MoDOT

Research, Development and Technology

B.C. Traffic Engineering, Inc.

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Pavement Marking Management System

Phase I

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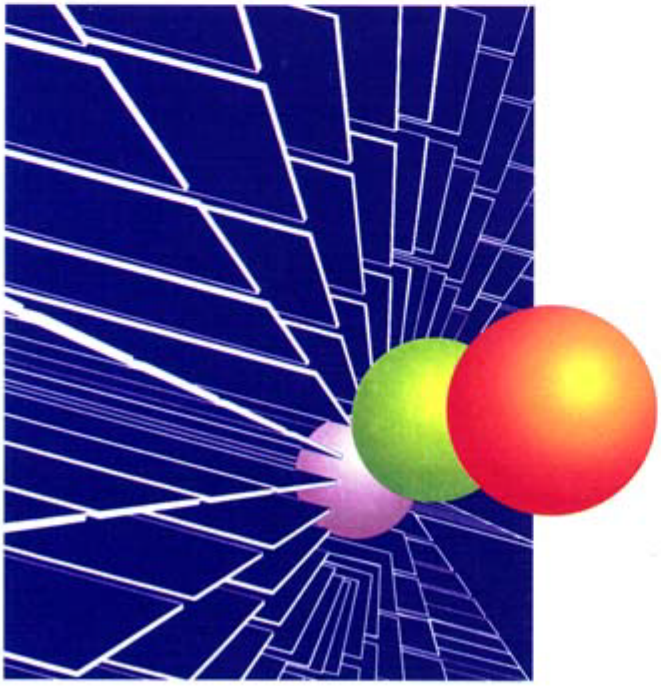

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16. Abstract

State Transportation Agencies have provided some form of delineation, for the traveling public, on roadways across America shortly after the automobile was invented. Pavement markings are one of those delineation practices that, until recently, have not been emphasized as much as other forms of delineation. The Federal Highway Administration (FHWA) is currently in the rule making process that will develop minimum retroreflectivity criteria for pavement markings. These criteria will be published in the next edition of the Manual on Uniform Traffic Control Devices (MUTCD) or as a supplement to the MUTCD. When these criteria become mandatory, state highway agencies will have a responsibility to assure that pavement markings in place on the highway system meet or exceed these minimum retroreflectivity levels.

The Missouri Department of Transportation (MoDOT) recognized this discrepancy and contracted with B.C. traffic engineering, inc. to conduct a research project to evaluate the effectiveness of MoDOT's pavement marking operations and to explore the feasibility of developing an automated customized Pavement Marking Management System (PMMS).

The mission of this research was to demonstrate that a customized pavement marking management system could be developed to help MoDOT improve their operations in a cost efficient manner while tracking the quality and life expectancy of the markings. This final report represents an approach developed by B.C. traffic engineering, inc. and MoDOT District Seven personnel for the initial development of a customized Pavement Marking Management System (PMMS).

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INTRODUCTION

State Transportation Agencies have provided some form of delineation, for the traveling public, on roadways across America shortly after the automobile was invented. Pavement markings are one of those delineation practices that, until recently, have not been emphasized as much as other forms of delineation. The Federal Highway Administration (FHWA) is currently in the rule making process that will develop minimum retroreflectivity criteria for pavement markings. These criteria will be published in the next edition of the Manual on Uniform Traffic Control Devices (MUTCD) or as a supplement to the MUTCD. When these criteria become mandatory, state highway agencies will have a responsibility to assure that pavement markings in place on the highway system meet or exceed these minimum retroreflectivity levels.

The Missouri Department of Transportation (MoDOT) recognized this discrepancy and contracted with B.C. traffic engineering, inc. to conduct a research project to evaluate the effectiveness of MoDOT's pavement marking operations and to explore the feasibility of developing an automated Pavement Marking Management System (PMMS).

The project was conducted in MoDOT's District Seven, with headquarters in Joplin, Missouri. The pilot projects primary focus was in the Jasper County area on over 1000 miles of pavement markings. Two striping crews are housed within District Seven's pavement marking operations and were used in the research.

The mission of this research was to demonstrate that a pavement marking management system could be developed to help MoDOT improve their operations in a cost efficient manner while tracking the quality and life expectancy of the markings. This final report represents an approach developed by B.C. traffic engineering, inc. and MoDOT District Seven personnel for the initial development of a Pavement Marking Management System (PMMS).

A PMMS is the only practical method to allow state highway agencies to track the materials, age, cumulative traffic exposure, and retroreflectivity level of existing pavement markings and to enable systematic decisions concerning when, and with what materials, existing markings should be renewed or replaced. The PMMS is designed to operate in conjunction with (1) a quality assurance program to verify adequate retro-reflectivity on installation of a pavement marking and (2) a periodic field-monitoring program to check the retroreflectivity levels of markings and guide the timing of marking renewal or replacement. The system is developed with flexibility to adapt to the broad range of pavement marking materials and the range of pavement surface types, traffic counts, route functional classification and climatic conditions under which they are used. This flexibility is of critical importance, because it is unreasonable to expect that one universal set of quality assurance, monitoring, or replacement criteria could ever be appropriate for all materials, pavement surface types, climates, or traffic conditions.

OBJECTIVES OF THE PMMS

The objectives of the PMMS will be as follows:

1. To provide a system that can track the condition of pavement markings (i.e., minimum standards for new markings, life cycle curves for various materials, and help to prioritize marking replacement).

2. To allow MoDOT to make installation, maintenance, and service life decisions concerning pavement markings that is based on valid data. This will provide a rational process, based on field measurements and previous experience with particular materials, for determining when pavement markings need to be replaced.

3. To provide better quality assurance when pavement markings are installed and, incorporate striping contractors into the pavement marking management process. This will make the quality of pavement markings more consistent throughout the highway system.

4. To provide better estimates of the service life of pavement markings by tracking their installation dates, replacement dates, and the changes in retroreflectivity with wear due to time and traffic passages. Life-cycle data of this type will allow MoDOT to make better decisions in selecting materials to provide the most cost-effective pavement markings.

5. To help MoDOT develop process to better evaluate new products as they come into the market.

BENEFITS OF THE PMMS

The benefits of this PMMS are:

1. Enhanced safety for the motoring public.

2. Replacement of pavement markings as soon as needed, but only when needed.

3. Improved productivity and quality of all contracted and "in-house" striping operations. This will assure maximum benefits from each dollar spent on pavement markings.

4. The availability of site-specific retroreflectivity data. Managers will have access to recent quality assurance data for any location on the system.

5. Reduction in tort liability results from incorporating a systematic approach to pavement marking replacement.

6. Increased knowledge of problem areas based on analysis of historical data. Identifying problem areas that could lead to use of a different type of marking in those particular problem areas.

7. Better service life and cost data for use in budgeting, which can lead to enhanced management process and better control of pavement marking costs.

Task 1:
Preliminary Plan for PMMS

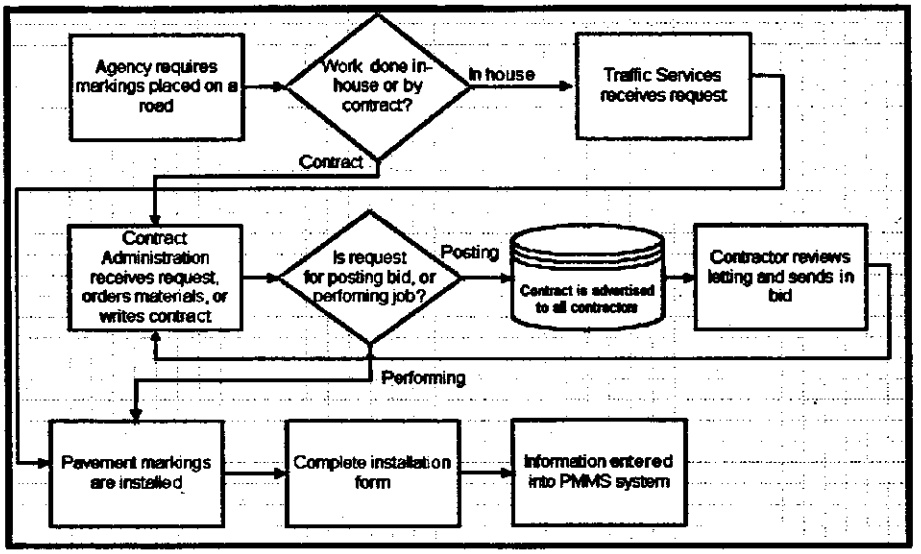
The first task was to develop a preliminary plan. This involved conducting an implementation meeting/demonstration with all the parties involved in providing "in house" pavement markings for District Seven in the spring of 1999. This meeting included staff responsible for inspection and project management; the two striping crews responsible for placing pavement markings in the District; and District personnel who perform the support functions for a pavement marking program.

The intention for this meeting was based on experiences B.C. has gained in developing a PMMS. When involving the employees responsible for supplying the system with data early on in the process you eliminate many of the problems that can and will develop. Early involvement allows those involved to gain an understanding of the process, in turn generating a positive comfort level regarding the program and its objectives. Also, early on in the process if a problem exists such as faulty material or workmanship it can be corrected immediately. The most important aspect is demonstrating to the crews that you're working with them and that MoDOT wants to employ the PMMS as a tool to help crews deliver better pavement markings.

Normally at this point in time is when the crews would be trained in calibrating their trucks glass bead guns, mil thickness, speed rates and equipment setup. However, the crews that are providing pavement markings in District seven have an excellent handle on their equipment. Every day they calibrate their bead guns and monitor the amount of material flowing through he trucks. This makes it much easier during early development stages.

The next step in the process of developing a preliminary plan was to look at the process flow of delivering pavement markings.

Preliminary Process Flow Diagram



The plan developed in Task 1 was preliminary in nature and revised throughout the project. The specific data items included in the PMMS database consisted of pavement marking inventory data, QC data from pavement marking installation projects and field monitoring data (QA) on in-place pavement markings. The appropriate structure of the database had to include these items. Many of the issues the plan tried to address are listed below:

- Track pavement markings from the time they are installed (QC) until the time they are replaced (QA).

- Mo/DOT has determined that it will use a quality process to manage its pavement marking resources. In other words, a quality control (QC) inspection approach is built into the PMMS processes. In order to take this approach several critical aspects of a pavement marking must be tracked. They include: location, manufacture/installer, date, specific line, material type, and most importantly the quantity of material used at time of installation. One of the main principles behind the quality movement is to control manufacturing processes so that inspections can be kept to a minimum. This is a critical aspect of this system.

- Provide the opportunity to develop knowledge on the expected life of particular materials under particular pavement, climate, and traffic conditions.

- A determination needs to be made as to whether QA acceptance tests should be conducted on all new markings, or only for a sample of the markings for each material placed in a given year.

- Link to a quality assurance (QA - field monitoring) program in which mobile and/or hand-held retroreflectometers are used to measure the retroreflectivity at periodic intervals

- Procedures will be established to determine what type of retroreflectivity measurements are needed in QA tests.

- A practical procedure for determining when pavement markings need to be replaced will be developed with MoDOT's input. This involves thinking through both the engineering and statistical issues concerning how to implement minimum replacement criteria.

- Establishing replacement/non-replacement criteria is an issue in statistical quality control and reliability theory that should be addressed. We suggest that MoDOT establish its own criteria that will lead to replacement criteria. Replacement criteria that utilize all of the available field data and consider mean values, standard deviations, input from experienced MoDOT employees, and ranges of retroreflectivity can and should be utilized.

- As a management and planning tool, the PMMS will anticipate (i.e., to predict) the time at which particular markings will reach the retroreflectivity level at which they fall below MoDOT specifications. The accuracy of such predictions is also a statistical question, which will need to be addressed by MoDOT. Such predictions are at the heart of the PMMS because it is essential to assure that markings in need of replacement are replaced, but also to assure that funds are not spent replacing markings unnecessarily if those markings still meet specification

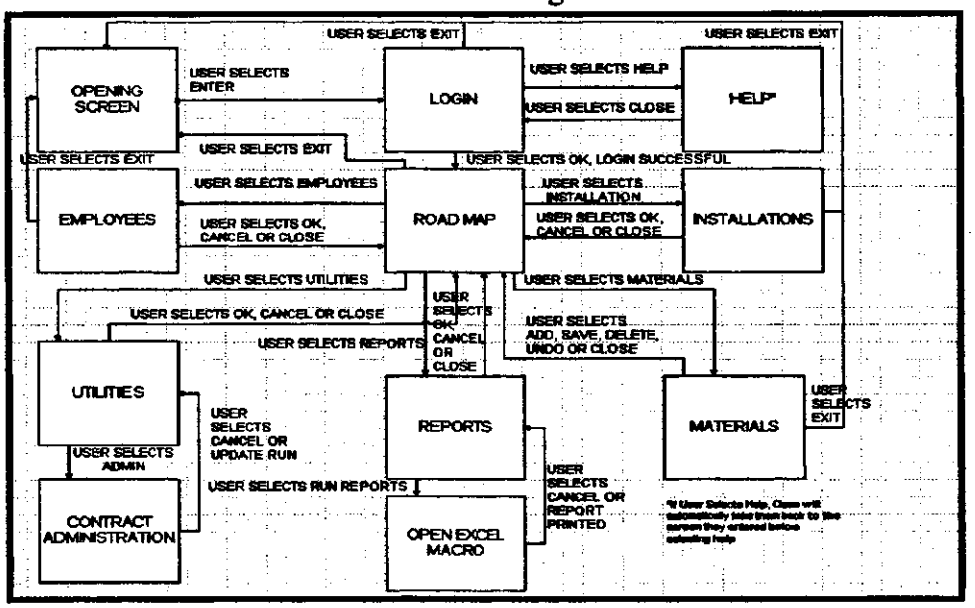
Task 2:
Preliminary Version of Data Base Management Program

In task two our goal is to develop a prototype of the databases, which also meant that we needed to layout the systems design elements.

Our approach to the development of the Pavement Marking Management System was centered around a Contextual Design format. Contextual Design (CD) is an approach to designing software and hardware systems that collects customer centered data collection techniques and integrates them into a design process. We use "design" in the ordinary English sense of conceiving and planning a system. Contextual design makes data gathering from customers the base criteria for deciding what the systems should be and how it should be structured. Our goal is to make a customer centered design that is practical for the Missouri Department of Transportation's organization, which will depend on us striking a balance among multiple considerations.

Ultimately, for this system to work we need to provide the tools that will allow the striping services employees to see the breadth of data that this system can generate, without being overwhelmed, to see the common structure and pattern without losing variation, and understand the wealth of detail without losing track of its meaning. It is these everyday employees that helped to make this system a success. Our system contextual design is modeled after Hugh Beyer and Karen Holtzblatt. Their ideas behind Contextual Design deal with the issues of gathering data, driving design, and managing the organizational context. Contextual Design provides complete support for the design process, from initial data gathering through the transition to object oriented design or whatever model designers put in place. This process brings together the techniques needed to design a system that will meet customer needs, while addressing the challenges of making design process work in real world situations.

Transition Diagram



The Pavement Marking Management System (PMMS) was designed around the user environment design. It was felt that this system must have the appropriate function and structure to support the department's natural flow, or existing flow, of work. This structure is a system work model -- the new way of working implicit in this system. It's a floor plan of the new system, hidden behind user interface drawings (state transition diagrams), implemented by an object model, and responding to customer work -- but it's typically not made explicit in the design process. In contextual design, the system work model has inexplicit representation in the user environment design. As a floor plan for the system, the user environment design shows the parts and how they're related to each other from the user's point of view. In this approach we will try to show each part of the system, how it supports the work, exactly what function is available in that part, and how it connects with other parts of the system, without trying to structure to any particular user interface (UI).

Our very first step, as a development team, was to outline a problem statement. Our problem statement states that, before this contract, the Missouri Department of Transportation did not have an automated process that provided it with an opportunity to strategically manage its pavement marking resources. Much of this problem statement is centered on the idea of providing the department with an opportunity to manage its pavement marking resources. There are many aspects that go into this managing idea. These aspects include the ability to better manage human resources, material resources, and provide the motoring public with markings that are highly visible. We would be remiss to not state that the Federal Highway Administration is also a driving factor into providing pavement markings that meet specifications.

