to refine operations over time.

The four maintenance-related audits date back eight to twelve years, to 1982. The primary goal of these audits was to deal with cost control and containment. These audits are also the most difficult to review for recommendation implementation. Data systems have changed, information has been lost, and, being a more public entity of the department, recommendation implementation has been superseded by other work deemed more important by the department.

All of these audits sought to improve UDOT maintenance operations by increasing organizational efficiency and effectiveness. Recommendations were made in a variety of areas including: decreasing road damage by reducing overweight trucking, improving budgeting procedures, identifying necessary staffing levels, and training maintenance staff in proper activity procedures. Two of the audits addressed and called for greater examination of contract maintenance as an alternative to strictly in-house operations.

Examples of recommendations that have been implemented over time rather than following the audits are those on overweight truck fines and utilization of contractual maintenance. The

recommendations made to prevent road damage by increasing fines for overweight trucks to a prohibitive level have been gradually implemented, but UDOT states that it has done no work to increase pressure on repeat offenders. Another recommendation to increase the amount of contracted rather than in-house activities has also been met, but can be attributed to the changing department emphasis from construction to maintenance rather than the audit.

Other recommendations have not been as well received. Recommendations calling for increased maintenance staff training and better control of staff activities and materials used have not been implemented to any measurable extent. These recommendation's were important because although UDOT had standards, which are meant to ensure efficient and effective work, for its road surface maintenance activities they were not closely followed. In addition to not following activity performance standards, UDOT maintenance staff did not have adequate training to insure materials were placed to get optimum performance and life from their work.

Recommendations were also made to improve the administration of maintenance activities. UDOT has frequently had problems with the maintenance division's budget which controls both summertime road-surface activities and wintertime snow removal. UDOT's philosophy is that snow removal is the primary element in staffing the maintenance operation. However, audit testing done in the early 1980's found that for average snow years UDOT has been over staffed. Altering UDOT's budgeting system could capitalize on this information by setting appropriate staffing levels for average snow years that would better utilize staff time and allow for the purchase of more materials. Ultimately this could also mean better utilization of resources in road-surface activity contracting. While the recommendation was not fully implemented, UDOT has created an emergency fund which mirrors the goals of the audit recommendations.

The previous work done in the maintenance area has been the most difficult to reconstruct. Much of the supporting documentation no longer exists or the methodology is no longer relevant to the organization. Eight to twelve years ago when these audits were conducted, UDOT viewed audit recommendations as suggestions, while the management of the time believed other issues were more pressing and set aside the recommendations. Over time audit recommendations have carried greater support from the Legislature and implementation has been higher.

## **Audit Scope and Objectives**

This follow-up audit was requested by Representative Byron Harward and Joint Majority Leadership. It was the requesters' opinion that the Legislative Auditor General's Office had conducted sufficient performance audit work at UDOT over the past decade to indicate the



condition of the organization. It was determined that a review of UDOT's actions following audit recommendations would show both the health of the organization and its willingness to

adapt to new programs. Additionally, some indication of future funding needs may be identifiable.

The actual request contained charges that covered three large audit areas. First and foremost, to conduct a follow-up of all past UDOT performance audits conducted by the Auditor General's Office. Second, to determine cost effective methods of maintaining roads. And third, to evaluate UDOT's strategic planning process. While these areas are the only ones included formally in the request, there has also been continued interest throughout the audit by other legislators.

The time allotted for this audit has meant that only the first area, follow-up, could be addressed with any depth. The second and third areas are addressed only within the framework of past audits. Past audit recommendations have been compressed into issue areas within this report where major recommendation themes are identified. We have examined UDOT actions within the framework of these issue areas.

The following areas are addressed within the chapters of this report:

- a) New Products and Research Operations Are More Directed
- b) Fleet Management and Building Construction Issues Are Being Resolved
- c) Maintenance Audits Have Been Partially Implemented

## **Chapter II**

### **New Product and Research Operations Are More Directed**

The new product and research areas have seen much improvement in the three years since the original audit. Over that time, most of the 22 recommendations to improve its efficiency and effectiveness have been implemented. The success of the implementation is due to greater support by UDOT management and better qualified staff.

The original audit recommended that the new products staff take more control over the testing and development of new products within UDOT. Previously, new products were being introduced and tested at the separate districts with no coordination from the central new products area at UDOT headquarters. The staff now has greater control of new products testing than during the previous audit. Since the audit, new products are funneled through the departmental level New Products' Engineer. In addition, district Materials Engineers are not testing products without the knowledge and involvement of the department and the New Products Engineer. This eliminates UDOT's problem of independent, duplicative testing at the district/regional level.

Although UDOT has centralized its product testing program, greater refinement can result in further improvement. UDOT policy calls for a three-year material testing cycle prior to adoption of any material for general use. If this three-year test cycle is to be departmental policy, it should be more closely followed. If not followed, the New Products Engineer needs to better document and explain why certain products are allowed to by-pass the policy and not be tested for the three years.

The research area has also seen great improvements. Staff with better research expertise have been hired and, as a result, projects are being completed in shorter time frames. The types of research projects being conducted has also changed to reflect a more directed, streamlined system. Also, in compliance with audit recommendations, only those projects that address current highway problems faced by UDOT are conducted.

#### **New Product Testing Has Improved**

Since the audit of new products testing three years ago, there have been improvements that

have resulted in better control over the testing of new products. Prior to the last audit, the new products area was not well utilized by UDOT staff at the department or district level. This lack of use was a problem because it meant products might be used inappropriately by UDOT at a great and unnecessary expense. Much of the policy was in place to utilize a centralized testing system but that policy was not being applied. In addition, there appeared to be a lack of support by UDOT management in the new products area.

Perhaps the greatest problem in this area was the lack of involvement the development engineer had over what products would be tested within the department and its regional offices. In previous years, the new products area was not well utilized and did not receive sufficient departmental support in the enforcement of established policies. As a result, most of the district materials engineers either were unaware of a central new products section that tested new products. If they were aware of the section they often did not bother including them in their tests or did not test the products at all.

Since the last audit, the new products area has taken a more proactive role by visiting the districts and asking them about the tests they are conducting on new products and what new products the districts need. The result is that the district personnel are now aware that a new products area even exists which is causing them to use it. In conversations with district materials engineers, they all claim that they now routinely use the central new products area to help them test new products.

Another, similar problem facing the development area three years ago was the fact that product vendors would consciously approach district level employees to get their products introduced into the department. During the course of this audit it appears that district staff are now more aware of the departmental development area and they are sending the vendors to the central development staff. One district materials engineer said that he does not have the time to deal with testing new products and so he finds it easier to send the vendors to the central office where the departmental development people can deal with the testing and acceptance of the vendor's new product.

Another area of improvement is the Qualified Products List (QPL) which the development section is now using. In our previous audit, we had recommended that an approved products list be created and distributed for department-wide use. Such a list would identify tested and approved products in an effort to avoid costly mistakes that could result from the use of non-approved products. This list has been created but more importantly it has created a tangible document that the district engineers are aware of. All the district materials engineers claim that they and their engineers routinely use the QPL.

In addition, our current review dealt with how actual product testing is performed. The development section has improved the way in which it keeps track of test conditions and what information is required of product vendors. Vendors are required to submit information regarding what tests have been conducted on their product and information on other states' use

of the product.

A review of the product files indicated that this information is being gathered on most products which helps in the determination of how a product should be tested. In fact, depending on what product is being introduced for testing, the results of others states' testing is used to make an initial determination as to whether a product needs further testing.