Along with providing a return on your automation investment B.C.'s goal for this system is to benefit the Missouri Department of Transportation in several ways, they include: the opportunity to increase productivity through asset maintenance and inventory of markings. The ability to develop an accurate account of assets and better resource allocation, and reduce liability and potential litigation. The idea of increasing productivity through asset maintenance and inventory revolves itself around several things. First, only re-striping markings when they need to be re-striped. This is the idea of using marking resources to their maximum extent, or replacing markings when they get to the end of their useful life. Second, being able to track assets should allow the department to only have material on hand that is needed to complete assigned jobs. Third, assets that are properly maintained allows productivity to increase when you consider some of a driving factors that drive up the costs associated with pavement marking installation. Being able to better utilize human resources should allow the department to increase productivity. Developing an accurate account of assets, or dollars spent, will benefit managers by allowing them to focus their attention on improving cost accounting.

Early on, in our contextual design process, we needed to develop some givens or assumptions. Our first assumption is that the systems developments were to be done using a Windows operating system, and Microsoft Access as a primary database. By making this assumption we knew that our front-end development could be done in Visual Basic. We feel this is good assumption because it allowed us to use tools that are found in the industry today. All of the systems controls, from the pull-down menus, windows contents, and button bars follow industry standards. We also based this systems development on a hardware platform designed around IBM style hardware.

We wanted a system to have the ability to report on when the quality of existing lines are due for replacement. Therefore, this needed to be built in from the very beginning. This of course centers itself around the idea of being able to manage the retroreflective lifecycle of the Departments pavement markings. Once again, this will reduce unnecessary waste. It is assumed that the pavement marking management system should document or show that federally mandated retroreflectivity standards are being met. Also, we assumed that the system needed to show that the department is efficiently using tax dollars to meet its customer's needs.

The next steps in the systems development lead us to developing our models. We needed to clearly show our software writers how the system should be able to capture work processes, and report them back to the users. As you can see in Task 1, the very first model that we drew was a process flow chart. This original process flow chart described for our software writers how there are really two processes available to the Missouri Department of Transportation for applying payment markings. This process flow chart, from a very high level, shows the process starting with the need for pavement marking replacement, and ends once the markings are in place. The two processes that are available to the department include: contracting for outside services or for in-house services to install pavement markings. This model is an important first step to understanding how the system develops. With this revelation we can see that the systems development is immediately split into two parts.

Perhaps, the most important part of the contextual design process is laying out the state transition diagrams. Our state transition diagrams are really our paper prototype of the Pavement Marking Management System. The state transition diagrams allows the user and programmers the ability to understand how it should be developed, and help managers to review and understand the inner workings of the systems processes. Which could also be considered work processes. The state transition diagrams help to show how the screen flows and are intended to portray how data is entered into the system. They not only show how the screens are laid out, but also show how the user can access other parts of the system. This allows users, managers, and programmers to see how the screen flows move from one point to the next. A huge benefit from this type of development is that these prototypes act as a language for communicating between user and designer. Instead of introducing a new language, hopefully our prototype builds on your own experience with computers and your striping operations. These original screen flows clearly show the system moving from opening screen to the login screen to the road map and on to the various screens.

After reviewing each part of the state transition diagrams the systems coders were able to develop the screens and corresponding database tables that follow those screens. There are two ways to take advantage of the user environment design. One is that while designing a new system that allows us to see the structure and ensures that the system will stay simple and hopefully close to the users needs, and helps us to see how the system will produce outputs. By allowing you to see these state transitions diagrams we are in essence bringing you into the systems development. This reveals the systems underlying work model. Hopefully, revealing what users think about into another in the system, and reveals assumptions built in the system about how users work. By taking this step in revealing how the system was intended to work we are already working towards designing the next version of the system. Before adding any new functions, we need input on our structure or structural issues in the existing version of the system.

This outline of the development of the system intended to be an overview of our design process. This outline does not capture many of the interceding processes that lead us to the present version of software. Our goal now at this point is to incorporate you, the user, into the next versions of the software.

Task 3:
Collect Pavement Marking Inventory and Field Data

Task 3 was set up for the collection of actual pavement marking field data and to use these data in the development of the PMMS. This task was conducted on four separate occasions, three times during the 1999 season and once during the spring of 2000.

Three specific activities were part of Task 3 including: development of a pilot inventory of existing markings in the Jasper area; monitoring the retroreflectivity of selected new markings as they are installed; and monitoring the retroreflectivity and condition of existing markings. This data was collected on over 1,000 miles of roadway identified in the Jasper area on four trips (approximately 4,500 miles of data).

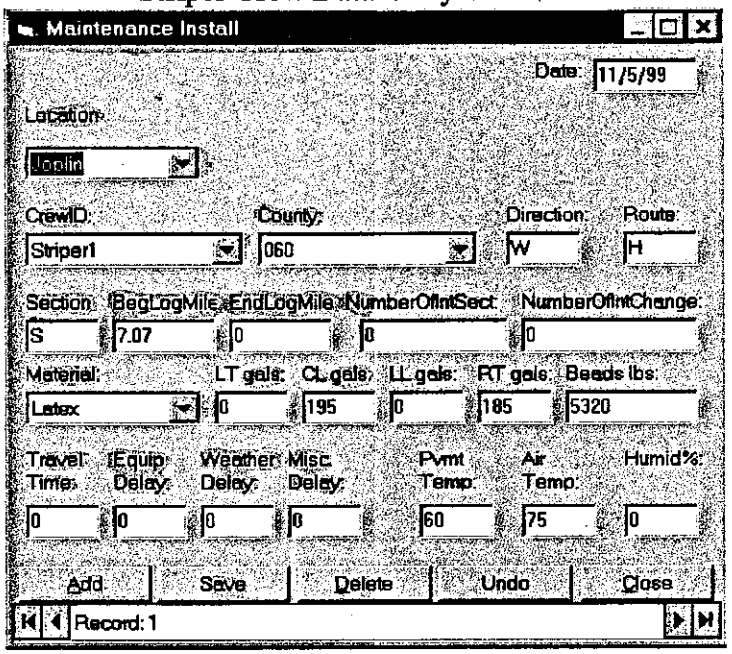
Pilot Inventory of Pavement Markings

Mo/DOT selected a over 1,000 miles of pavement markings in the Jasper County area, Missouri to be inventoried with such variables as:

Location (route, county, beginning reference point, ending reference point, direction of travel)
Type of line (right edge line, lane line, centerline, and left edge line)
Color of line (white, yellow)
Pavement marking material
Installation date
ADT and number of lanes
Surface type
System designation
Current retroreflectivity

The critical information for developing this inventory was collected in paper format and then transfered into the prototype PMMS after it's development. The following input screen is the Maintenance Installation screen. This screen is the basis for building the PMMS automated pavement marking inventory. All the information collected from this screen is then compiled with the other aspects on the system to generate expected life cycles, the quality assurance checks and balances, and the rest of the data analysis.

Striper Crew Data Entry Screen



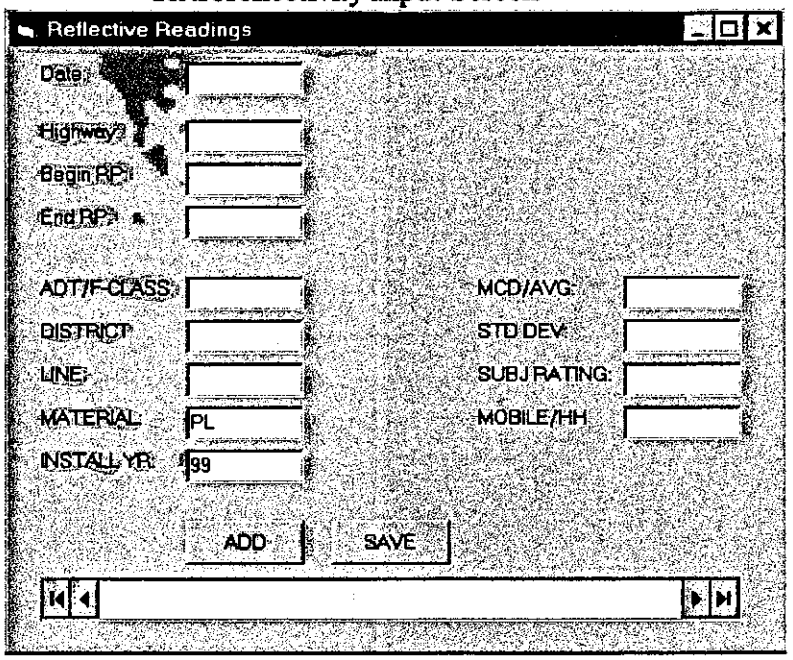
The pilot inventory data was entered into the prototype PMMS database and the data was utilized in the PMMS testing.

QA Measurements of Newly Installed and Existing Markings

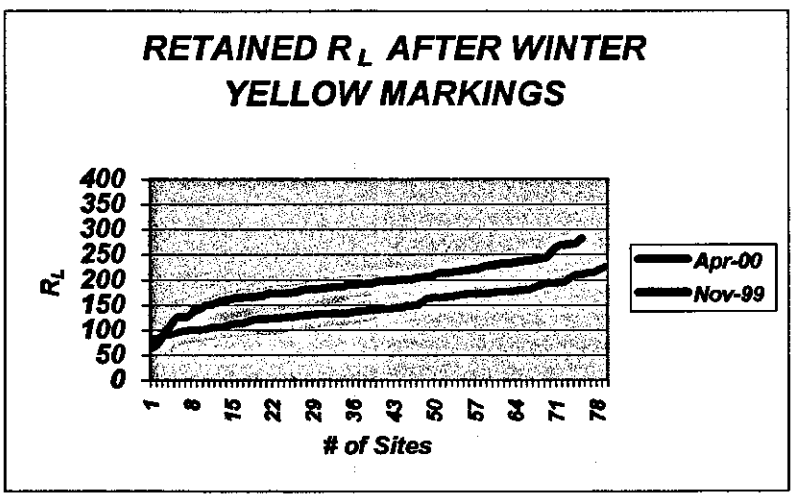
During the 1999-striping season (spring, mid summer and late fall) as well as spring of 2000, retroreflectivity measurements were made on selected pavement markings. These readings were taken on pavement markings that had been striped: 1) just after the 98-99 winter season before being re-striped; 2) at the mid point in the striping season with markings that were placed in 99 and some 98 markings as well; 3) in the late fall when all the markings had been striped during the 99 season; 4) again in the spring of 2000 after the winter season of 99-00. This data was linked to the prototype PMMS and was used in Task 4 to develop a recommended strategy for future QA monitoring of newly installed markings. The QA measurements performed by B.C. traffic engineering were collected with both a mobile reflectometer (Laserlux) and hand-held retroreflectivity measurement devices as well. Collecting measurements of newly installed markings was the first step in developing life cycles as well as checking gains related to best practice procedures.

The following input screen is where the PMMS user enters the retroreflectivity readings of a roadway. Notice how all of the important aspects are captured on this one screen. One of the more important features of this screen is how it is not dependant on mobile readings for storing the information. There is an unlimited field for entering readings in the case of handheld measurements. Furthermore, after entering the data for each individual handheld reading the PMMS averages those readings for the segment and returns a standard deviation similar to the mobile instruments.

Retroreflectivity Input Screen

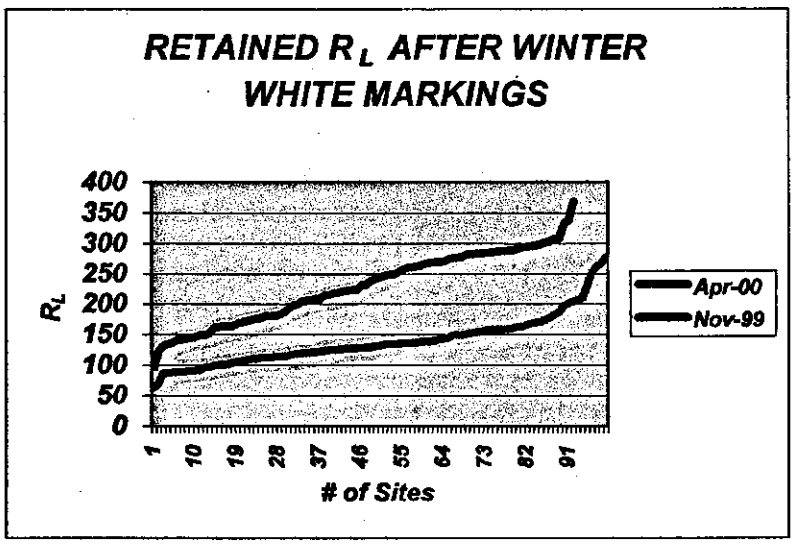


As mentioned earlier field monitoring was conducted four times during the project period for each marking in the pilot inventory. This data was entered into the prototype PMMS database and used in development and testing of the PMMS procedures and life cycle analysis. The following graphs illustrate the outcomes of those field surveys over 2 striping seasons.



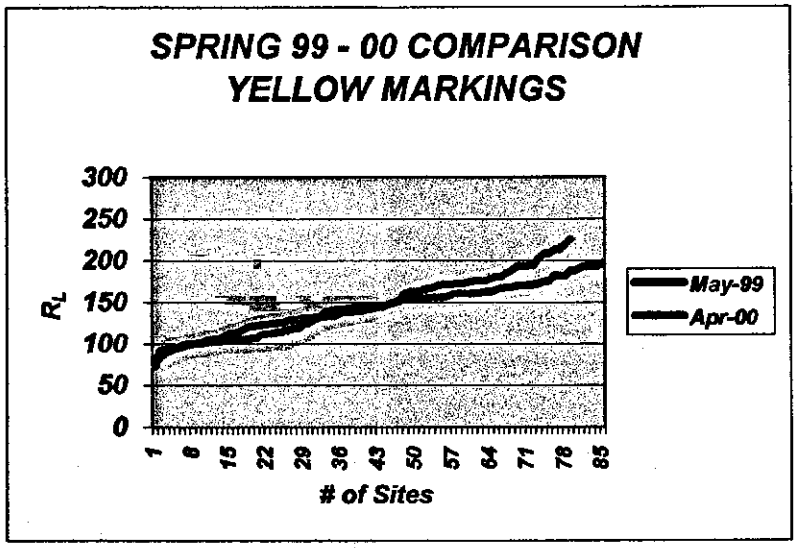
The retained retroreflectivity graphs for both white and yellow markings display very consistent deterioration in retroreflectivity. This deterioration is not uncommon at all. The reduction for the yellow markings is relatively consistent at around 30%; white on the other hand does not show the same consistency and is approximately 50%. This is typical for reductions in retroreflectivity and compares with other States like Michigan, which saw their markings in one Region fall: 35% for yellow and 46% for white.

Notice how the curve for white markings deteriorates. The gap between fall and spring is not as consistent as the yellow markings. This is a clear indication of the variability in the performance of the white markings when comparing them to the yellow markings. The white markings in the Jasper County area are not degrading uniformly, while the yellow markings are.

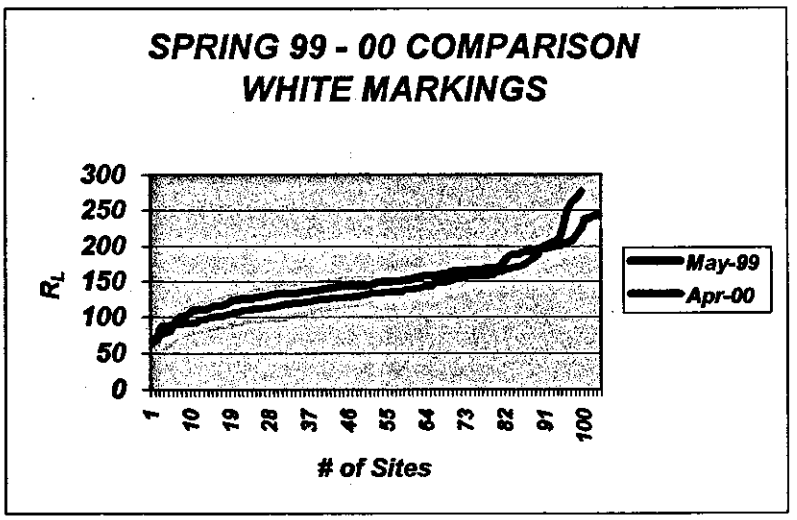


Since this project came in well under budget the Program Manager decided to use some of the excess funds and conduct a 4th retroreflectivity evaluation. This gave the Department and B.C. the ability to look at how the pavement markings survived the mild winter of 1999-2000. The following tables represent the results of the first retroreflectivity survey in May of 1999 with that of the last survey completed the first week in April 2000.

These life cycle curves for the Jasper County area are a good indication of how markings are deteriorating. However, the study was confined to one small area within one MoDOT District. It's to early to say all of MoDOT's pavement markings will degrade like those in Jasper County. Variability in application from District to District could have a drastic effect on the performance of markings through out the State.



Notice how consistent the yellow pavement markings results are from one year to the next. The findings are almost identical. The White markings are also very consistent, with the markings in the spring of 2000 somewhat lower than those of the spring of 1999.



Task 4:
Pavement Marking Management Procedures and Criteria

A key joint effort between B.C. traffic engineering and MoDOT was to develop recommended pavement marking management procedures and criteria for use in the PMMS. The procedures and criteria were developed using the inventory and field data collected in Task 3 and the results were incorporated in the final plan for the PMMS developed in Task 5.

The Department and B.C. has worked on the following issues with some of the tasks forwarded on to Phase II of the project.

- Recommend practical field measurement procedures for monitoring the retro-reflectivity of new and existing markings. The issues included the choice of measurement technology, sampling intervals, sampling locations, etc.

- Recommend practical procedures for Quality Control. The only way to control quality is to make sure installation specifications are followed. In the case of pavement markings that means tracking each installation. In order to do this each striping truck will be required to track the total amount of material that was used each and every day. The PMMS software has been designed to track each specific striping trucks material out-put. One of the innovative approaches that this system is designed to do is to track a stripers set-up (i.e., material coming out of the equipment at specified speed), which will help to maximize the quality and lengthen the useful life of each and every installation. This static test is done before stripers apply materials on the roadway.

- Recommend practical procedures for Quality Assurance of newly installed markings. The issues include the field measurement issues discussed above, as well as whether all newly installed markings or just a sample need to be measured for particular pavement marking materials. These procedures must be consistent with any performance specifications for pavement marking retroreflectivity incorporated in striping contracts.

- Recommend practical scheduling criteria for field monitoring of existing markings. The issues addressed include how often existing markings should be measured and whether the monitoring frequency should increase as the marking gets older. Sampling rates may also need to be higher at sites with higher traffic volumes where markings are likely to get more wear? Seasonal considerations also need to enter into the establishment of monitoring schedules.

- Recommend practical replacement criteria for pavement markings to implement the anticipated minimum retroreflectivity levels. Key issues addressed include:

  What measure of the retroreflectivity of a line should be used as the replacement criterion? Should it be the minimum reading, the mean reading, or a specific percentile of the reading determined on the basis of both the mean and standard deviation? This is a statistical issue and needs to be addressed as such, which the DOT has a statistician working on.

  How soon does a marking that is found to fall below the minimum level of retroreflectivity need to be replaced? The acceptable time between the field measurements and the scheduling of replacement depends on how low the retroreflectivity reading is.

  How accurate can the future retroreflectivity levels of pavement markings be predicted? If we anticipate that a particular marking will be in need of replacement 3 years after installation, when are retroreflectivity levels that indicate a need for replacement actually observed?

These recommendations are incorporated in a technical memorandum on the results of Tasks 3 and 4. Also, a summary of the field measurements is located in the Appendix.

Task 5:
Revise Data Base Management Program and PMMS Development Plan

The final task of the project is to finalize the plan for the recommended PMMS based on the findings of Task 4 and to revise the preliminary PMMS data base program. B.C. has made changes to the PMMS database based on what has been learned throughout the study. In fact some changes are being identified now that will be completed in Phase II of this project.

Soliciting feedback from the District has been an ongoing process, and is once again addressing the quality aspects of this system. Included in the PMMS are quality indicator tools, so that everyone utilizing the system will be able to track whether improvement has taken place. A quality indicator is a measure of this systems ability to meet its valid expectations. Examples of quality indicators that the District can choose to utilize are:

Costs of providing the service (i.e., by mile, foot, county, crew, etc.)
Timing – related to factors that effect placing of materials (i.e., weather delays, travel times to high, production rates, equipment down time, etc.)
Timeliness of data – is the information entered into the system soon enough
Other measurable values that relate to managements expectations.

Once those indicators have been identified, the system will generate reports for both managers and production personnel, and continuous improvement targets or goals can be set and monitored.

Training MoDOT employees how to operate the PMMS is a critical aspect of the development of any management system. The software has been installed and training took place for a select few individuals during the season. Utilizing the previous season's data will give everyone an opportunity to become familiar with the system and ready for full-scale District implementation.

Located in Appendix A are the setup procedures for the Pavement Marking Management System. These procedures are an excellent opportunity for someone who wants to understand how to load and operate the system. Each field is explained in detail and will give the user a better understanding of how each part of the system functions.

Also located in Appendix B is the Table Update Procedures. These procedures identify the new tables that have been added to the software as part of the revisions in PMMS for task 5. It also gives the user step-by-step instructions on how to save the tables that already have data entered into them and need to be changed because of revisions.

Conclusions
Technical Memorandum: Management Procedures and Criteria

This technical memorandum has been developed in order to formulate recommendations to the MoDOT General Headquarters personnel and the management team responsible for pavement marking operations in MoDOT's District seven. The views are those of the consultant conducting this project and don't necessarily represent the views of the MoDOT.

PMMS

- First and foremost the Pavement Marking Management System should have a centralized location. Centralizing the system allows for easier maintenance and system upgrades to be carried out.

- The Department must also define who will have access to the system. The more access the Department allows to the system the more information can become contaminated.

- Test the system hardware and processes in other Districts. So far Phase I has implemented the needs of one District in MoDOT. The views and procedures in District seven may or may not be the same as those in other MoDOT Districts. The basic fundamental systems base will work for each and every District, however some of the reports and data collected may need to be customized for other Districts.

Pavement Markings

- Yellow markings on lower volume roadways should not be striped every year. This becomes very evident after linking the retroreflectivity data collected in conjunction with the subjective ratings for the markings. In almost every case the roadways in the Jasper County area that only have centerlines (i.e., the M, N and P type routes) had retained retroreflectivity values well above any proposed minimum levels. This was true with the exception of routes that had some type of maintenance activity on them or routes located in urban areas.

- Roadways that have been chip sealed and/or fog sealed should have a different treatment as opposed to roadways without that type of preventative maintenance. Those roadways that are chip sealed should have a minimum of two applications in the year it is sealed, or increase the mil thickness and bead output. Roadways that were measured the same season they were chip sealed had retroreflectivity values well below those that are one year old.

- The Department should consider using more of the higher build latex products (i.e., HD-21). Those types of products (i.e., HD-21, Epoxies, Tapes, Thermoplastic, etc.) should be utilized in urban and high volume freeway type roadways. The test areas where HD-21 was applied consistently performed well even after 2 years of wear.

- Some areas on the Interstates, and high volume US routes have an enormous amount of paint build up. Those areas with excessive layers of product from continual re-striping are not performing as well. These areas are prime candidates for durable markings (i.e., Tapes, Thermoplastic, Epoxy, and HD-21). One other way to alleviate the build up problem is to re-stripe roadways by tagging skips onto old skips and placing the edge lines next to the old edge lines. This might not be preferred but gives the driver an eight-inch edge line and a 20-foot skip providing more delineation.

- A predetermined sampling rate for quality control checks should be implemented. The recommended rate is 20% of the Districts pavement markings. Those roadways sampled should be based on a percentage of each roadway type in the District (i.e., functional class, surface type, ADT, urban, rural, etc.) Therefore, if the Interstate has 1000 miles of the Districts concrete pavement markings with high volume ADT than 20% of that mileage should be evaluated).

- Pavement markings that have been placed under the construction program are not performing as well as in house latex operations. One route surveyed on the Interstate, which was less than one year old, had retroreflectivity values below suggested minimum levels. Therefore, it is recommended that the Department institute performance specifications for all contract applied pavement markings irrespective of material type and include those markings in the PMMS.

- The need for the Department to develop a new product approval process is essential. In today's changing environment more and more products are coming into the market. Agencies need to evaluate those products without having to pay for them only to find out they've failed later on. Products should be worthy enough to stand on their own merits and not rely on DOT's to pay for their lack of product development when they fail. This was very evident on the I-44 experimental product, which the Department paid for only to have it fail.

- Eliminate the procurement of pavement marking materials by the low bid process. If an Agencies overall goal is to raise the level of performance and quality of their pavement marking program, than why buy the cheapest product that meets your specification? The largest increase in performance and quality can be gained by implementing a performance specification as part of the purchase specification for buying maintenance products. The small increase and Agency may pay for better products can be recovered many times over in longer lasting materials that don't need to be re-striped as often.

- Planning

  Develop a decision matrix based on qualitative/quantitative factors including remaining roadway life and preventative maintenance practices for when markings need to be replaced. It's very evident that markings are being re-striped to often in the Jasper County area. The following condition matrix is an example of B.C. traffic engineering's criteria for deciding which roadways not to re-stripe.

CONDITION MATRIX (YELLOW MARKINGS)

	R_L mcd/m²/lux						
	< 100	100-125	125-150	150-175	> 175		
5	C	C	B	A	A	5	
4	C	C	B	A	A	4	SR
3	D	D	C	B	B	3	SUB RATING
2	F	D	C	C	C	2	
1	F	F	D	D	D	1	

A = DO NOT RESTRIPE
*B = ADT HIGH - RESTRIPE?
*B = ADT LOW - DO NOT RESTRIPE?
C = RESTRIPE AS PLANNED
D = RESTRIPE SOON
F = RESTRIPE ASAP
* MODOT NEEDS TO DEFINE THE PARAMETERS AND ACTION

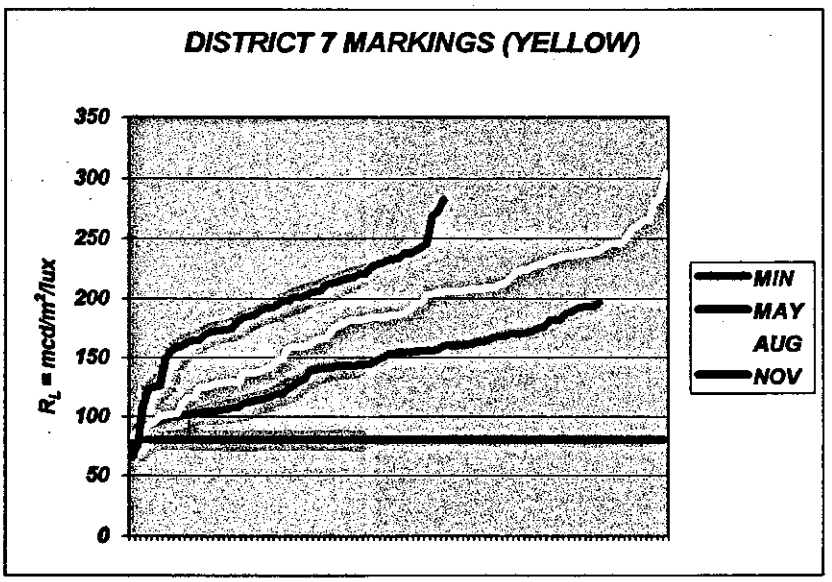
These condition matrix diagrams use both retroreflectivity (quantitative) and subjective rating (qualitative) values to determine how a pavement marking is performing. The subjective rating is a visual rating of pavement marking, from 1-5 (1 failure – 5 excellent), based on daytime appearance of the in place marking. Combining these two factors gives the decision maker a better understanding of the overall performance of an in place pavement marking.

CONDITION MATRIX (WHITE MARKINGS)

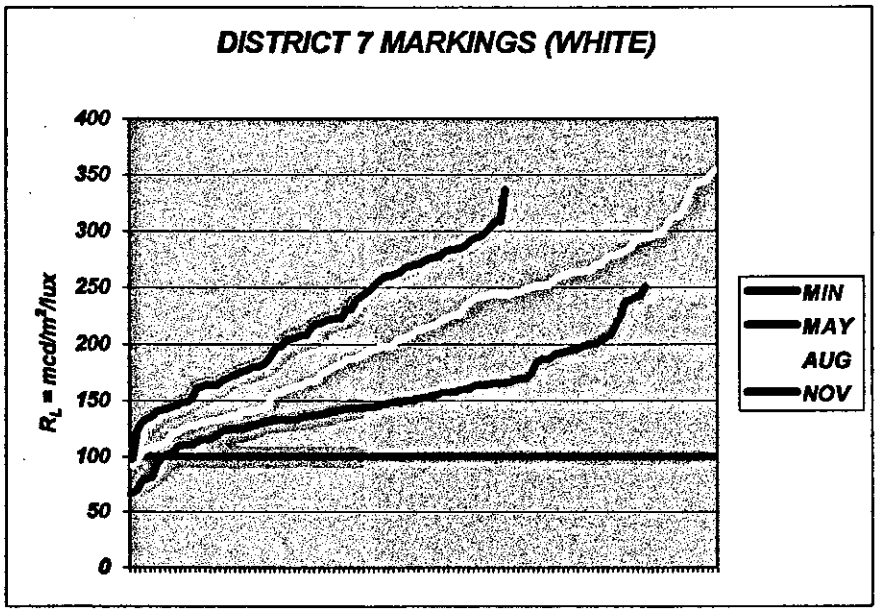
	R_L mcd/m²/lux						
	< 100	100-150	150-200	200-250	> 250		
5	C	C	B	A	A	5	
4	C	C	B	A	A	4	SR
3	D	D	C	B	B	3	SUB RATING
2	F	D	C	C	C	2	
1	F	F	D	D	D	1	

A = DO NOT RESTRIPE
*B = ADT HIGH - RESTRIPE?
*B = ADT LOW - DO NOT RESTRIPE?
C = RESTRIPE AS PLANNED
D = RESTRIPE SOON
F = RESTRIPE ASAP
* MODOT NEEDS TO DEFINE THE PARAMETERS AND ACTION

The following two graphs look at the performance of District sevens pavement markings after each of the 3 retroreflectivity surveys during the 1999 striping season. The red colored straight lines are located at 80 mcd/m²/lux for yellow markings and 100 mcd/m²/lux for white markings. These levels were chosen because they represent closely the levels that are being discussed by FHWA for minimum levels of retained retroreflectivity on a national basis.



Clearly both the white and yellow markings are performing well above those suggested levels. The real question is whether those levels are adequate for the customers of the Missouri Department of Transportation?



Another key planning tool is to provide training for MoDOT personnel on the importance of preserving pavement marking resources. To often pavement markings are destroyed by other areas within the DOT's because of a lack of communication or just plain unawareness. Increasing the awareness of the importance of pavement markings gives a DOT's entire workforce more buy in from a department wide position. Getting that buy in is a critical aspect in providing long lasting good performing markings.

- Based on the conclusions of the pilot study, expand the PMMS District wide and incorporate a few other Districts to further evaluate the programs effectiveness. This also will generate important information relating to best practices of one District to others. This will actually generate healthy competition among the various crews, which is good!

- To help in the monitoring of materials that are placed on the roadway the DOT should consider incorporating weigh in motion bead/paint tank monitoring systems for on the fly QC checks. New technologies are being created everyday, and there is a system available that actually gives the operators a readout or printout of the striping equipments outputs. Outputs such as:

  Bead rates
  Mil thickness
  Speed
  Updates of each material (per tank) left on board

  Linking these type of outputs with the PMMS gives operators all the tools available today to deliver the best pavement marking to the traveling public.

- The practice of re-striping roadways that have old thermoplastic as the in place marking should be re-evaluated. Every time those markings were evaluated they had extremely variable results. The latex pavement markings that are placed over top of the old thermoplastic wear at a faster rate than latex over latex.

Finally the Pavement Marking Management System is not designed to favor one type of measurement process or another. The System is designed for the user to utilize whatever type of measurement process they have available. The system will accommodate any process, whether the process is night measurement and subjective ratings, measurement with hand held retroreflectometers, or mobile retroreflectometers.

The key to successfully managing the program is for the Department to follow through with their measurement process and utilize the results of the system to improve the quality and cost effectiveness of their pavement marking operations.