The last area reviewed within the development section was the three-year testing cycle. For this follow-up, new products introduced into the department over the last three years were reviewed. The conclusion of the review was that products are not being tested for the UDOT policy specified period of three years. However, the director of the Research and Development Division and the director of the development section, and the development engineer all agree that the three-year testing cycle is really only a guide and should not apply to all products.

For example, the department is currently testing a temporary marking tab that is used to mark the center dividing line on roads after crews have put a new overlay on the road. Then, once the new asphalt is ready, paint crews will paint a permanent striping line. This all takes place within about a week and the temporary markers only have a life expectancy of two weeks. The development people claim that it would be ridiculous to test this product for three years, and we agree.

While the new products group's claim that three years is too long for a product that is meant to last only two weeks, there is still validity for testing in excess of two weeks. No single test of two weeks could address all the variables faced by products that are adopted for general use. For example, many products used by UDOT are subjected to variations in temperature and weather, such as extreme heat or cold winters, which need to be accounted for in any test. This implies testing a product for at least one year if not more to see how the product will endure during these different conditions. Figure II shows three examples of products that were not tested for a three-year period.

<b>Figure II</b>		
<b>Example Of Products Not Tested For Three Years</b>		
<b>Product</b>	<b>Introduction Date</b>	<b>Approval Date</b>
Trinidad Lake Asphalt	8/92	10/6/92
HSE 2411	1/22/93	3/25/93
Pro-Poxy 100*	5/20/92	5/27/92

*\* Possibly based on tests in other states but not clearly stated.*

Figure II clearly shows that these products were approved from one week to two months after the product was first introduced to the new products panel (as indicated by UDOT file documentation). The sellers of the Pro-Poxy 100 material indicated that the product was being used in other states extensively but no explanation was given that this was why the product was approved within a week. The new products development area needs to make sure that adequate explanations are given as to why products are not being tested for three years. According to the new products engineer, these explanations are available in a computer database but not in the paper files that are generally used. We suggest that any available explanations be included in the appropriate files.

It appears that UDOT's philosophy of testing for a 3-year cycle has changed and there is no longer a concern with testing every product for 3 years. Rather, UDOT's development group sees a less expensive and perhaps more useful development tool in the application of criteria from other states' tests. Our previous audit had recommended that other states' criteria be used in determining how viable a product was. In reviewing products tested and accepted by other states, they believe they can ensure enough testing is done to show that the product will work.

We continue to recommend that the new products testing section test products for the 3-year period. In the event that enough criteria can be gathered from other states or other sources, or if the product's life is less than three years, then an explanation should be given as to why UDOT policy has not been followed.

### **Research Projects Are Better Managed**

The research section within the Research and Development Division has implemented all of the recommendations from our previous audit. Many changes have been made in how research projects are conducted and in the staffing of those projects. Our current review found that the quality of the research staff has improved and that all of the projects are directly related to improving the quality of UDOT's service. In addition, the timeliness of projects has improved, universities and private consultants are being used more, and better information is available to help researchers through their projects.

In the last three years the division has replaced most of the divisional management and staff in place at the time of the last audit. Our previous audit found that UDOT personnel were being shuffled to the research area. The current change in staffing has not been a shuffling of existing UDOT staff. Some of the new research staff have been hired from outside the

department with experience and expertise in specific areas of research. For example, one engineer worked in Illinois on a large federal research project. In addition, many of the research engineers have experience in both federal government and private industry that qualify them for their research positions. A problem still faced by this area is the possible loss of two research managers because of their temporary employment status. UDOT research has made good improvements through the use of the research manager position and if these positions were now to be lost, the research program could suffer.

As recommended in our previous audit, the current philosophy of the research section is that they no longer do as much research but contract out more research to outside consultants. In order to accomplish this, they have three newly created positions called Research Project Managers whose duties are to manage research conducted by others. This research is usually performed by one of the three largest universities in the state. In our opinion, the current staff is qualified for the type and size of projects undertaken.

Our previous audit recommended that the types of projects researched by UDOT be more practical, and concerned with solving daily problems rather than problems of a national level. The types of research projects being conducted has greatly improved. In order to come up with ideas for future research projects, the research section holds an annual workshop and invites representatives from all over the department. At these workshops, the research staff solicits ideas from the department representatives. Most of the divisions of the department are represented so there appears to be a good cross-section of ideas.

The result of these seminars is that the type of research being proposed is more concerned with day to day problems that UDOT faces. The previous audit noted that research dealt with problems of national interest that UDOT did not have the money or the expertise to perform. Figures III shows the projects that were proposed as a result of the annual Logan workshop. This figure represents the top projects that representatives from all over UDOT voted on.

**Figure III**  
**Proposed Research Projects**

**Descriptions**

- Earthquake hazards to highway structures--ground response and liquefaction
- System requirements for incident management and non-recurring congestion on Utah freeways
- Field test of video-imaging technology for ramp queue detection
- Best use of RAP(recycled asphalt pavement)
- Concrete rehabilitation technique determination
- Impact of salting operations on water quality
- Feasibility of implementing a one-way frontage road system for the I-15 corridor
- Transverse concrete joints and joint sealants
- UDOT PR/public involvement policies
- Salt detention basin best practical technology
- Improve skid resistance on concrete pavements
- Estimated life of pavement treatments
- Computer-based design procedures and training resources for transportation applications
- Congestion management--measurement, monitoring and evaluation of solutions
- Metrication implementation
- Transportation database development and flow
- Air quality
- Temporary raised pavement markers (TABS)
- The use of large aggregate mixes in bituminous and concrete pavements
- Access achievement of environmental responsibility on UDOT projects
- Human resources and skills needed for the near future transportation system
- Follow-up of past research studies--implementation guidelines
- Bridge structure corrosion repairs (new technology)



- Life cycle of pavements

Figure IV represents those research projects that were chosen by the UTRAC (Utah Transportation Advisory Committee) committee out of those shown in Figure III to be the most useful research to be conducted by UDOT. These projects were chosen by UTRAC after information was supplied to them by the UDOT research staff on each proposed project.

<b>Figure IV Approved Research Projects</b>	
<b>Description</b>	
●	Field test of video-imaging technology for ramp queue detection
●	Best use of RAP(recycled asphalt pavement)
●	Concrete rehabilitation technique determination
●	Impact of salting operations on water quality
●	UDOT PR/public involvement policies
●	Salt detention basin best practical technology
●	Estimated life of pavement treatments
●	Computer-based design procedures and training resources for transportation applications
●	Temporary raised pavement markers (TABS)
●	Human resources and skills needed for the near future transportation system
●	Bridge structure corrosion repairs (new technology)

These projects clearly show that the research being conducted this year are of a practical nature designed to solve real problems faced by UDOT. In addition, the engineers we talked to all feel that UDOT is capable of handling these projects given the budget allocated for research.

In our previous audit, we expressed concern that some research projects were taking two or three years longer than planned. Currently, the time taken to complete research projects has improved over the previous administration. Now, project duration is shortened and the research director considers a large project anything that lasts one year. Our review of current projects indicates that the large projects do tend to be completed in approximately one year's time.

As a result of the changes in attitude toward research, more projects are now being given to people with the experience and the expertise to do them. In many cases, this is the universities. UDOT has not only begun utilizing the university personnel more but has also encouraged universities to build up their transportation research programs. The first example of this is the cooperative research program and T2 program that USU has with UDOT to encourage the sharing of information and the furtherance of research results.

Another example is the help that the University of Utah received from the research staff at UDOT to gain federal funding for a center of excellence in the transportation field. UDOT staff worked with university personnel in getting applications written and in providing supplementary funding from the research budget to help create the national center for excellence.