APPENDIX

APPENDIX A

Setup for Pavement Marking Management System

Install Pavement Marking Management System from CD

NOTE: Go to Explore and Remove the Directory C:\DOT
(Only if installed on system before)

Installation:

Click on **Start**
Click on **Run, Browse** – Click on your CD-Rom Drive and double click on the folder
Open the Folder called **DOT**
Open the Folder called **Package**
Double Click on **Setup,** Select **OK**
Click on the Installation Button
Click on **Continue**
Setup Complete Select **OK**

Setting up ODBC Drivers
(Only if NOT installed on system before)

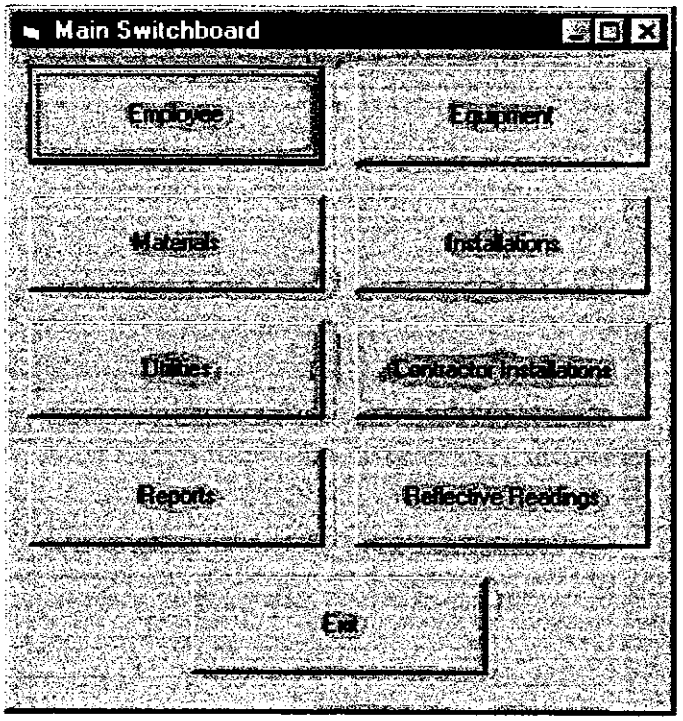
After setup is finished installing setup the ODBC driver by
Double click on **My Computer**
Double Click on **Control Panel**
Double click on **ODBC 32**
Click on **Microsoft Access Driver** Then Click **ADD**
Data Source Name: **DOT**
Description: **Driver for Pavement Marking Management System**
Then click on Select then click on path to find Dot.mdb it should be **C:\Dot\Dot.mdb**
Then click **OK** then click **OK**

Running Pavement Marking Management System:

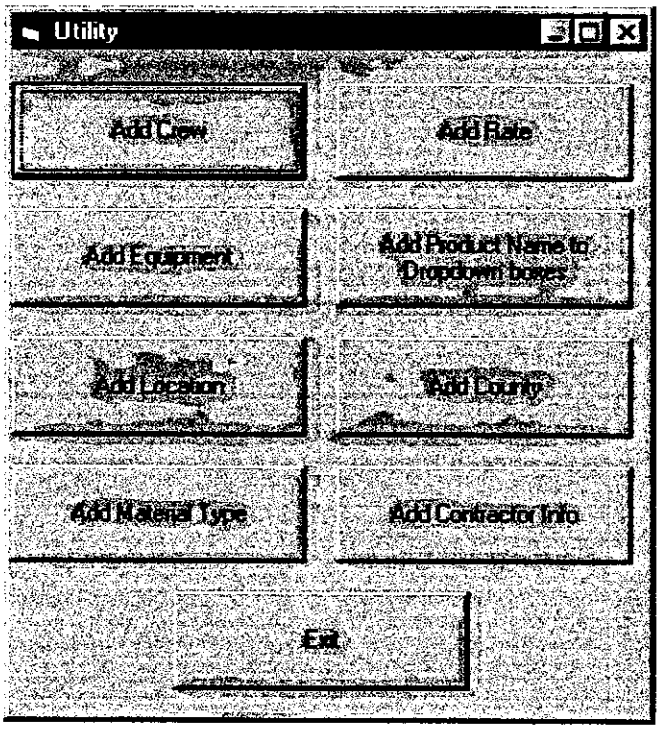
Signing On:

Click on Start, then Programs then Pavement Marking Management System
Click on the Picture or click on File then Login
On the Login use User Name: *9999*
On the Password: *Leave Blank*

Main Menu



Utilities – Add Crews, Rates, Equipment, Products, Locations, County, Material, Contractor



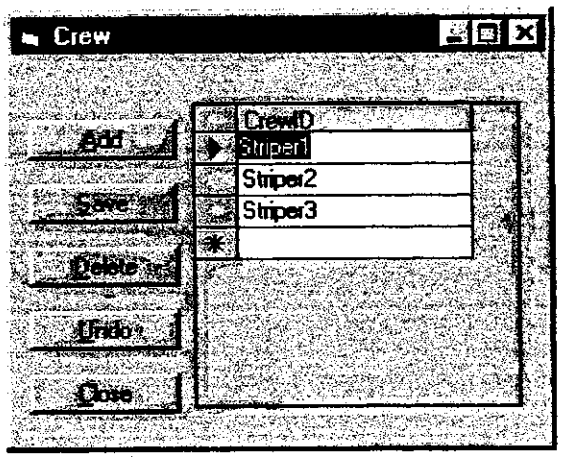
Setting up the system:

Open the Utilities Screen here is where you will enter:

Crews: Add & Delete Crew ID.

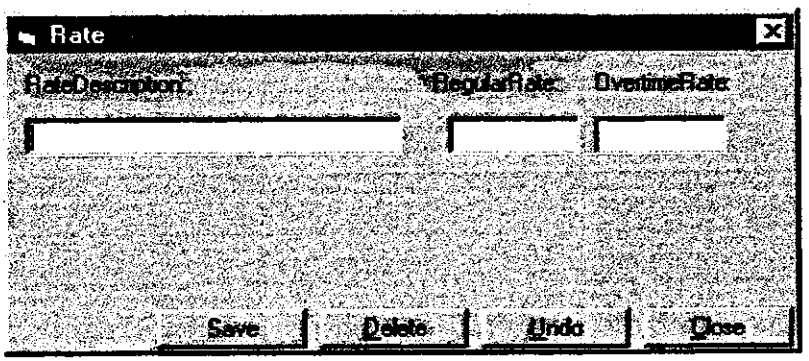
To add Crew click on the Add button then type Crew ID then click on the Save button.

To delete click on the Crew ID you want to delete and then click on the Delete button.



Rates: Add Rates

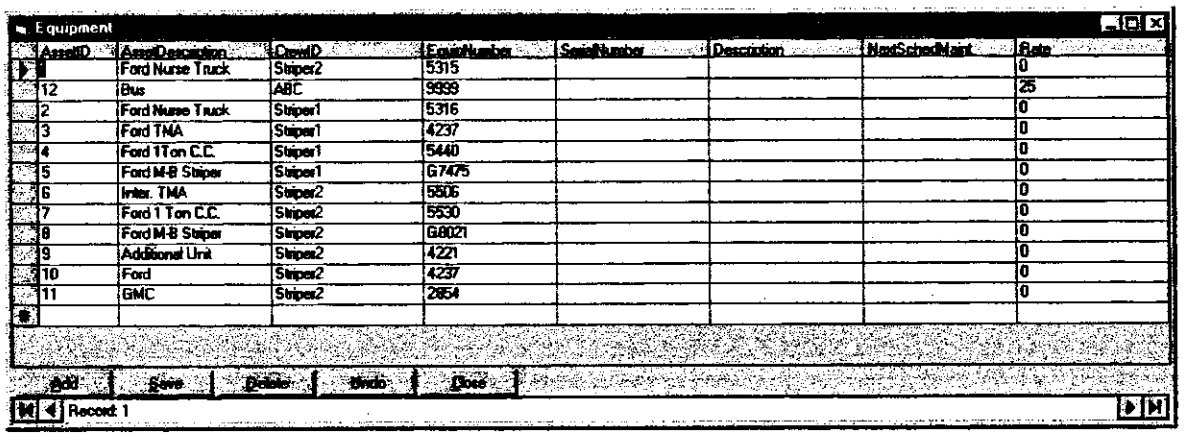
When you enter this screen you will automatically be in the add mode. Enter the Rate Description and the Regular Rate and Overtime Rate and then click the Save button. To add another rate click on the Add button.



Equipment: Add / Delete Equipment

To add Equipment click on the Add button then type Description, Equipment Number and Crew ID then click on the Save button.

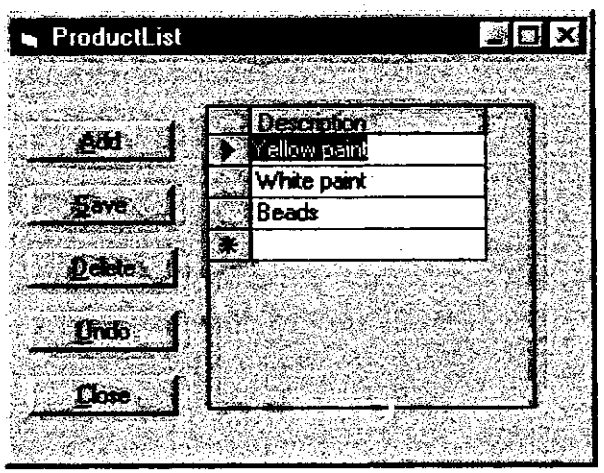
To delete click on the record you want to delete and then click on the Delete button.



Products: Add & Delete Products.

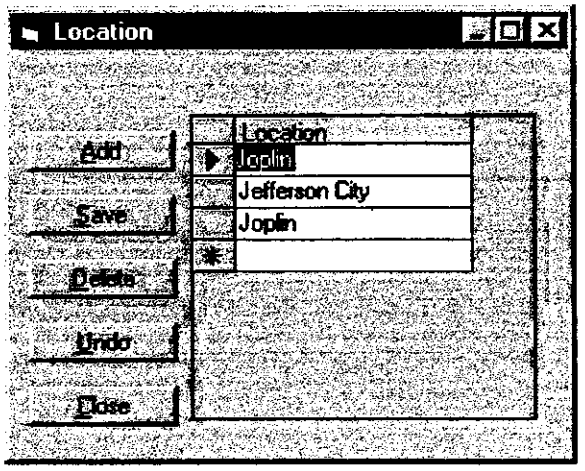
To add Products click on the Add button then type the Products then click on the Save button.

To delete click on the Product you want to delete and then click on the Delete button.



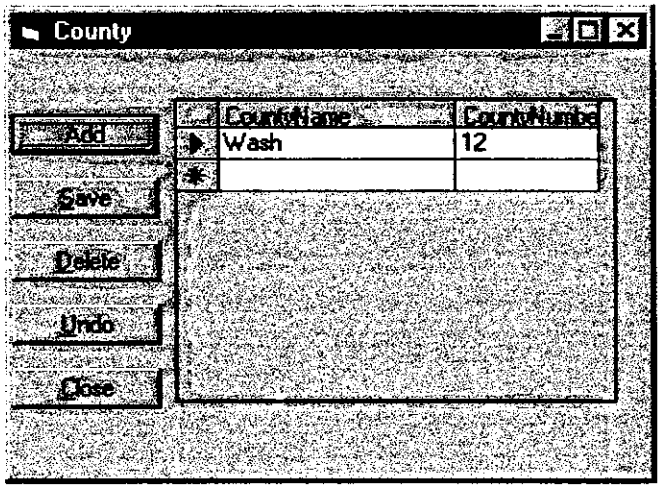
Locations: Add & Delete Locations.

To add Locations click on the Add button then type the Locations then click on the Save button.
To delete click on the Locations you want to delete and then click on the Delete button.



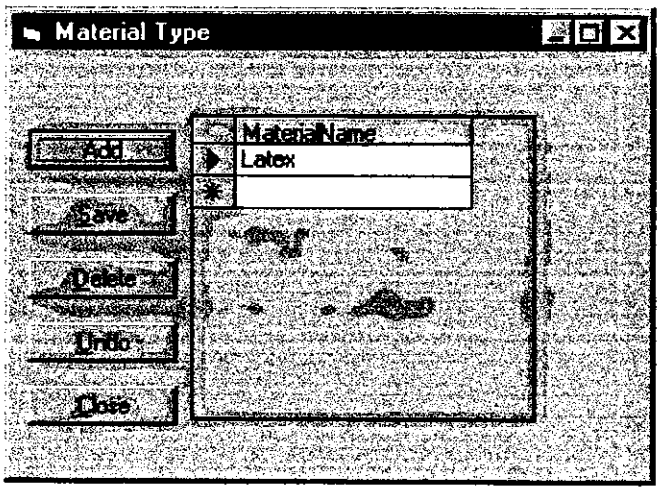
County: Add & Delete Counties.

To add Counties click on the Add button then type the Counties then click on the Save button.
To delete click on the Counties you want to delete and then click on the Delete button.



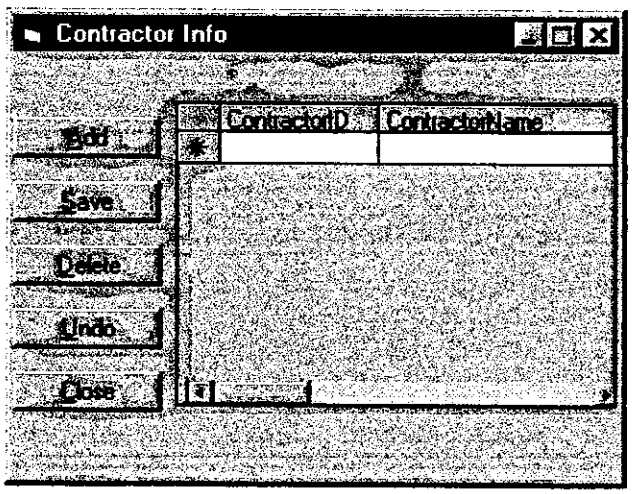
Material: Add & Delete Material.

To add Material click on the Add button then type the Material then click on the Save button.
To delete click on the Material you want to delete and then click on the Delete button.

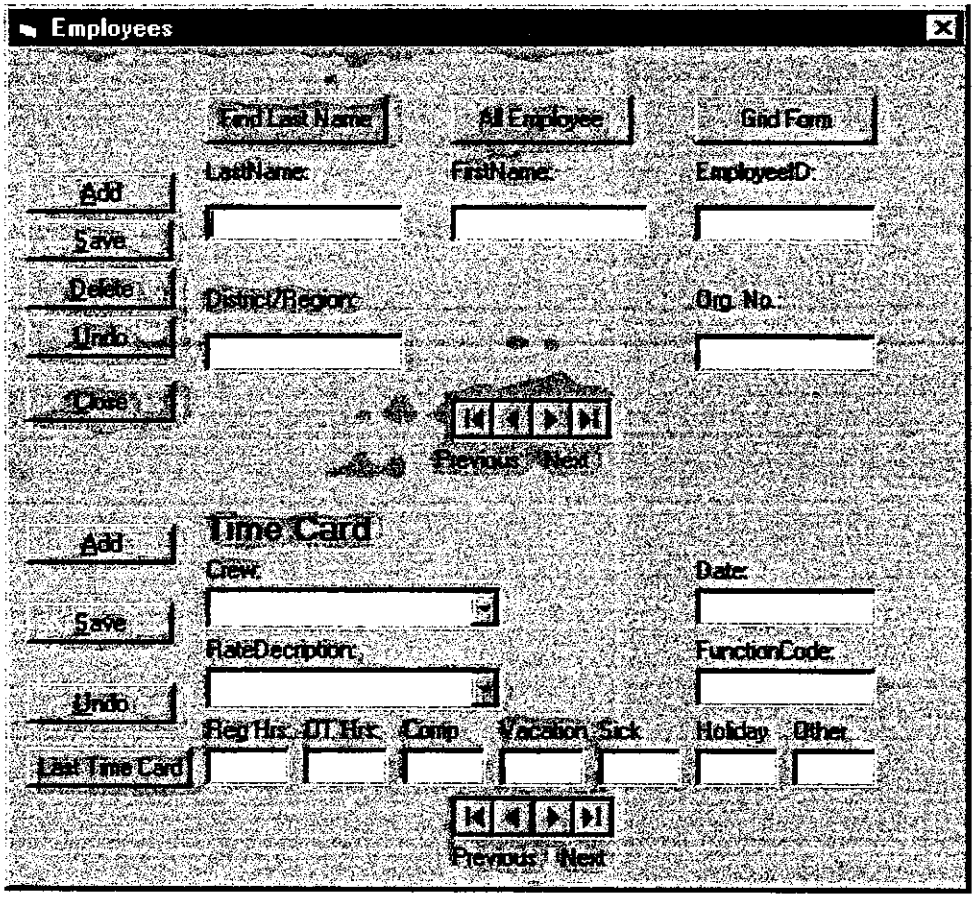


Contractor Information: Add & Delete Contractors.