In our previous audit, we expressed concern over the lack of information that the UTRAC (Utah Transportation Research Advisory Committee) was given before voting on research projects. This committee is the body that ultimately votes on and decides which projects the research staff will work on in the following year. In order to adequately give direction, they must have as much information as possible about each and every proposed research idea. In previous years, the UTRAC committee was given sparse information on what had been conducted in certain areas of research. The result was that the committee was voting on which projects to conduct without any information as to what had been done before, either within the department or in other states. This problem has been rectified. The UTRAC committee is now given a separate briefing on the top twenty proposed projects from the annual workshop. This briefing lets the committee members know what other studies have been done and who is interested in the project. In addition, if there is not a UDOT employee willing to sponsor a project, then the project is not done.

Previously, the scopes and objectives of research projects were vague and purposely unclear as to how the projects should be completed. Our review indicates that the scopes and objectives of current projects has greatly improved. Now, meetings are held by advisory panels on each research project to discuss how the project should be completed. During these advisory panel meetings, the sponsor of the research idea is given the most time to say what direction the research should take.

**Recommendation:**

We recommend that UDOT identify applicable testing period for new products and establish it as policy. If this policy is not applicable to a particular product, then we recommend that an explanation be given in the appropriate files of why the product is exempt from the policy.

## **Chapter III**

# **Fleet Management and Building Construction Issues Are Being Resolved**

This review has found that UDOT has responded positively to recommendations in past ULAG audits of fleet management and maintenance building construction. Overall, improvements have been made in the equipment utilization, and the total size of the fleet has been reduced with some significant reductions in specific classes. The UDOT Vehicle Advisory Committee has been reorganized and, currently, appears to be functioning properly. In addition, UDOT has made efforts of varying degrees to comply with other audit recommendations concerning UDOT fleet and equipment management. UDOT has also complied with audit recommendations regarding maintenance buildings. Several cost-saving changes were made to their maintenance building design and incorporated into the maintenance building replacement plan.

### **Improvements Have Been Made In Fleet Management**

As a result of implementation of ULAG recommendations, equipment inventories have been reduced and average equipment utilization has improved. We believe that further improvement is still possible with the implementation of dual-rate charging and increased control of exclusive-use vehicles. While this work remains to be done, the light vehicle fleet has been reduced and average annual miles have increased. The fleet management audit of 1989 found that equipment numbers and equipment utilization were not maintained at the most efficient levels. Consequently, some of the audit recommendations called for peak demand analysis of equipment, and changes in equipment rental rates in order to cause reductions in fleet size and make improvements to the average utilization.

#### **Fleet Has Been Reduced**

At the completion of the previous fleet management audit, the total fleet size was 4,474 units. In 1994 the total number of units in the fleet was 4,210, a reduction of about 6% or 264 units overall. We reviewed the number of units for nine categories of key equipment with several classifications in each category. Only selected equipment classifications were reviewed but the same types were analyzed in the previous audit. We found that equipment cutbacks

were not uniform across all classifications. Some equipment types were reduced significantly, while other types were actually increased. For example, our sample indicated the number of dump trucks actually increased by about 7% from 433 units in 1989 to 465 units in 1994. On the other hand, the number of motor graders decreased from 89 to 76 (15%), mowers decreased from 118 to 83 (30%), tractors decreased from 94 to 78 (17%), sweepers decreased from 18 to 9 (50%), rollers decreased from 63 to 56 (11%), and automobiles decreased from 198 to 155 (22%). The number of loaders stayed the same at 145 units, and the number of pick-up trucks dropped from 607 to 606 units. Although the number of units for the various types of equipment may fluctuate to some degree depending on the season, overall we feel UDOT has made significant efforts to reduce their excess inventory.

### **Equipment Utilization Has Improved**

In addition to an overall reduction of fleet size, average utilization for equipment has improved since 1989. We compared utilization reports from June 1989 and June 1994. This was the best information available at the time of our review because the year-end adjusted reports were not completed. In our review we tested the year-to-date average utilization for seven of the same equipment codes as in the previous audit and found improvements in six of the seven categories reviewed. For example, the average annual utilization for dump trucks improved (5%) from 499 to 524 hours in 1994. Tractor utilization improved from 131 to 251 hours (92%), motor graders utilization improved from 324 to 381 hours (18%), utilization for loaders improved from 334 to 548 hours (64%), rollers improved from 77 to 194 hours (152%), and mower utilization improved from 94 to 192 hours (104%). Only the sweepers' utilization decreased from 277 to 185 hours (33%) in 1994.

Although there appears to be a significant improvement in the equipment utilization from 1989, the degree of improvement may be overstated because of recent changes in the way utilization is tracked. In 1989, equipment hours and miles were reported as time actually working on the job. After the audit identified poor utilization for certain equipment types, the maintenance division changed the reporting process to include all time the equipment is committed to the job. Average utilization figures increased significantly from this point on. For example, prior to 1989 mower utilization was reported for actual mowing time only. Hours in transit and other miscellaneous hours were not accounted for, causing the utilization to be understated. The current reporting process is for committed time. In other words, if a mower is committed to a certain location for certain days, the time reported for utilization includes the transit time needed to get the mower to the location, time used to complete the task, and any other time (excluding down time) while that mower is committed to that particular task.

This process of reporting committed time provides a more accurate picture of utilization but it makes comparison difficult between the utilization figures of 1989 and 1994. However, we believe improvements have been made in equipment utilization. This belief is

based on the fact that UDOT's maintenance work is being completed in spite of equipment reductions and increases in Utah's road surfaces.

### Light Vehicle Inventory Reduced

In 1989, the audit identified some issues of concern with the light vehicle (pick-ups and cars) fleet. When compared to other similar states, it appeared that UDOT had an excessive number of light vehicles based on the ratio of vehicles to employees. In addition, the average annual mileage per vehicle was lower in comparison to other states. We reviewed the light vehicle inventory as of the end of fiscal year 1994 and found reductions were made in the total number of light vehicles in the inventory. These reductions are shown in Figure V.

<b>Figure V</b>			
<b>Light Vehicle Inventory 1989 To 1994</b>			
<b>Vehicle Type</b>	<b>FY 1989</b>	<b>FY 1994</b>	<b>Change</b>
Cars	207	165	-20.3%
Pickups	607	606	-.2%
Total	814	771	-5.3%

As shown in the figure, the total number of light vehicles was reduced by about 43 units (5.3%) between 1989 and 1994. The reduction was due almost entirely to the elimination of surplus cars, as the number of pick-up trucks was practically unchanged. The composition of the light vehicle fleet has also changed to include more economical types of vehicles. For example, in 1989 there were only 17 compact sedans as compared to 83 compacts in 1994. There were 45 light duty pick-ups in 1989 and now there are 102 light duty trucks.

The ratio of light vehicles per full-time equivalent (FTE) has improved from .502 vehicles per FTE in 1989 to .444 vehicles per FTE in 1994. This improvement is due partly to the reduction in light vehicles and partly to an increase in the total FTEs at UDOT. This ratio is still higher than in several other western states, but the reduction does show improvement.

In addition to an overall reduction and change in composition, the utilization of light vehicles has improved. In 1989, the average annual mileage for cars was 10,446. Vehicle utilization increased in 1994 by 12% to 11,702 average annual miles. Pick-up trucks had

similar utilization improvements. The average in 1989 was 10,369 annual miles. In 1994 the average was 11,502 average annual miles, an increase of 11%.

### **Exclusive-Use Vehicles Have Increased**

We are concerned with developments in one area of fleet management. Our concern is with the significant increase in the number of vehicles assigned to UDOT employees for exclusive-use. Compounding this concern is the small reduction in the number of commute-classified vehicles which are, in theory, being replaced by exclusive-use vehicles. An exclusive-use vehicle is defined as one that is dedicated to an individual and used for job-related activities by that individual 80 percent or more of the time. The exclusive-use vehicle is stored on department property and is not used for commuting. Commute vehicles, on the other hand, can be assigned to an individual for use on job-related activities and can be driven to and from work. No personal use of exclusive-use or commute vehicles is permitted.

In the 1989 state-owned vehicle report to the Legislative Fiscal Analyst, 153 vehicles were listed as commute vehicles, by 1994 this figure decreased to 143. In 1989, UDOT did not report any vehicles as exclusive use, but in 1994 there were 205 exclusive-use vehicles reported. One UDOT manager claims this increase is simply due to a change in the way vehicle designations are reported. Another manager said the amount is due to the fact that many employees now work from their cars. In addition, during the construction season there is an increase in the number of seasonal workers, many with exclusive-use vehicles.

### **Fleet Efficiency Recommendations Are Being Implemented**

In our opinion, UDOT has responded well to our fleet efficiency recommendations. Two of the recommendations in the 1989 fleet management audit, to establish a light vehicle advisory committee and to try daily demand analysis have been implemented. Unfortunately, the department's attempt with the implementation of daily demand analysis was not completely successful. A third recommendation for a dual-rate charging system has not yet been implemented but, according to UDOT management, will be implemented.

### **Equipment Management Committee Formed**

One of the major recommendations of the fleet management audit was to establish an empowered light vehicle advisory committee. The goal of this recommendation was to increase control of light vehicle use and growth throughout the department. This goal was not

possible with the existing vehicle advisory committee (VAC). After the completion of the 1989 audit, the VAC was split into two separate committees; the equipment advisory committee (EAC), and the equipment management committee (EMC). The equipment advisory committee continues to meet on a regular basis to discuss matters relating to heavy equipment needs, and policies and procedures. The equipment management committee however, fulfills the goal of the recommendation by approving or denying vehicle requests and establishing vehicle use criteria.

The EMC is chaired by the operations engineer for the department and it consists of other members of management. The purpose of this committee is to meet and discuss the needs of the department relating to light vehicles (cars and pick-ups). One of the duties of this committee is to review the organizational requests for light vehicles. The committee also reviews and approves or denies all requests for assigned vehicles such as commute use, and exclusive use. In addition, the committee collects reports and reviews utilization of personally assigned light vehicles on a monthly basis. We reviewed the files of all personally assigned light vehicles and it appears that the committee is conducting regular reviews of these vehicle requests and assignments.

### **Demand Analysis Attempted**

One goal of the past audit was to better identify equipment needs of the department by analyzing demand for types of equipment. That audit recommended a method called daily demand analysis be tried by UDOT fleet management. Implementation of daily demand analysis was attempted shortly after the fleet management audit. However, the attempt was not successful. For example, reductions were made in mowing equipment based on the demand analysis done for the prior audit. These reductions turned out to be harmful to the districts during the next mowing season because there weren't enough mowers to complete all the tasks. New mowers were purchased at a higher cost to replace the ones that were eliminated. The reason this demand analysis failed according to equipment analysts, was that this type of analysis is not an accurate indicator of actual equipment needs. It does not take into account important factors such as weather, transit time, and lack of manpower to operate the equipment when needed. The equipment may be available for the task but it sits idle because of a shortage of maintenance workers due to sickness, vacation, or assignment to other priority jobs.

In place of equipment demand analysis, UDOT recently hired several new equipment specialists to assist the equipment manager in monitoring the equipment utilization and demand. These new specialists visit each of the districts on a regular basis to discuss the equipment utilization and demand with the district maintenance engineers. This type of managerial review of equipment utilization and demand is a step in the right direction but, from the information we have received, lacks any baseline information necessary for measuring the success of programs. Some method of analysis, like demand analysis, is still

necessary as a valid measurement of accomplishment. Whatever system is used, the process needs to be refined and a standard for equipment demand needs to be identified.

### **Dual-Rate Charging System Not Implemented**

The fleet management audit also recommended that the department implement a dual-rate charging system that separates possession and actual use of equipment as rental rate charge elements. The goal is to establish a system that rewards efficient use and punishes inefficient use of equipment. The recommendation for a dual-rate charging system for equipment has not been implemented. According to managers at UDOT, one reason the dual-rate charging system has not been installed is that the financial system for the state (FIRMS) was being phased out and a new financial system (FINET) was going to be installed soon. Although managers agreed that the recommendation was viable and a dual-rate charging system would have facilitated better control and management of equipment, they reasoned that to implement this recommendation prior to the installation of the new statewide FINET system would be premature and wasted effort. UDOT felt it would be prudent to wait until the new system was on-line so that the modifications for the charging system would only need to be interfaced once.

UDOT officials have indicated in the past that the dual-rate recommendation is a viable alternative. UDOT has delayed implementation because of changes in the statewide financial system. We believe this recommendation is still valid and should have been implemented at the time of the audit. Our review found some other state agencies with large vehicle fleets are currently using dual-rate systems. Both the State Motor Pool and the Department of Natural Resources successfully use dual rate charging systems. They have been in use for several years even before the changeover from the FIRMS accounting system. Additionally, other states contacted during the original audit in 1989 and during this current audit, use dual-rate charging systems with good results. Although other states have indicated that the dual-rate system may not be beneficial when applied to all equipment, it has provided very good results for selected classifications. The Department of Natural Resources indicated that the dual-rate system has been beneficial in helping the equipment manager reclaim underutilized and unused vehicles.

### **Maintenance Buildings Have Been Modified**

The 1992 audit of UDOT maintenance buildings recommended a programmatic review of maintenance facilities construction. This audit recommendation has been implemented. A programmatic review of the construction of maintenance facilities was conducted and modifications were made to the design in order to improve the efficiency and reduce



construction and operational costs. A review of UDOT's 5-year operational plan shows the changes were incorporated into the plan for replacement of all maintenance buildings.

In the previous audit, excesses were found in the design of UDOT maintenance station structures that greatly increased the construction cost without significantly increasing the structure's utility. In 1991, the Division of Facilities Construction and Management (DFCM) conducted an analysis of UDOT's needs, and a building cost analysis of construction, operating, and heating costs over the life of the proposed building. This study compared six different building types that met UDOT's needs. The new design type was selected from this study. An additional cost analysis was conducted by an independent consulting firm and released in September 1992. Figure VI identifies the costs associated with the two building designs.

<b>Figure VI</b>			
<b>Comparison Of Original Prototype With New Design</b>			
<b>Feature</b>	<b>Prototype (Square Feet)</b>	<b>New (Square Feet)</b>	<b>Change (Square Feet)</b>
Total Area	10,811	7,222	-3,589
Space Per Truck (6 Trucks)	1,801	1,203	-598
Work Area	1,000	300	-700
Unassignable Space	4,547	868	-3,679
<i>Estimated Savings:</i>			
<i>Estimated prototype construction cost</i>	<i>\$ 886,000</i>		
<i>Contractor bid new design</i>	<u><i>612,895</i></u>		
<i>Estimated savings per building</i>	<i>\$ 273,105</i>		

Figure VI shows that the new design, supported by the past audit, is far more efficient than the prototype selected by UDOT. Reduction in total square footage, mostly from the reduction in unassignable space, and in space per truck combine to lower construction costs by \$273,000 per building. In total, this per building savings can be applied to 23 structures scheduled for construction in the coming years.