To add Contractors click on the Add button then type the Contractors then click on the Save button.
To delete click on the Contractors you want to delete and then click on the Delete button.



Employee – Adding / Deleting Employee Information & Time Card Information



Adding

Fill in the 6 boxes on the top part of the screen. The District / Region and Org. No have to be ***numbers only*** also the Employee ID must be filled in order to save the record.
If you don't Click the Save button after filling in the fields and click on one of other buttons on the form the new Employee record will not be added the database.

Lookup by Last Name

This can be used to find a record of an Employee by typing in the last name in the popup input box. This would be used to check the information about an employee or to the check information about a time card associated with

this employee. In the time card section below you can add a new time card record for each day of the employee.
If there happens to be more than one Employee with the same Last Name the first one in the database would appear in the text boxes and you would have to use the arrow > scroll thru to get to the rest of the Employees with that last name.

All Employees

This gives you all the Employees in the database and you would have to use the arrow > keys to scroll thru the Employees. As you move to each Employee the records change in the Time Card portion of the form so that you only see the Time Card records that go with that employee.

Grid Form

This gives you all the Employees in a grid form. You can Add or Save or Undo just like on the main Employee form. The way Delete works is you click on the Blue gray box at the beginning of the row and it highlights the whole row then click delete.
Undo only changes back the last row you made changes to.
The Crew information must be entered on the Crew Grid form before it will appear in the Drop down list.

Time Card

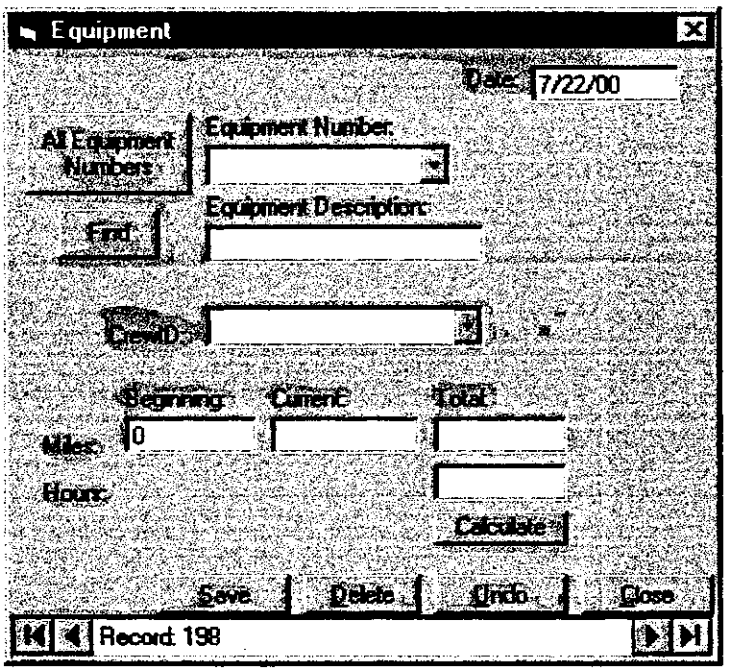
The Time Card portion of the form changes so that you only see the Time Card records that go with that employee on the top of the form.
It gives you all the Time Cards for that Employee and you would have to use the arrow > keys to scroll thru the rest of the Time Cards.
Last Time Card button takes you to the Last Time Card for that employee.

Adding Time Cards

You must fill in the rates on the Utility Rates screen before you can enter the Time Card portion of the form. Then you will be allowed to pick a rate from the drop down list. The date is auto filled with today's date but can be changed if you need a different day. Fill in the rest of the boxes that you need then click save. If you don't Click the Save button after filling in the

fields and click on one of other buttons on the form the new Time Card record will not be saved to the database.

Equipment – Equipment Used *(Miles, Hours)*

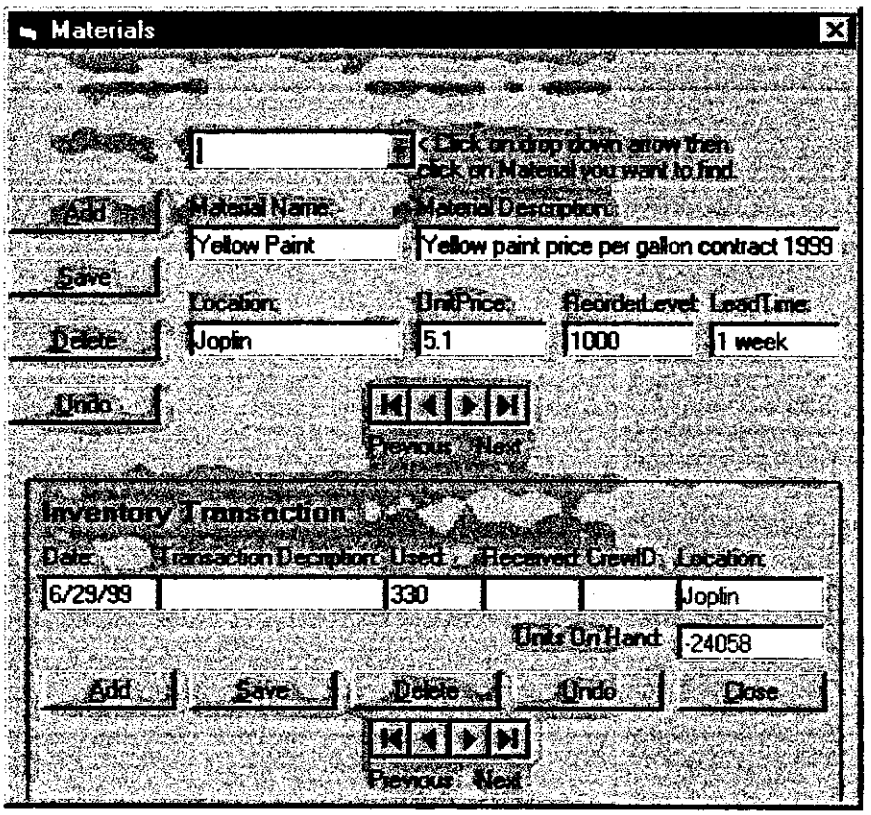


Equipment:

The Crew ID, and Employee ID information must be entered on the Crew screen in the Utility screen before it will appear in the drop down list.
The Equipment screen opens in the Add mode so you can just start entering data. The date is auto filled with today's date but can be changed if you need a different day. Fill in the rest of the boxes that you need. To save the record currently working on, click on the Save button. If you don't click the Save button after filling in the fields on the Material screen the record will not be added to the database.
If you don't want to add a record, click on All Equipment Numbers or the Find button. Click on the drop down Equipment Number List Then Click on Find Button. Use this drop down arrow button to see all Equipment Numbers listed after having selected one of the item then scroll through the records for that Equipment Numbers with arrow > keys.
If after having selected one item you need to see the full list in the drop down box click on the All Equipment Numbers button.

If you make any change to any record click the Save button before moving to another record or the change will not be saved.
Use this button to either see all Equipment Numbers by moving through the records with arrow > keys or to get the full list in the drop down after having selected one item.

Materials – Adding Materials & Materials in Stock



All Materials
The Material and Location information must be entered on the Utility screen before it will appear in the Drop down list.
Use this button to either see all Materials by scrolling through the records with arrow > keys or to get the full list in the drop down after having selected one item. If after having selected one item you need to see the full list in the drop down box click on the All Materials button.
If you make any change to any record Click the save button before moving to another record or the changes will not be saved.

As you move to each of the Material records the Inventory Transaction portion of the form changes so that you see the last Inventory Transaction records that go with that Material. Now you can pick a rate from the drop down list. The date is auto filled with today's date but can be changed if you need a different day. Fill in the rest of the boxes that you need. Then click save button. If you don't Click the Save button after filling in the fields and click on one of other buttons on the form the new Material record will not be added the database.

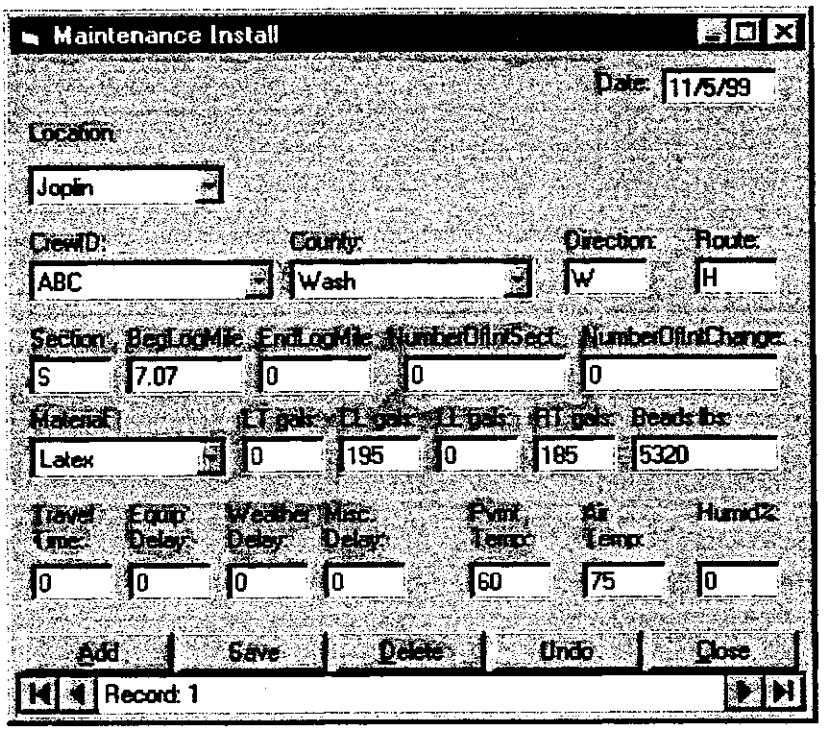
Inventory Transaction

As you move to each of the Material records the Inventory Transaction portion of the form changes so that you see the last Inventory Transaction records that go with that Material.
That way can see how many units are left on hand.
You can look a look at previous Inventory Transaction for that Material with < arrow key but if you find an
Entry mistake you may have made in the used field or Received field or Location field do not correct it there instead make a new Inventory Transaction entry for the difference to correct it.
Also keep in mind that Units on Hand includes what is at that location plus units loaded out of that Location and still on a nurse truck or sprayer truck plus any units not yet entered through Maintenance Install form.
If all of the above has been accounted for and Inventory is still off just make a new Inventory Transaction entry for the difference to correct it.

Add
When you click on the Add button Date, Location and Units on Hand are filled in for you. You can change the date but not the other 2.
Only fill in Used or Received not both. Make another separate Transaction.
Used subtracts from Units on Hand.
Received adds to Units on Hand.
After you Click on save the new Units on Hand is calculated and filled in.

Delete
You can delete the last record for a material from the record then click on the All Materials button at the top of the form and all subsequent records should be correct for units on hand.
If it is not the last record for that material you can still delete but it will not recalculate all the records made after that one for that material. So Units on hand may be off.

Installation – Materials Installed, Crew that Installed the Material, Where Installed, How much Installed

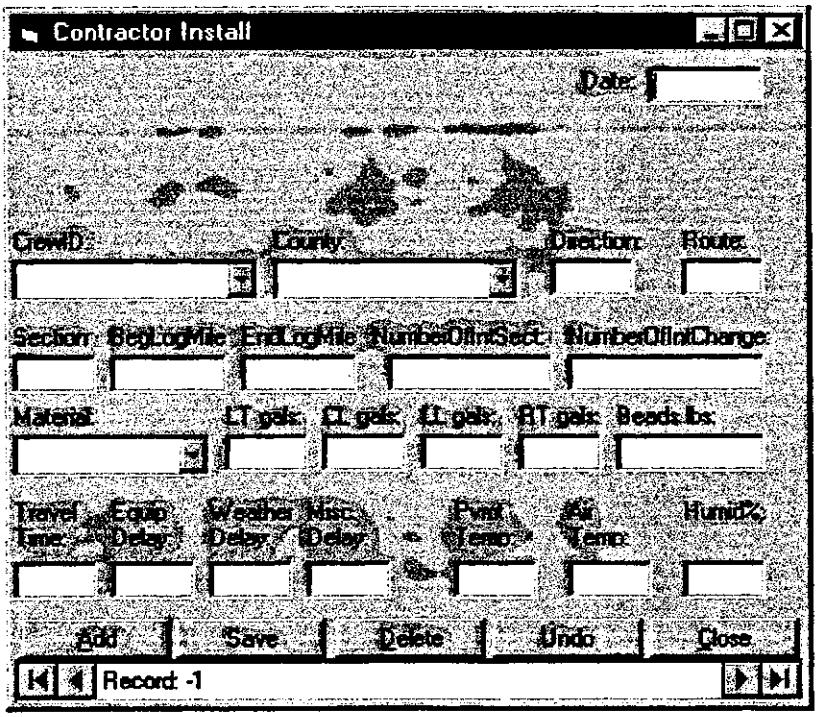


Installation

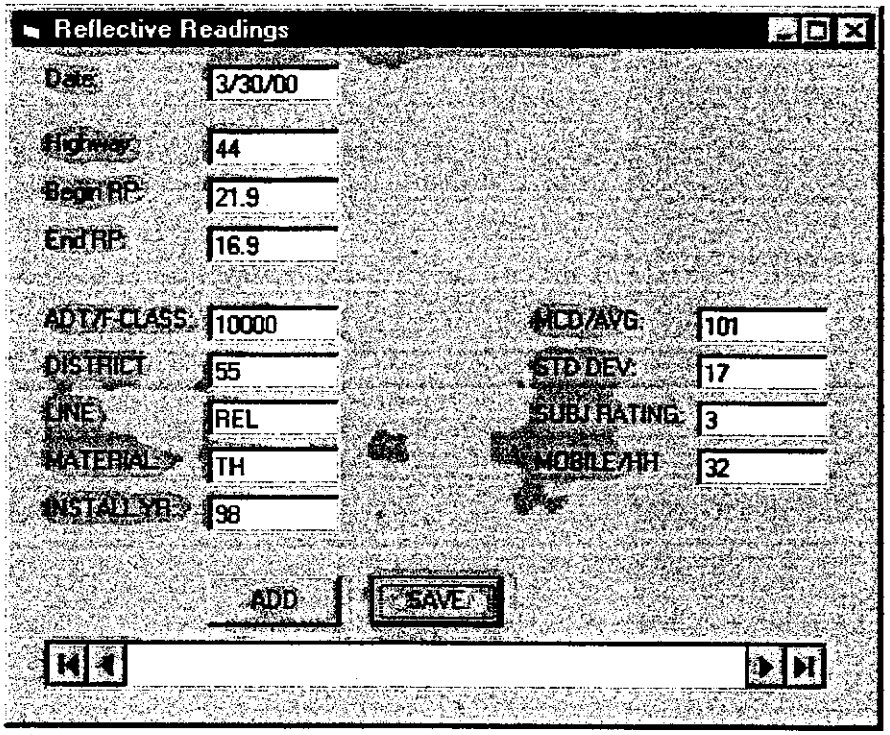
The Material, Location, and Employee ID information must be entered on the Utility screen before it will appear in the Drop down list.
Now you can pick a Location, Crew ID and Employee ID from the drop down lists. The Date is auto filled with today's date but can be changed if you need a different day. Fill in the rest of the boxes that you need. Then click save. If you don't Click the Save button after filling in the fields and click on one of other buttons on the form the new Material record will not be added the database. When the record is save to the Maintenance Install Table it also creates a record in the Inventory Transaction table for each material used if CL field has gallons > 0 Yellow paint is subtracted from Inventory at that Location. If LL field or LT field or RT field has gallons > 0 White paint is subtracted from Inventory at that Location. If Beads field has lbs. > 0 Beads are subtracted from Inventory at that Location. If you are moving through the records with the arrow keys and find a mistake, correct it and then click on save the Record is changed in the Maintenance Install table which is fine but it also will update Inventory another time if CL or LL or LT or LT or RT have number > than 0 in them which will cause Inventory to

get off. If you delete a Record on the Maintenance Install form that deletes a Record out of the Maintenance Install table which is fine but it does not put the materials back into Inventory that were first subtracted from Inventory when the record was saved originally. So this also could cause inventory to get off.