Most other states have structures similar to the building design that is now included in UDOT's budget. This design is approved by the Department of Administrative Services Division of Facilities Construction and Management and is supported by ULAG.



**Recommendations:**

1. We recommend that a standard for equipment demand be identified to assist equipment specialists in monitoring equipment utilization and demand.
2. We recommend that a dual-rate charging system be implemented for light vehicles and tested for other equipment classifications.
3. We recommend that the assignment of exclusive-use vehicles be reviewed and that the policies and standards be enforced.

## **Chapter IV**

### **Maintenance Audits**

### **Have Been Partially Implemented**

The most audited portion of the Utah Department of Transportation (UDOT) has been its Maintenance Division. It has also been the most difficult area in which to conduct a follow-up audit because the original work is eight to twelve years old. Both elapsed time and organizational changes since the early 1980s have combined to reduce the effectiveness of the recommendations or, at least, make it difficult to detect what has been done. Overall, UDOT's implementation of maintenance division audit recommendations has been slow because UDOT funding and operations have changed significantly rendering some recommendations obsolete. Even so, many of the more important recommendations have been implemented over time, albeit in a circuitous manner. Recommendations from these audits can be divided into three major issue areas: contracted maintenance, contingency budgeting, and road damage abatement.

UDOT has taken action in each of the three areas over the last decade. UDOT's actions, however, have not necessarily been answers to audit recommendations as much as the result of changing times. We believe that in the early 1980s, when the maintenance audits were completed, UDOT officials did not view our audit recommendations as anything more than suggestions. Consequently, other maintenance problems received attention while recommendation implementation was delayed.

Each of the three areas have major recommendations that were implemented well after the audits were released. Contracting out maintenance operations is now a significant part of the UDOT road maintenance plan. UDOT has altered the funding of maintenance activities as the organization evolves making a contingency fund program awkward or obsolete, the new funding program does have non-lapsing funds as a component which addresses some of the 1982 audit's recommendations. And, in the reduction of road damage area, overweight truck fines have been significantly increased and the federal Bridge Formula B has been adopted resulting in the implementation of audit recommendations.

Since 1982 four of the eight major audits including 44 audit recommendations have dealt with road surface maintenance issues. ULAG recommendations for the maintenance area have primarily been directed at improving program efficiency and effectiveness on a program-wide basis. This change in philosophical direction, taken by all four audits in the early 1980's, is also a reason for the lack of full implementation. Recommendations concerning maintenance

operations in these audits were of a large and sweeping nature that

called not only for a change in operations but a change in thinking. Such recommendations are more difficult to implement in large organizations.

However, there are a number of recommendations that have been or should have been acted upon by UDOT. Figure VII lists audit issue areas with recommendations that can be or have been addressed by UDOT.

<b>Figure VII Maintenance Issue Areas</b>	
<b>Number of Recommendations</b>	<b>Issue Area</b>
4	Maintenance Budgeting
12	Use of contracted maintenance
7	Enforcement of overweight vehicle laws and minimizing truck damage to road surfaces
21	Miscellaneous maintenance recommendations

UDOT's maintenance division has been slow to accept and address the changes delineated in the recommendations. A primary reason given by UDOT for this lack of action is that UDOT is going in new and different directions than those taken a decade ago under a different directorship. As an example, UDOT is now in the process of introducing a new management information system that is meant to increase information flow and control over staff activities. Operation of this new system, it is believed by UDOT, is necessary before other actions can take place. Our review, contrary to this belief, indicates that many or even most of the recommendations could have been implemented at the time of the original audits.

We believe that the implementation of past audit recommendations at the time of the audits would have been an aid to UDOT, particularly during the growth and shifting emphasis UDOT's maintenance division has seen over the last decade. Between 1984 and 1994 UDOT's maintenance division's annual expenditures increased at a rate of five percent per year from \$34,882,000 to \$57,710,000. These values do not, however, show the full picture of the growth of maintenance spending or UDOT's shifting emphasis from road construction to road preservation and maintenance. This shift has meant additional maintenance funding is available from UDOT's construction division and has allowed greater application of contracted maintenance.

## **Contracted Maintenance Has Increased**

UDOT's use of contracted maintenance has increased dramatically since ULAG made 12 recommendations to increase contracted maintenance in 1984. During that 1984 audit, 12.4% of UDOT's maintenance expenditures were used for contractual services. In FY94 as much as 30% of total maintenance expenditures have been contracted to private concerns for a 500 percent increase. UDOT's growing support of contractual maintenance was noted in a follow-up report issued in 1987. At that time it was determined that UDOT had made a good faith effort to support outside contracting but was in need of better unit cost analysis to best identify what activities could be better served by contracting.

Now, a significant amount of contractual maintenance is funded through the construction division. Since the 1987 follow-up, UDOT management has adapted to its changing environment and developed a department-wide strategy of preventive maintenance. This strategy change is due primarily to a shift in emphasis from road construction to road preservation and maintenance. This new policy has created new avenues for maintenance funding. The contract maintenance funded through construction, combined with the existing maintenance budget, means a greater percentage of maintenance dollars can be spent on outside contracting. Figure VIII demonstrates this shift in the maintenance expenditures.

**Figure VIII**  
**Maintenance Expenditures (Millions)**  
**From 1984 to 1994**

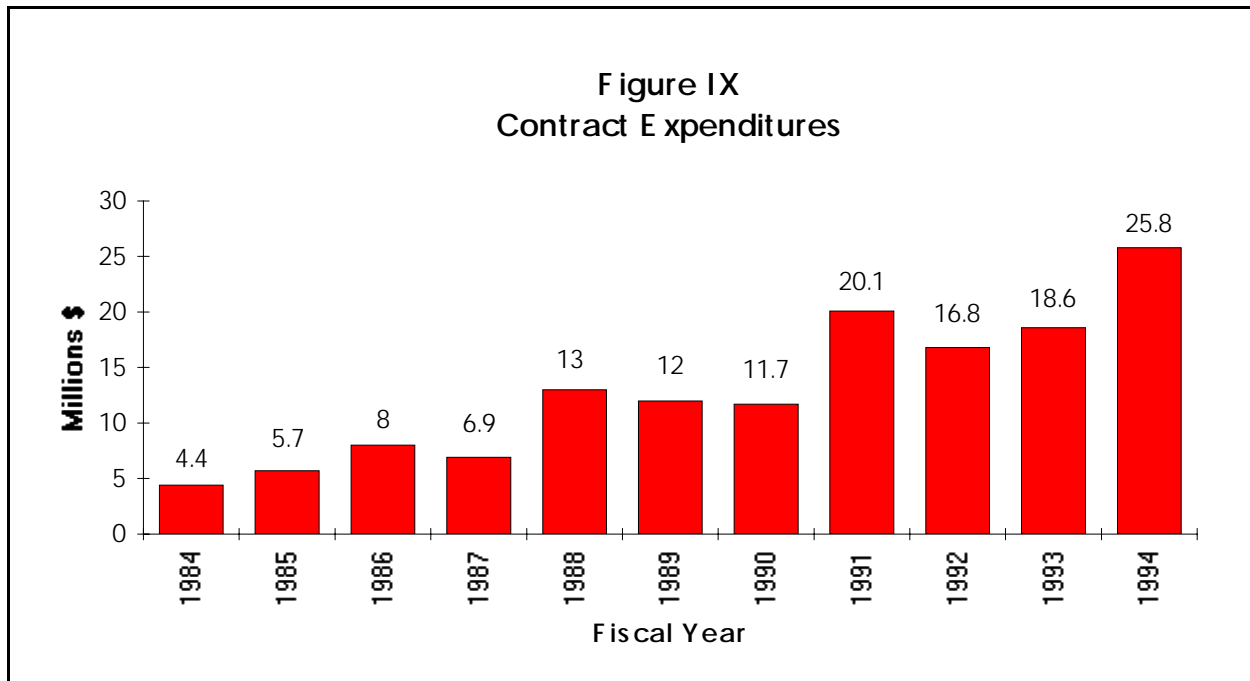
Fiscal Year	Total Contracted*	Total In-House and Contracted	Percent Contracted	Maintenance FTE's
1984	\$4.3	\$34.9	12 %	619
1985	5.7	39.6	14 %	631
1986	8.0	40.4	20 %	625
1987	6.9	36.8	19 %	595
1988	13.0	54.7	24 %	525
1989	12.0	61.4	20 %	524
1990	11.7	58.7	20 %	524
1991	20.1	70.4	29 %	564
1992	16.8	68.3	25 %	564
1993	18.6	82.4	23 %	566
1994	25.8	84.5	30 %	577
<b>Total</b>	143.1	694.6	-	-
Changes Since 1984	+500 %	+142 %	+150 %	-7 %