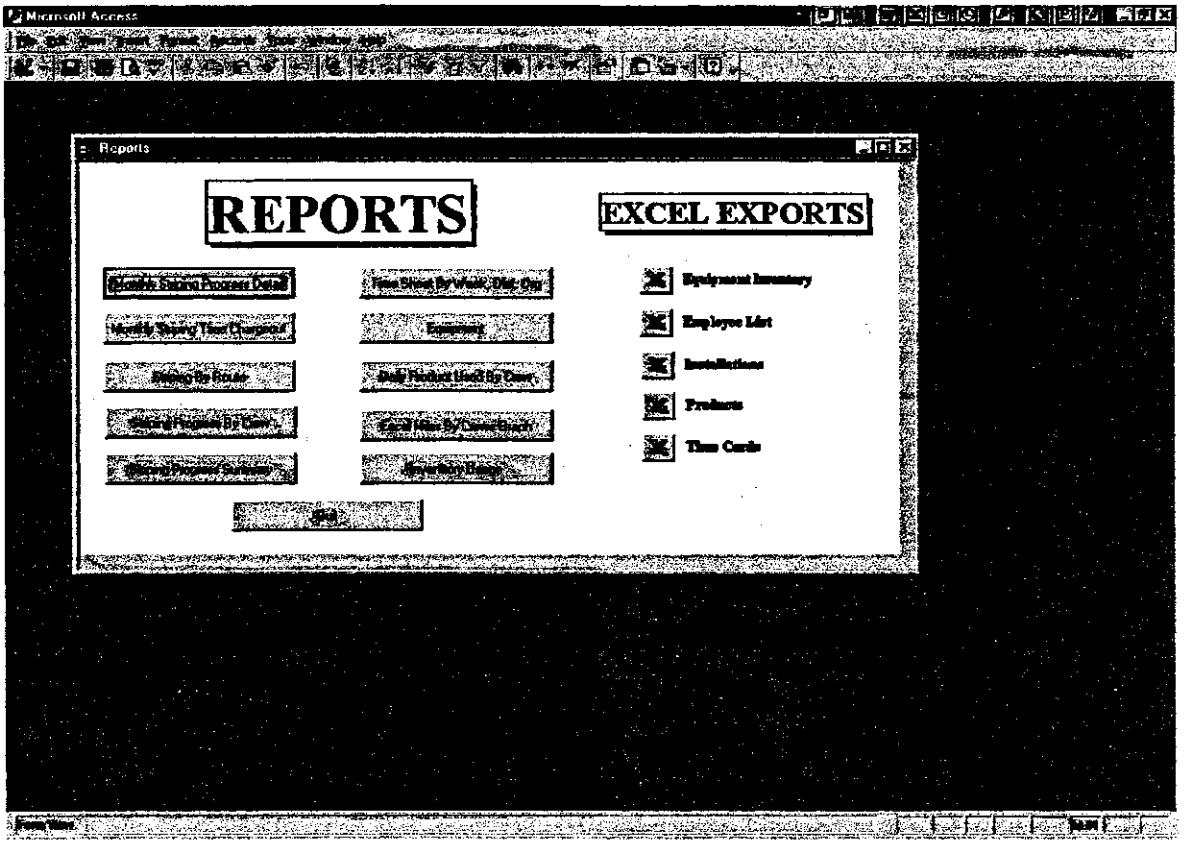
Contractor Installation – Contractor Installs



Reflective Readings



Reports


Reports
REPORTS
EXCEL EXPORTS
Employment Inventory
Employee Idlet
Installations
Products
Time Cards

APPENDIX B

Table Update Procedures

New Tables:
ContractorInfo
ContractorInstall
County
MaterialType

** Note you do not have to do anything to the new tables!

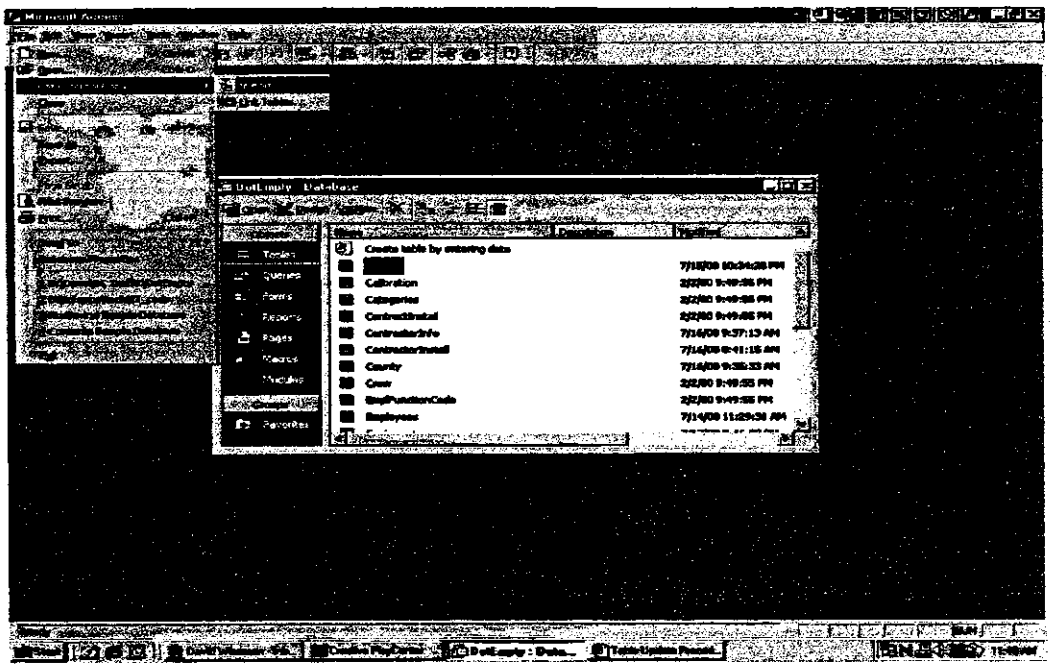
Tables that changed:
Assets
Employees
Equipment
Maintenance
TimeCard

** The tables that have changed you have to import and run an append query.

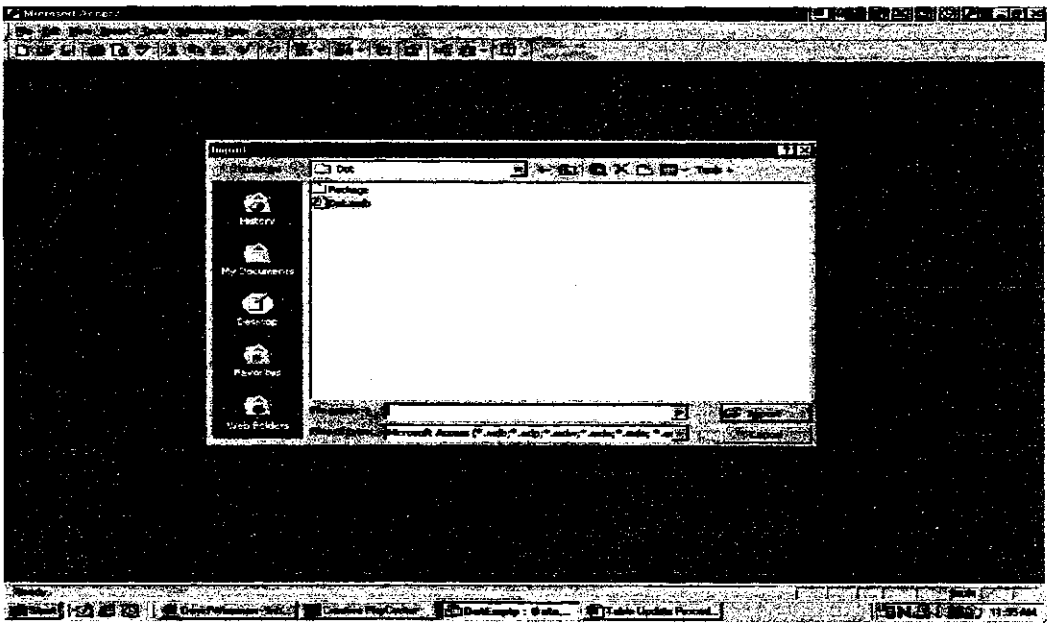
Copy from CD **DotEmpty.mdb** to the Dot Directory

Open Access and open the **DotEmpty.mdb** Database.

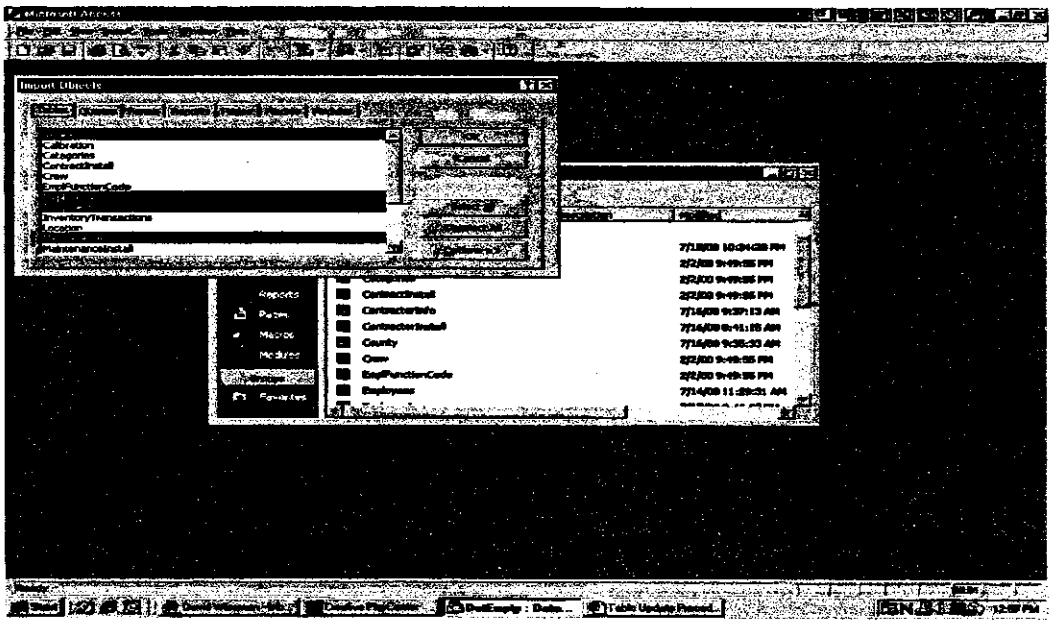
Click on **File → Get External Data → Import**



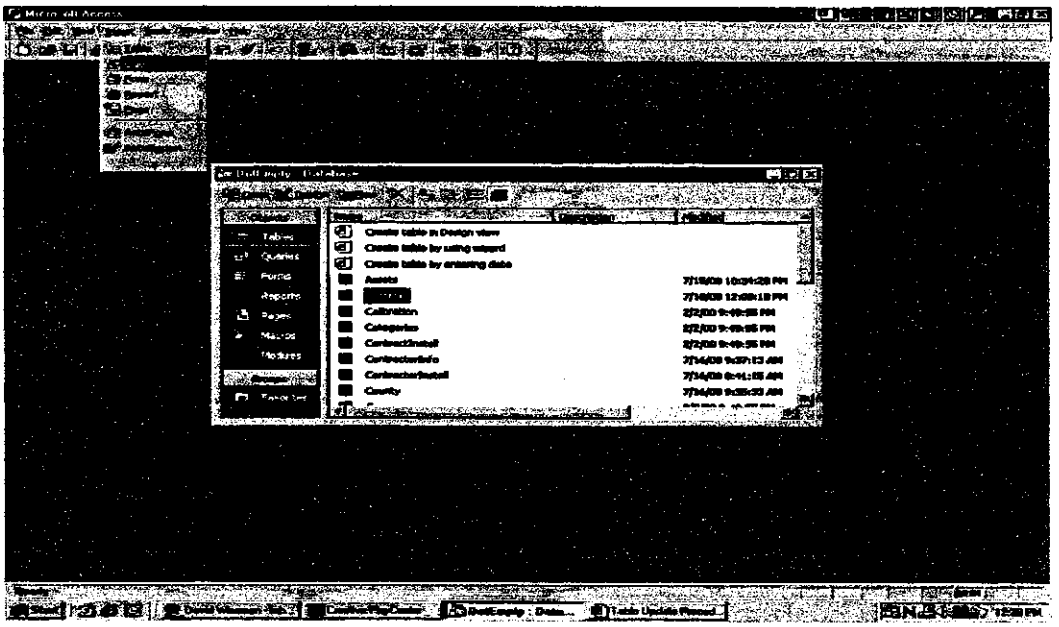
This will bring up an import window. In the Look In box select the Dot directory. Find the file Dot.mdb and double click on it.



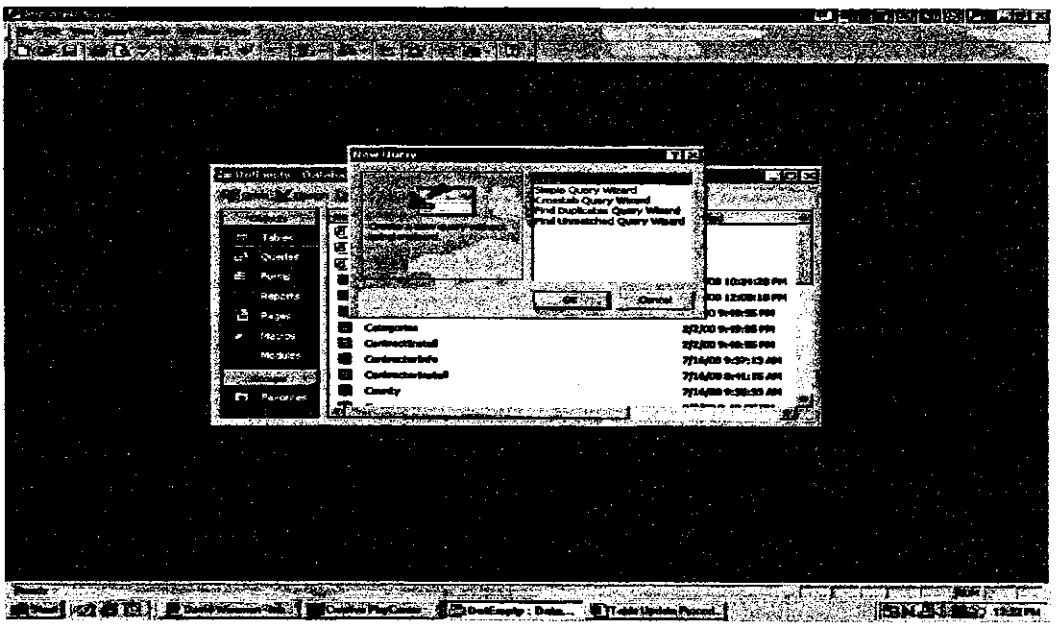
This will pop open an import objects box. Select the tables that have changed by clicking just once on Assets, Employees, Equipment, Maintenance, TimeCard. The ones selected will be highlighted. Then click on OK this will then add these tables to the EmptyDot Database. The tables will be imported with a one after the name these will contain the old data.



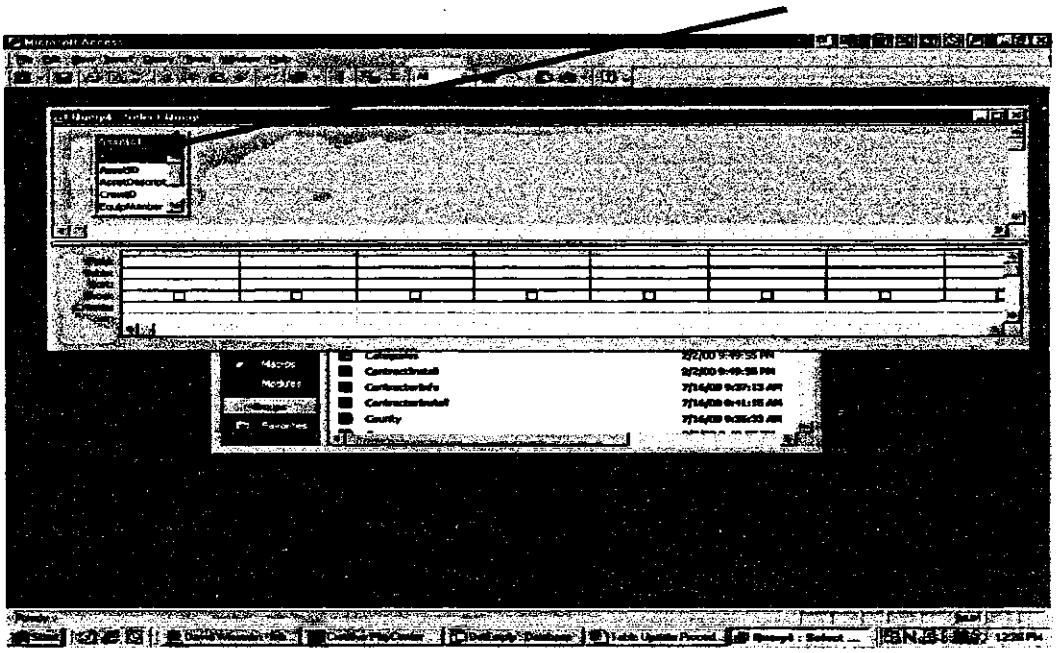
Now click on table **Assets1** and then go to **Insert** on the menu bar and click on **Query**.