*\* Contracted Maintenance includes contracts funded through maintenance division and pavement preservation contracts funded through construction division.*

As Figure VIII shows, there has been a definite shift in UDOT's emphasis with six times the level of outside contracting in 1994 as there was in 1984. UDOT is budgeting more for maintenance and is placing more of the funding in the hands of private contractors. In the past ten years, maintenance contracts have been issued for approximately 45 different types of maintenance activities where only a few activities were considered as possible to contract in 1984. However the majority of contract maintenance dollars has been spent for surface maintenance activities, like those recommended in the 1984 audit. Primarily the increase in contract maintenance has been in asphalt surface treatments. For example, about 67% of contract expenditures have been used for plant mix seal coat and chip seal products which are high cost maintenance activities. Figure IX shows the growth in maintenance contract



expenditures since 1984.



The contract expenditures, shown in Figure IX, are composed mostly of the high cost activities necessary to maintain roads. These activities are single tasks that are easily divided into cost areas for bidding purposes. This means uncertainty can be reduced and profitability can be established. Many of UDOT's maintenance tasks do not afford this opportunity. This level of contractual maintenance should still reduce UDOT's staffing needs.

The 1984 audit that recommended increasing contracted maintenance also reviewed the state's snow removal needs to establish minimum staffing levels. At that time, UDOT management claimed that staffing was set by the state's snow removal needs. Since that staffing level needed to be maintained year-round, to keep trained staff, that staff may as well be utilized for all maintenance activities. The audit findings and recommendations suggested that fewer staff were necessary for snow removal and thus more funding was available for contractual maintenance activities. Excess staffing costs could also be used for additional maintenance surface materials which management at that time claimed were insufficient.

Unfortunately, up to the time of that audit, contracted snow removal had not worked well. From past work we know that snow removal test contracts have been abandoned due to the variability of weather conditions and the resulting unprofitable nature of heavy snow years. During this audit, we attempted to examine contracts let out by UDOT for snow removal to determine the cause of failure. Private sources have speculated that the choice of test sites for testing snow removal contracting were restricted to unprofitable locations to force the failure of

contracting snow removal. We found that UDOT does not have any

record or memory within the maintenance division as to tests performed in the past. However, current management is opposed to the idea of contracting snow removal.

Contracting snow removal, although untested in the eyes of current maintenance management, still has merit as a method of reducing staffing to minimum levels. The 1984 audit's recommendations called for staff reductions to a level that could meet the average year's snow removal needs without excessive overtime. Testing contracting of snow removal was a method recommended in that audit. Since 1984, road surface area has increased by 18% while maintenance staffing has decreased by 6.8%. In essence, UDOT has held its own against increasing costs by utilizing contractual maintenance and expenditures for selected activities in addition to reducing staffing cost to the minimum needs of the snow removal program.

### **Recommendations to Reduce Road Damage by Better Controlling Overweight Trucks Have Been Followed**

Audit work on improving Utah's road surfaces by reducing the damage to roads by overweight truck travel has been implemented over time. At the time of the audit's release, 1982, the recommendations calling for much greater penalties and the adoption of the federal Bridge Formula B were not well received, and neither the Legislature nor UDOT acted on them. Recommendations to improve road conditions via better training programs and improved control of staff and material were also not well received.

Over the last twelve years, however, the intent of the overweight truck recommendations has been met. Fees and fines have, in fact, increased in some instances to the \$3,000 level. This level is beyond the \$1,000 level recommended in the 1982 report. The truck-wheel configuration table known as the federal Bridge Formula B has also been adopted. The implementation of these recommendations means that there is a supported system for identifying damage possible by an individual truck in the Bridge Formula B and the ability to inflict economic damage on truckers choosing to violate the law and damage roads. Figure X shows the increase in the number of actions taken by the ports-of-entry, the total fines, and the fine per action.

**Figure X**  
**Increase In Overweight Actions And Fines**

<b>Fiscal Year</b>	<b>Number of Actions*</b>	<b>Total Fines</b>	<b>Fine Per Action</b>
1986	4,902	\$372,983	\$76
1987	4,323	394,559	91
1988	8,392	382,231	46
1989	9,862	676,504	69
1990	11,577	1,176,730	102
1991**	7,422	878,470	118
1992	7,262	975,962	134

\* *Represents citations issued for driving truck overweight*  
 \*\* *1991 figures for portables not available*

Figure X shows that the amount of fines levied have increased significantly over the years. Unfortunately, it is not possible to compare the effect of the current fine level with the level existing in 1982 because we did not have sufficient time to reconstruct that database. We can state that the maximum fine that can be levied per violation has significantly increased to \$3,583. This fine level also reduces the need for heavier fines for repeat violators as also recommended in 1982. Our only concern in this area is with the number of vehicles now in operation with non-standard wheel and axle configurations. We did not have the time to review the effects of these vehicles on roads or identify how they comply with Bridge Formula B.

Recommendations in the 1983 audit calling for improved staff and material control have not been as successful as recommendations in overweight trucking. Our audit work during this follow-up has not been as extensive as it has been in other areas. In 1982, extensive work was done to identify how efficiently and effectively maintenance field crews performed their tasks. For that audit, auditors spent a great deal of time at the department's maintenance station actually going to job sites to measure equipment utilization, material use and handling, and work crew activities in comparison to the UDOT established standards.

This degree of scrutiny was not possible during this follow-up. Maintenance management believes that headway has been made in the area of staff training since 1983. Our abbreviated review indicates that many of the problems found in 1983 may still exist. No standards or measures of accomplishment have changed in UDOT's Maintenance Handbook over the last

eleven years. Activity equipment and manpower standards have also remained

the same. Our review of current station by station performance measures shows a wide variance in performance much as existed in 1983.

### **Changing Budget Has Given UDOT Some Contingency Budgeting Ability**

UDOT's Maintenance Division has, historically, had a difficult time maintaining sufficient funding for spring maintenance activities when burdened with the cost of snow removal during heavy snow years. This is important because road repairs in the spring and early summer are less costly than later in the year after further deterioration has occurred. Because of this problem, a ULAG performance audit recommended in 1982 the use of a contingency fund to insure funding for spring surface activities necessary prior to "new year" funding in July. The idea presented in that 1982 report was that snow removal would be separated from the maintenance budget and funded separately with non-lapsing funds based on departmental needs for an average snow year. The rest of the maintenance budget would then be set for the year as lapsing funds. Major maintenance activities could therefore take place at the most appropriate time of year, not just when there was funding available.

Since this program would eliminate some of the uncertainty of the coming year's demand for road surface maintenance, funding would be available for the following spring's road surface activities. At the time that report was released, UDOT maintenance management did not see any advantage to withholding a portion of its limited budget to do work in the spring they would have done in the fall. Their point being that insufficient funding meant there was only enough funding available to keep the existing staff gainfully occupied for part of the year. Basically, they did not see a major benefit in repairing damage as quickly as possible after it occurred over fully utilizing their budget in the fall.

UDOT states in its current response, that this recommendation has not be implemented but points out its desire for all maintenance funding to be non-lapsing. This suggestion highlights a change in organizational thinking. In 1982, UDOT did not believe there was enough funding available in the maintenance budget to carry the organization through an entire fiscal year. In 1994 the situation is different because UDOT believes it could capitalize on the use of carry-over funds from one fiscal year to another.

In point of fact, since 1989 some of the funding now used for maintenance is in the form of non-lapsing construction funding. The maintenance budget has changed significantly and bears little resemblance to the maintenance budget of 1982. This is primarily due to the fact that UDOT's operations have matured and the nature of the organization's work has changed from a construction base to a maintenance/preservation base. Maintenance which was historically under the maintenance division can now be addressed by maintenance or by

construction. UDOT budgeting has improved and is better than it was in 1982. While we believe there is still merit to the 1982 recommendations, the organization may not need a separate snow removal budget under current conditions.

**Recommendations:**

1. We recommend that the Maintenance Division re-test snow removal contracting and adopt it if it is found to be cost effective.

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## **Appendix**

**APPENDIX A**  
**Actions Taken on Audit Recommendations**

**RECOMMENDATION**

**ACTIONS TAKEN**

**Audit # 92-02, February 1992:  
UDOT Maintenance Buildings**

- |  |                        |
|--|------------------------|
| <p>1. We recommend that the Legislature make a policy decision on construction of UDOT maintenance facilities, based on one of the following options:</p> <ul style="list-style-type: none"><li>a. funds can be appropriated for fiscal year 1993 with accompanying intent language requiring that a full programmatic review will be conducted before any buildings are built;</li><li>b. a programmatic review can be done without funding this year and DFCM would report back to the Legislature next session when funding decisions would be made;</li><li>c. the modified prototype can be funded and construction proceed this fiscal year.</li></ul> | <p>1. Implemented.</p> |
|--|------------------------|

**Audit # 92-01, January 1992:  
UDOT Research and Development Section**

**Chapter II**

- |   |                        |
|---|------------------------|
| <p>1. We recommend that the department make sure that each research project is conducted by researchers with experience and expertise in the field being studied.</p>   | <p>1. Implemented.</p> |
| <p>2. We recommend that UDOT find outside experts from universities or consulting firms for its highly specialized research projects that require more expertise than can be provided by UDOT research staff.</p> | <p>2. Implemented.</p> |
| <p>3. We recommend that UDOT research staff perform research assignments for which their training is suited such as implementing other's research, evaluating</p>   | <p>3. Implemented.</p> |

## RECOMMENDATIONS

## ACTIONS TAKEN

department construction practices, and testing new products.

- |   |                 |
|---|-----------------|
| 4. We recommend that UDOT encourage local universities to expand their research and educational capabilities in fields related to transportation.   | 4. Implemented. |
| 5. We recommend that UDOT continue to encourage the creation of an Advanced Center for Transportation Studies by supporting cooperative educational programs, by providing access to its materials laboratory, and by contracting out research to local universities. | 5. Implemented. |
| 6. We recommend that UDOT and local universities formulate a cooperative research agreement to facilitate the process of assigning research projects to university faculty.   | 6. Implemented. |

### Chapter III

- |   |                 |
|---|-----------------|
| 1. We recommend that the R & D section reduce the time it takes to complete major research projects by (1) reducing the number of assignments given to each principal investigator, (2) replacing under used staff positions with additional researchers, and/or (3) increasing outside research contracts. | 1. Implemented. |
| 2. We recommend that the R & D section solicit more research proposals from the department's operating entities.  | 2. Implemented. |
| 3. We recommend that the department not consider any research proposals submitted by outside researchers and UDOT research staff unless they have a co-sponsor from within the operating entity effected by the research.   | 3. Implemented. |
| 4. We recommend that voting rights on the UTRAC committee be reserved for representatives of the department's operating entities, not researchers.  | 4. Implemented. |
| 5. We recommend that the R & D section avoid conducting original research into subjects of national interest and focus instead on problems unique to Utah, implementing   | 5. Implemented. |

## RECOMMENDATIONS

## ACTIONS TAKEN

the research results of other states as applicable.

- |  |                 |
|--|-----------------|
| 6. We recommend that before a research proposal is considered by the Utah Transportation Research Advisory Council, that a complete summary be provided of similar studies conducted by other research institutions. | 6. Implemented. |
| 7. We recommend that the scope and objectives of outside research projects be clearly defined.   | 7. Implemented. |

### Chapter IV

- |   |                 |
|---|-----------------|
| 1. We recommend that the development engineer within the Materials and Research Division oversee all new product testing within UDOT.   | 1. Implemented. |
| 2. We recommend that the Materials and Research Division be authorized to control the department's use of all construction and maintenance products through the use of an approved products list, which identifies all products which have been tested and approved for use by the Materials and Research engineer. If department staff wish to use a product not on that list, they should be required to get authorization from the development engineer to test it as a new product. | 2. Implemented. |
| 3. We recommend that product vendors be required to provide as much information as possible regarding independent tests and the product's use in other states, and that the development engineer use literature searches to obtain information regarding a new product before conducting tests in Utah.   | 3. Implemented. |
| 4. We recommend that all product vendors be required to submit their new products to the development engineer for consideration, not to other department staff.   | 4. Implemented. |
| 5. We recommend that each product vendor be required to perform independent ASTM and AASHTO tests before submitting it for testing by UDOT.   | 5. Implemented. |

## RECOMMENDATIONS

6. We recommend that UDOT follow its 3-year new product evaluation procedure as outlined by department policy.
7. We recommend that new product tests be properly documented. This includes documenting the product formulation, the process used to prepare and install the product, under what weather conditions, the application process, and the results of the test on the product.
8. We recommend that the Materials and Research Division prepare detailed product specifications for each product category and that vendors be required to report any and all changes to mix design and formulation of products.
9. We recommend that UDOT control product performance by adopting materials testing procedures which identify the physical characteristics relevant to each product's performance.

## ACTIONS TAKEN

6. Not Implemented.
7. Implemented.
8. Implemented.
9. Implemented.

### **Audit # 90-16, December 1990: UDOT Equipment Fleet Management Program**

#### **Chapter II**

1. We recommend that UDOT expand and refine the Legislative Auditors daily demand analysis methodology and make periodic reports available to district maintenance engineers and the new mid-level supervisors. We also recommend that the department use the daily demand analysis reports to identify equipment that can be deleted from the fleet inventory.

1. Partially Implemented.

#### **Chapter III**

1. We recommend that the UDOT continue its recent efforts to establish a light vehicle advisory committee. We also recommend that the committee's responsibilities include reviewing and approving organizational units' requests for replacement and additional light vehicles.