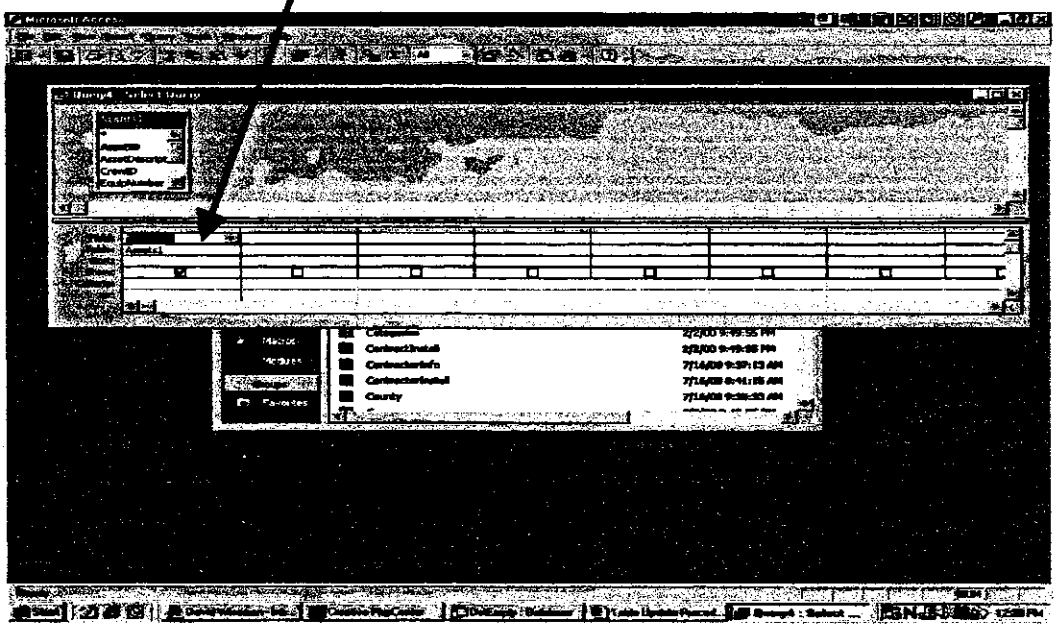
This will bring up a box called **New Query**. Select **Design View** and click **OK**.



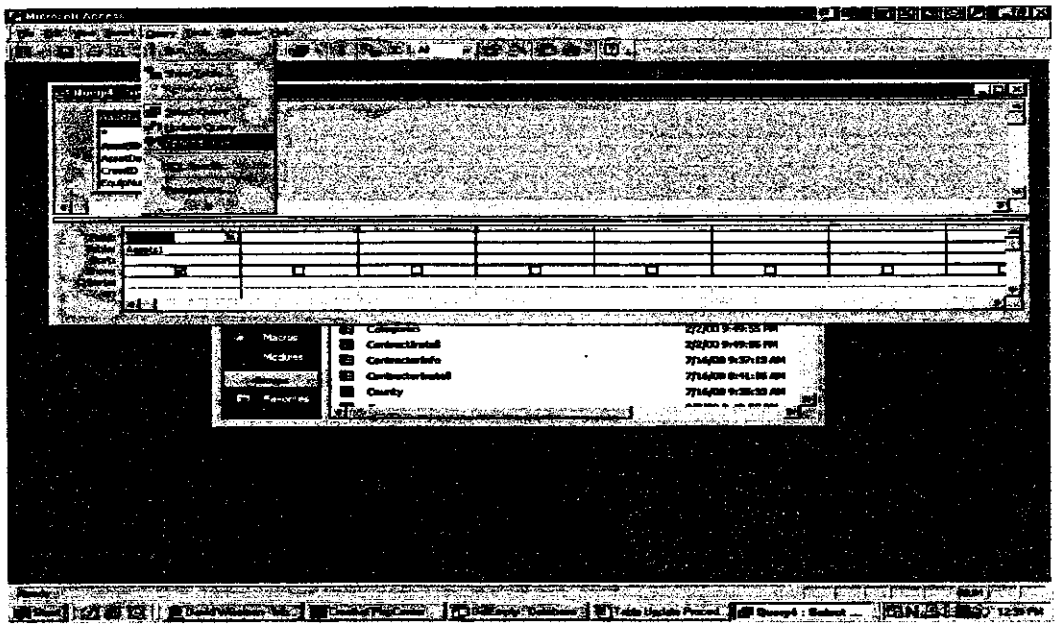
A Box **Select Query** will pop open. Double click on the asterisk in the tables box.



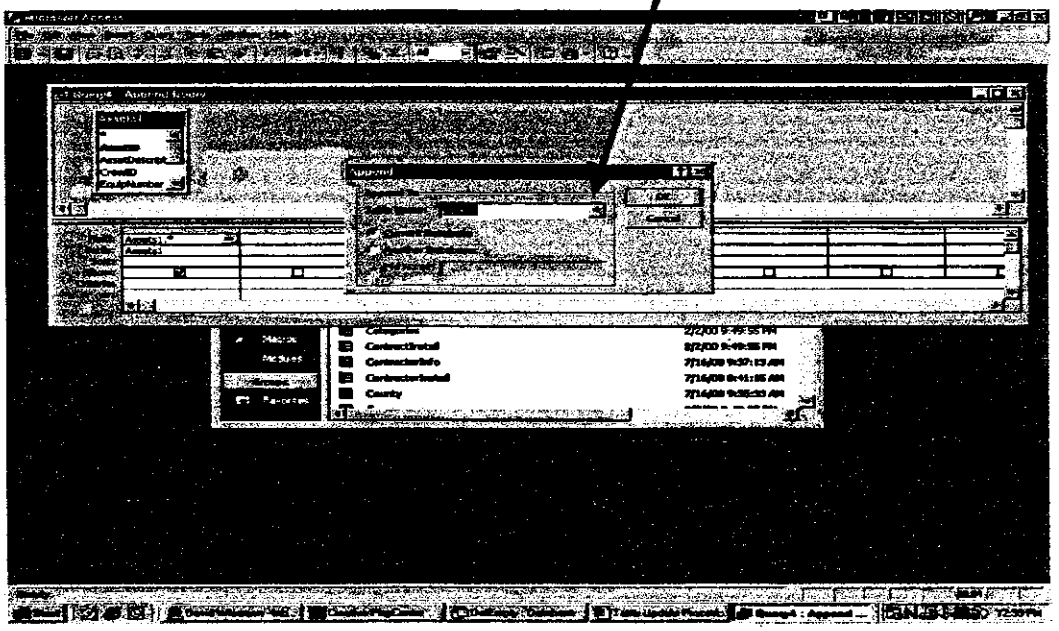
This will then fill the left most box below.



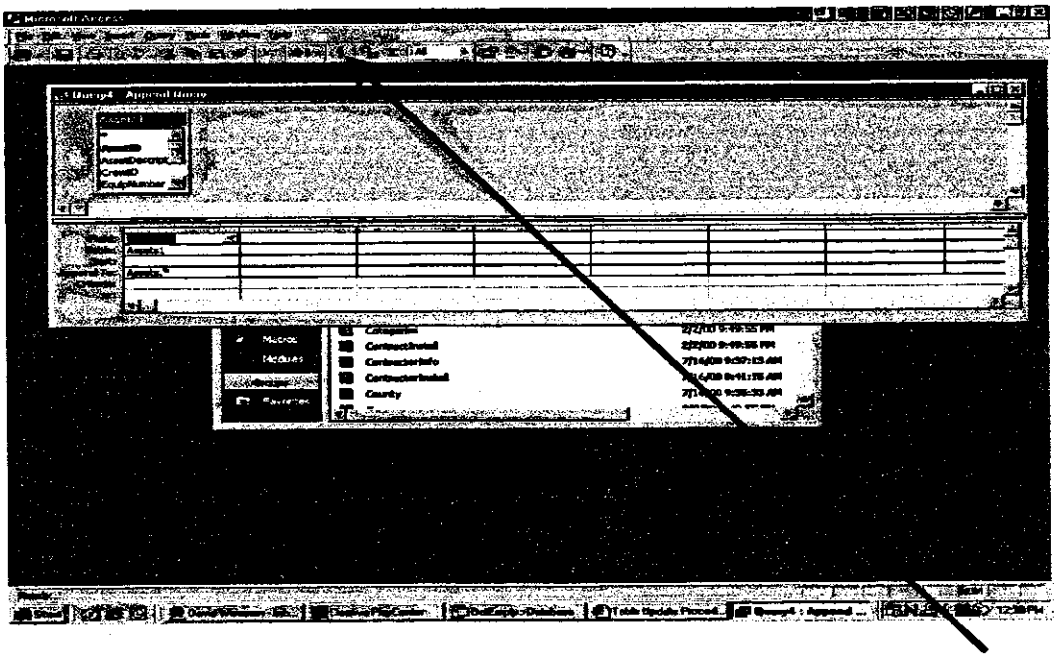
Now click on **Query** on the menu bar above and select **Append Query**.



This will open a box called **Append**. With the pull down select the **Assets** table. Then select **OK**. The Append box will disappear.

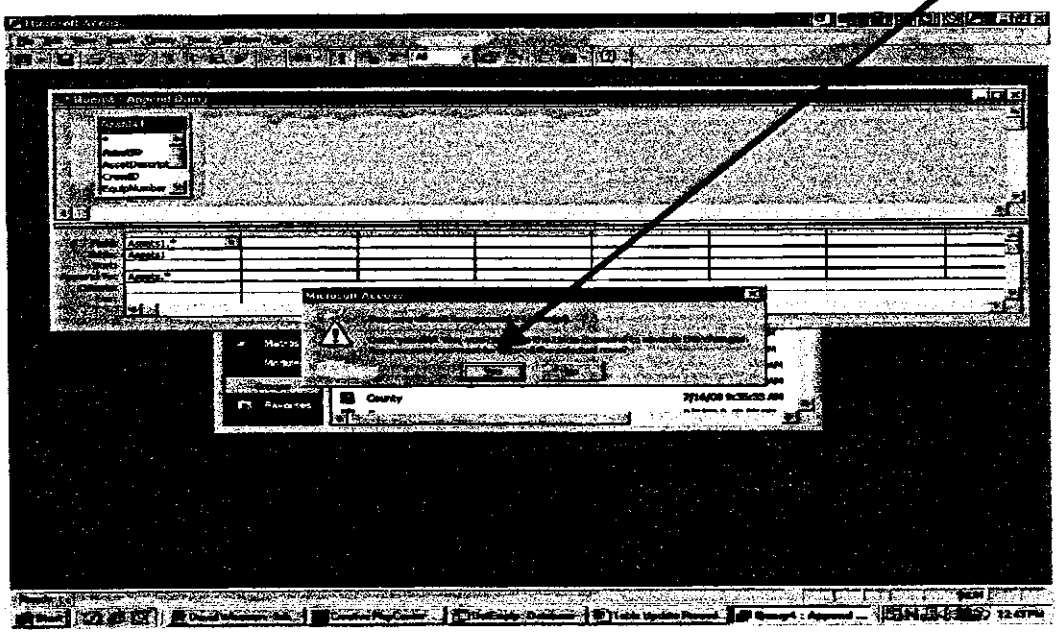


Now you are ready to run the query.

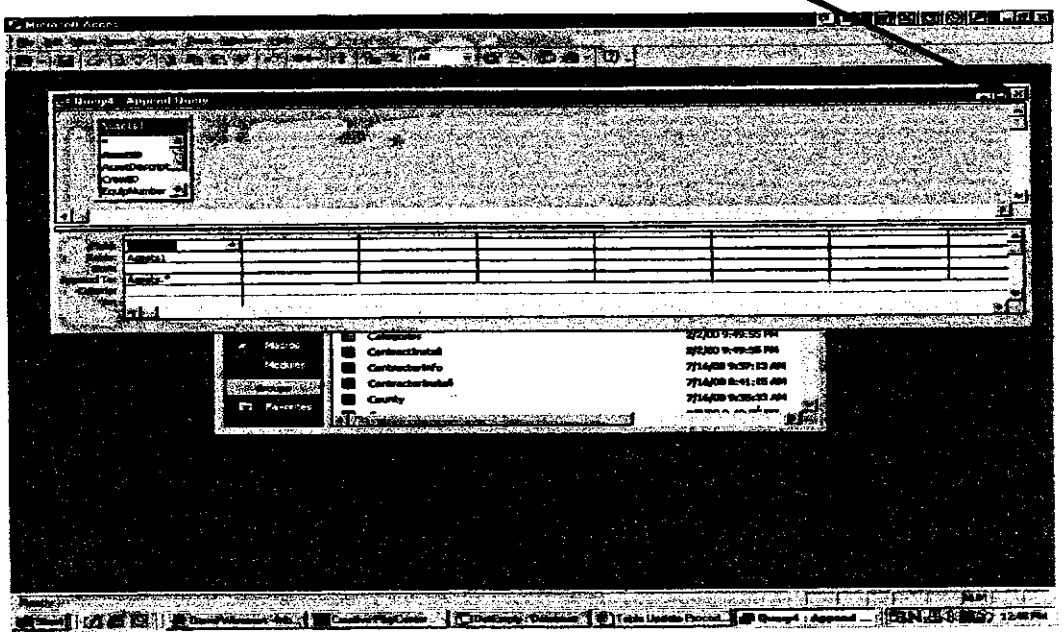


Click on the **RED Exclamation Point** on the Menu bar above to run query.

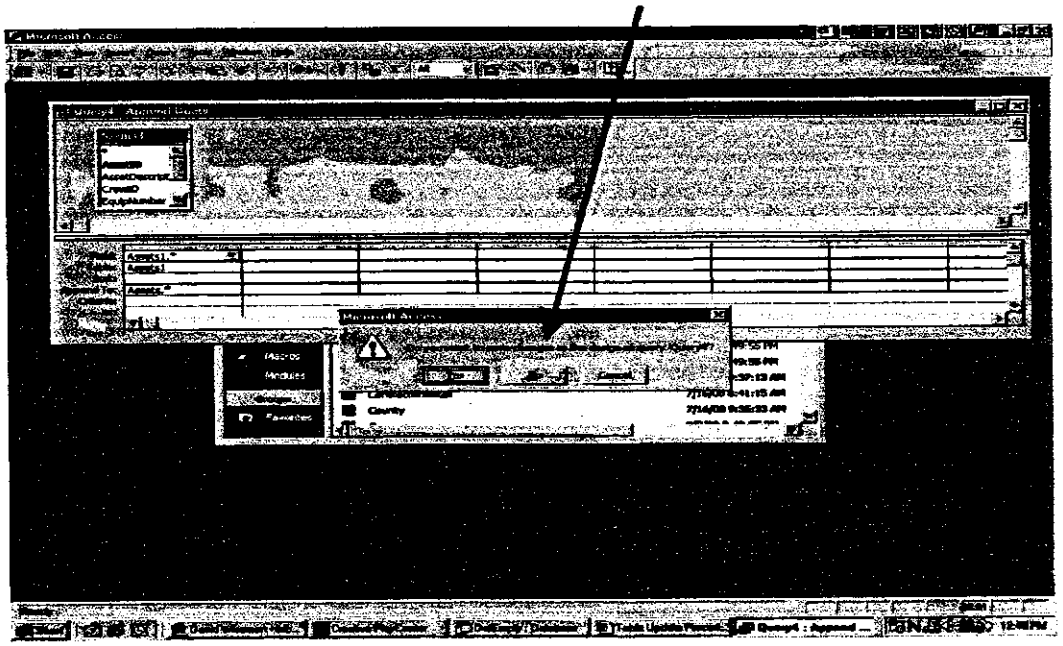
A warning box will appear asking if you wish to append the records. Click **YES** to continue.



The warning box will disappear and now click on the X in the upper right corner to close query.