1. Implemented.

## RECOMMENDATIONS

## ACTIONS TAKEN

### Chapter IV

- |  |                     |
|--|---------------------|
| 1. We recommend that UDOT study and develop a plan for a dual rate charging system or an alternative incentive system to be implemented at the earliest opportunity. | 1. Not Implemented. |
|--|---------------------|

### Audit # 87-06, August 1987: UDOT Contractual Maintenance II

#### Chapter II

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|--|-----------------|
| 1. We recommend that UDOT reactivate the Maintenance Standards Panel to perform the cost analysis that is necessary for policy development.  | 1. Implemented. |
| 2. We recommend that the Panel use objective unit cost comparisons and cost/benefit analysis to identify the maintenance activities that should be contracted.                             | 2. Implemented. |
| 3. We recommend that UDOT strengthen its contract maintenance policy by making the districts responsible for program implementation and by defining which activities should be contracted. | 3. Implemented. |
| 4. We recommend that UDOT strengthen its contract maintenance policy by defining the program goals and objectives.   | 4. Implemented. |
| 5. We recommend that the goals of the contract maintenance program include: 1) containing costs; 2) freezing in-house capacity; 3) reducing staff size in the long term.                   | 5. Implemented. |

#### Chapter III

- |   |                 |
|---|-----------------|
| 1. We recommend that the revised contract maintenance policy direct the districts to use the unit cost selection criterion when deciding whether to contract a project or use in-house crews. | 1. Implemented. |
| 2. We recommend that the Division of Maintenance use unit   | 2. Implemented. |

## RECOMMENDATIONS

cost comparisons to analyze the performance of district maintenance operations.

3. We recommend that the Division of Maintenance make changes to the cost reporting system to ensure that all relevant costs are included in project cost calculations.

## ACTIONS TAKEN

3. Implemented.

### **Audit # 84-06, September 1984: UDOT Contractual Maintenance I**

#### **Chapter II**

1. We recommend the division analyze its snow removal staffing need and then establish an appropriate minimum staffing level.
2. We recommend the division determine an appropriate level for maintenance contracting based on consideration of the minimum staffing level, comparisons of costs and quality, and all feasible options.
3. We recommend DOT retest snow removal contracting and include in its analysis all costs of keeping maintenance workers busy throughout the snow removal season.
4. We recommend the retest should include snow removal contracts with multi-year durations and escape clauses to allow contractors to recover equipment costs and to minimize DOT's risk.

1. Implemented.
2. Implemented.
3. Not Implemented.
4. Not Implemented.

#### **Chapter III**

1. We recommend that the Department of Transportation continue testing contractual maintenance in order to determine the activities which contractors can do competitively.
2. We recommend that total internal maintenance costs (including overhead, down time, and low priority filler time) be determined and used in comparison with contractor bids.

1. Implemented.
2. Implemented.

## RECOMMENDATIONS

## ACTIONS TAKEN

- |  |                  |
|--|------------------|
| 3. We recommend that maintenance projects be monitored over several years in order to determine maintenance costs over time in comparing contractors and state crews.  | 3. Implemented.  |
| 4. We recommend that multi-year or multi-project contracts be considered to enable contractors to reduce costs by spreading equipment costs over more work.  | 4. Not Reviewed. |
| 5. We recommend that maintenance division administrators determine the appropriate specifications and the appropriate level of testing and inspecting required to insure that maintenance projects completed are as desired. | 5. Implemented.  |
| 6. We recommend that state maintenance crews be required to adhere to the same work specifications as contractors do.  | 6. Implemented.  |
| 7. We recommend that DOT administrators monitor maintenance work quality over several years so that the quality of contractor and state work can be compared.  | 7. Not Reviewed. |

**Audit # 83-05, June 1983:  
UDOT Maintenance Division II --  
Program Efficiency and Effectiveness**

### Chapter II

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|--|------------------|
| 1. We recommend that state and district managers review the procedures being followed by the crews with best productivity to determine if their procedures are acceptable and can be applied statewide. Where appropriate the standards should be revised. | 1. Not Reviewed. |
| 2. We recommend the division require that maintenance crews comply with the performance standards and that district and state management do more field observations to ensure maintenance crews comply with standards.                                     | 2. Not Reviewed. |



## RECOMMENDATIONS

3. We recommend that the state office assume more responsibility for reviewing and changing standards. The standards panel's role should be strictly advisory.
4. We recommend the division develop productivity standards where possible for all significant maintenance activities.

### Chapter III

1. We recommend the division use four day 10-hour work day schedules whenever possible if it will improve productivity significantly.
2. We recommend the UDOT reduce the level of snow removal service provided on low usage roads.
3. We recommend the division review what other states are doing to minimize snow removal overtime and implement a state policy to reduce Utah's overtime for snow removal and other maintenance activities.

### Chapter IV

1. We recommend the division eliminate the paint crews in Districts 5 & 6 and that these districts share crews with Districts 3 & 4 respectively.
2. We recommend the division sell one striping machine.
3. We recommend that the division implement an organized training program to ensure that employees learn correct equipment operating procedures.
4. We recommend that the division's training officer be assigned to make sure districts are planning for future equipment operator needs.
5. We recommend that the training officer conduct periodic observations to ensure equipment operators are following proper operating procedures.

## ACTIONS TAKEN

3. Not Reviewed.
4. Not Reviewed.
1. Implemented.
2. Not Implemented.
3. Not Reviewed.
1. Not Implemented.
2. Not Implemented.
3. Not Reviewed.
4. Not Reviewed.
5. Not Reviewed.

## RECOMMENDATIONS

## ACTIONS TAKEN

### Chapter V

- |  |                  |
|--|------------------|
| 1. We recommend that the State Maintenance Engineer develop a policy defining what tests are to be run on maintenance materials and their frequency. | 1. Not Reviewed. |
| 2. We recommend that funds for these tests be increased in the division's budget.  | 2. Not Reviewed. |

### **Audit # 82-09, November 1982: UDOT Maintenance Division I -- Improving Road Quality**

### Chapter II

- |  |                     |
|--|---------------------|
| 1. We recommend that the maintenance division reserve part of its appropriation in a contingency fund to cover unanticipated increases in maintenance costs. | 1. Implemented.     |
| 2. We recommend that the legislature appropriate snow removal and maintenance funds as separate line items.  | 2. Not Implemented. |
| 3. We recommend that the legislature's annual snow removal appropriation be equal to the average need and that excess funds not lapse.                       | 3. Not Implemented. |
| 4. We recommend that maintenance planning modify the existing budgeting system to incorporate all elements which affect the need for maintenance.            | 4. In Process.      |

### Chapter III

- |   |                     |
|---|---------------------|
| 1. We recommend that the legislature pass legislation allowing the Department of Transportation to assess a prorated fee of up to \$1,000 to the owner of any truck cited for violation of the state's weight laws. | 1. Implemented.     |
| 2. We recommend that the Department of Public Safety implement a system to identify parties guilty of repeated truck weight violations.   | 2. Not Reviewed.    |
| 3. We recommend that the legislature pass legislation allowing penalties in excess of \$299 for repeat violations.  | 3. Not Implemented. |

## RECOMMENDATIONS

4. We recommend that the legislature enact legislation imposing a schedule of mandatory penalties for weight law violations.

### Chapter IV

1. We recommend that the legislature amend Utah Code Annotated 27-12-151 (2) to adopt Federal Bridge Formula B as the basis for determining the gross vehicle weights for trucks up to a maximum of 122,000 pounds with the following restrictions:
  1. They do not pose a safety problem.
  2. They are required to buy an overweight permit.
2. We recommend this change to be phased in over a period of time acceptable to FHWA.
3. We recommend that the Transportation Commission identify the "good cause" situations where a permit to exceed the 34,000 pound tandem axle limit should be issued and that all other use of the permit be discontinued.

## ACTIONS TAKEN

4. Not Reviewed.
1. Implemented.
2. Implemented.
3. Not Reviewed.

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## **Agency Response**