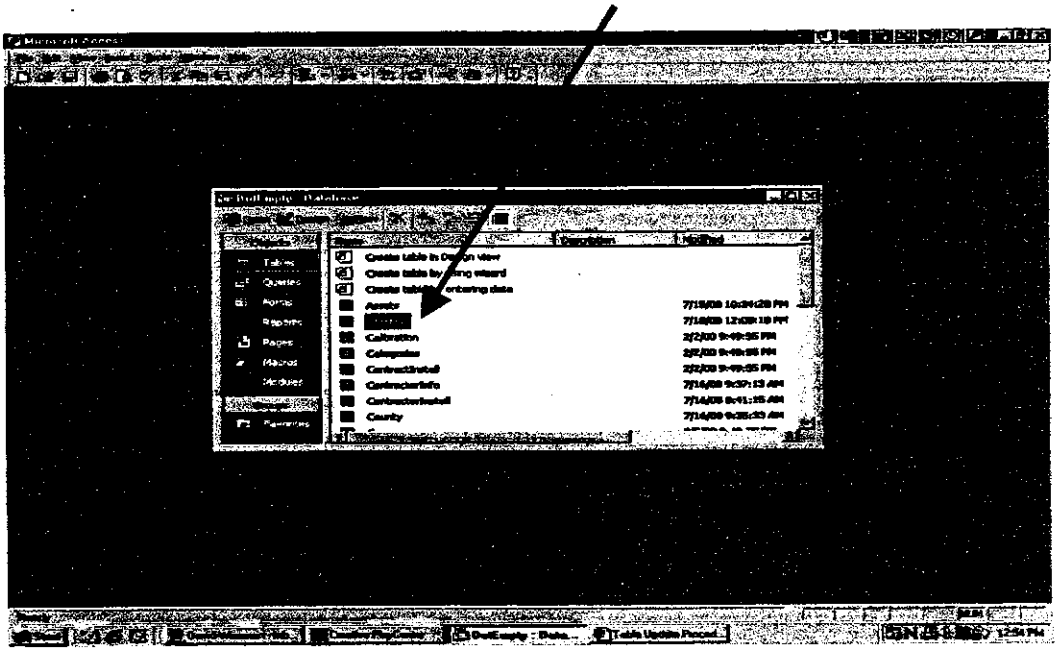


A box will appear asking you to save query click **NO**.

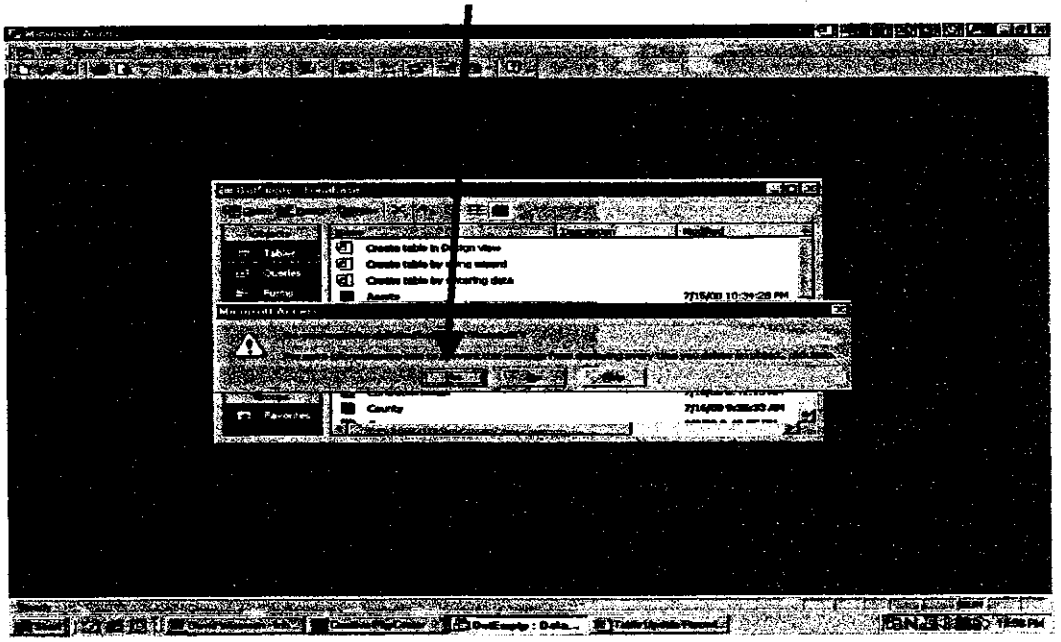


Now repeat these steps for each of the Changed tables.
Assets, Employees, Equipment, Maintenance, TimeCard

When complete Delete each table that has a 1 (one) after its name.
To do this click on the table and press delete.



A warning box will appear click **YES** to continue.



Once complete go to Explore in Windows. Open the Dot directory and rename the **Dot.mdb** file to **Dotold.mdb**. Now rename **Emptydot.mdb** to **Dot.mdb.**
Now Your data is ready.

APPENDIX C

Summary of Retroreflectivity Surveys (Jasper County Area)

The following tables represent the summaries of the four field measurements conducted in May, August, and November of 1999 as well as the April 2000 survey. At this time it's important to list some terms and definitions that will be used in these summaries. Some of the terms and definitions include:

R_L	Retroreflectivity.
LEL	Left Edge Line of a four lane divided or undivided highway or street (yellow marking).
REL	Right Edge Line of a four or two-lane highway (white marking).
LL	Lane Line (skips) of a four lane divided or undivided highway or street (white marking).
CL	Centerline of a two way two lane or three lane with continuous left turn lane roadway (yellow marking).
MP	Mile Post of a particular roadway which is the start/end of data collection area.
mcd	Units retroreflectivity are measured in (metric units mcd/m^2/lux).
Subjective Rating	Visual rating of pavement marking, from 1-5 (1 failure – 5 excellent), based on daytime appearance of the in place marking.
PL	Material type: PL = paint latex
TH	Material type: TH = thermoplastic
T	Material type: T = tape
E	Material type: E = epoxy

Summary of May 99 R_L Survey

(Segmented by Route)

Date R_L	Date Striped	File #	Route	Beg MP	End MP	ADT	Direction	State	Line	Material	Year	Sub Rate	Avg MCD	Std Dev
4/30/99	7/20/98	94U0E3	I44	21.9	5	13405	E	MO	LEL	PL	98		182	53
4/30/99	7/20/98	94U0E4	I44	5	0	12274	E	MO	LEL	TH	98		98	36
4/30/99	7/20/98	94U0E5	I44	0	5	12116	W	MO	LEL	TH	98		91	15
4/30/99	7/20/98	94U0E6	I44	5	21.9	13617	W	MO	LEL	PL	98		170	54
4/30/99	7/20/98	94U0E7	I44	21.9	5	13405	E	MO	LL	PL	98		206	58
4/30/99	7/20/98	94U0E9	I44	0	5	12116	W	MO	LL	TH	98		*169	*163
4/30/99	7/20/98	94U0EA	I44	5	21.9	13617	W	MO	LL	PL	98		197	55
4/30/99	7/20/98	94U0EK	I44	21.9	5	13405	E	MO	REL	PL	98		194	63
4/30/99	7/20/98	94U0EL	I44	5	0	12274	E	MO	REL	TH	98		125	60
4/30/99	7/20/98	94U0EM	I44	0	5	12116	W	MO	REL	TH	98		143	30
5/2/99	7/20/98	95201U	I44	0	5	12116	W	MO	LL	TH	98		**135	**32
5/2/99	7/20/98	95201V	I44	5	21.9	13617	W	MO	REL	PL	98		195	73
5/3/99	7/20/98	95301G	I44	8	1	10000	W	MO	LEL	EXP	98	4	124	41
5/3/99	7/20/98	95301H	I44	1	8	10000	E	MO	LEL	PL	98	4	104	39
5/3/99	7/20/98	95301I	I44	8	1	10000	W	MO	LL	EXP	98	4	143	37
5/3/99	7/20/98	95301J	I44	1	8	10000	E	MO	LL	PL	98	4	225	81
5/3/99	7/20/98	9530F1	I44	8	1	10000	W	MO	REL	EXP	98	3	110	43
5/3/99	7/20/98	9530G2	I44	1	8	10000	E	MO	REL	PL	98	3	183	70
5/4/99	7/20/98	954013	E26	0	0.36		E	MO	LEL	PL	98	2	144	40
5/4/99	7/20/98	954014	E29	0	0.39		E	MO	LEL		98	2	73	28
5/4/99	7/20/98	954015	E29	0.4	0		W	MO	LEL	TH	98	3	165	36
5/4/99	7/20/98	954016	E26	0.36	0		W	MO	LEL	PL	98	3	93	27
5/4/99	7/20/98	954032	I44	5	15	14247	E	MO	LL	PL	98	2	203	73
5/4/99	7/20/98	954033	E26	0	0.49		E	MO	REL	PL	98	2	158	63
5/4/99	7/20/98	954035	E29	0	0.4		E	MO	REL	PL	98	3	78	40
5/4/99	7/20/98	954036	E29	0.4	0		W	MO	REL	TH	98	3	160	65
5/4/99	7/20/98	954037	E26	0.4	0		W	MO	REL	PL	98	1	137	62

E26 & E29 are the exit and entrance ramps on I-44 at Exit 26 and Exit 29

* This file was surveyed without eliminating the rasied pavement markers - notice the high standard deviation

** This file was surveyed taking the markers into account - notice how the results are in line with the white edge line

Summary of May 99 R_L Survey

(Segmented by Route)

Date R_L	Date Striped	File #	Route	Beg MP	End MP	ADT	Direction	State	Line	Material	Year	Sub Rate	Avg MCD	Std Dev
5/1/99	8/19/98	95101E	71	21	14	9691	N	MO	LEL	PL	98		140	64
5/1/99	8/19/98	95101F	71	14	0	5835	N	MO	LEL	PL	98		193	62
5/1/99	8/19/98	95101G	71	0	14	5912	S	MO	LEL	PL	98		130	40
5/1/99	8/19/98	95101H	71	14	21	8583	S	MO	LEL	PL	98		101	35
5/1/99	8/19/98	95101I	71	21	14	9691	N	MO	LL	PL	98		133	50
5/1/99	8/19/98	95101J	71	14	0	5835	N	MO	LL	PL	98		133	47
5/1/99	8/19/98	95101K	71	0	14	5912	S	MO	LL	PL	98		137	57
5/1/99	8/19/98	95101L	71	14	21	8583	S	MO	LL	PL	98		167	62
5/1/99	8/19/98	9510Q1	71	21	14	9691	N	MO	REL	PL	98		165	61
5/1/99	8/19/98	9510R1	71	14	0	5835	N	MO	REL	PL	98		152	60
5/1/99	8/19/98	9510S1	71	0	14	5912	S	MO	REL	PL	98		160	69
5/1/99	8/19/98	9510T1	71	14	21	8583	S	MO	REL	PL	98		152	61
5/3/99	7/15/98	953016	71	0	8.3	8000	S	MO	LEL	TH	98	1	105	22
5/3/99	7/15/98	953017	71	9	0	8000	N	MO	LEL	TH	98	2	106	25
5/3/99	7/15/98	953019	71	0	9	8000	S	MO	LL	TH	98	1	138	46
5/3/99	7/15/98	95301A	71	9	0	8000	N	MO	LL	TH	98	2	187	54
5/3/99	7/15/98	95301B	71	6	0	8000	N	MO	LL	PL	98	4	243	63
5/3/99	7/15/98	95301C	71	0.2	6	8000	S	MO	LL	PL	98	5	239	102
5/3/99	7/15/98	95301D	71	6	0	8000	N	MO	LEL	PL	98	3	144	40
5/3/99	7/15/98	95301E	71	0	6	8000	S	MO	LEL	PL	98	2	160	52
5/3/99	7/15/98	9530G3	71	0	6		S	MO	REL	PL	98	3	217	80
5/3/99	7/15/98	9530G4	71	0	9		S	MO	REL	TH	98	2	130	42
5/3/99	7/15/98	9530H1	71	6	0		N	MO	REL	PL	98	4	242	65
5/3/99	7/15/98	9530H3	71	9	0		N	MO	REL	TH	98	2	149	39
5/4/99	9/9/98	95401P	B71	14.7	8.8		N	MO	CL	PL	98	2	107	30
5/4/99	9/9/98	954038	B71	14.7	9.2	7000	N	MO	LL	PL	98	1	124	39
5/4/99	9/9/98	954039	B71	9.2	8.8	7000	N	MO	LL	PL	98	1	69	17
5/4/99	9/9/98	95403A	B71	8.8	14.7	7000	S	MO	LL	PL	98	1	125	33
5/4/99	9/9/98	95403B	B71	14.7	9.2	7000	N	MO	REL	PL	98	1	113	41
5/4/99	9/9/98	95403C	B71	9.2	14.7	7000	S	MO	REL	PL	98	1	116	46
5/4/99	9/9/98	95403O	B71	8.8	14.7	7000	S	MO	CL	PL	98	2	104	29

Summary of May 99 R_L Survey

(Segmented by Route)

Date R_L	Date Striped	File #	Route	Beg MP	End MP	ADT	Direction	State	Line	Material	Year	Sub Rate	Avg MCD	Std Dev
5/2/99	4/15/98	95202G	66	0	3.2	4952	E	MO	REL	PL	98		200	57
5/2/99	4/15/98	95202H	66	3.2	0	5015	W	MO	REL	PL	98		192	51
5/2/99	4/15/98	95202I	66	0	3.2	4952	E	MO	LL	PL	98		208	49
5/2/99	4/15/98	95202J	66	3.2	0	5015	W	MO	LL	PL	98		187	48
5/2/99	9/10/98	95202K	66	3.2	7.9	17342	E	MO	LL	PL	98		115	40
5/2/99	9/10/98	95202L	66	7.9	9	16222	E	MO	LL	PL	98		166	45
5/2/99	5/5/98	95202M	66	9	14.1	10109	E	MO	REL	PL	98		109	45
5/2/99	5/5/98	95202N	66	14.1	9	10109	W	MO	REL	PL	98		115	42
5/2/99	9/10/98	95202O	66	9	7.9	16222	W	MO	LL	PL	98		169	39
5/3/99	4/15/98	953041	66	3.2	0	5015	W	MO	LEL	PL	98	4	156	47
5/3/99	4/15/98	953051	66	0	3.2	4952	E	MO	LEL	PL	98	2	150	51
5/3/99	9/10/98	953061	66	3.2	6.5	17342	E	MO	CL	PL	98	1	115	32
5/3/99	9/10/98	953071	66	6.5	7.9	17342	E	MO	CL	PL	98	1	132	34
5/3/99	9/10/98	953081	66	7.9	9	16222	E	MO	CL	PL	98	1	163	45
5/3/99	5/5/98	953091	66	9	14.1	10109	E	MO	CL	PL	98	3	161	41
5/3/99	9/10/98	9530D1	66	9	7.9	16222	W	MO	LL	PL	98	3	150	69
5/3/99	9/10/98	########	66	7.9	3.2	17342	W	MO	LL	PL	98	3	150	120
5/1/99	6/4/98	95101Y	96	26.4	12.5	4224	W	MO	CL	PL	98		102	37
5/1/99	5/11/98	951021	96	11.4	0	2089	W	MO	CL	PL	98		170	52
5/2/99	5/11/98	95201H	96	0	11.4	2089	E	MO	REL	PL	98		136	41
5/2/99	5/11/98	95201I	96	11.4	0	2089	W	MO	REL	PL	98		157	62
5/2/99	6/4/98	95201J	96	12.5	26.4	4224	E	MO	REL	PL	98		103	44
5/2/99	6/4/98	95201K	96	26.4	12.5	4224	W	MO	REL	PL	98		110	48
5/2/99	10/27/98	95201L	96	12.5	11.4	12717	W	MO	REL	PL	98		145	63
5/2/99	10/27/98	95201M	96	11.4	12.5	12366	E	MO	REL	PL	98		195	85
5/2/99	10/27/98	95201N	96	12.5	11.4	12717	W	MO	LL	PL	98		*	*
				* Stopped file on Lane Line because the paint was gone and only the small tape skips were remaining										

Summary of May 99 R_L Survey

(Segmented by Route)

Date R_L	Date Striped	File #	Route	Beg MP	End MP	ADT	Direction	State	Line	Material	Year	Sub Rate	Avg MCD	Std Dev
5/1/99	6/1/98	951041	43	11.1	0	2253	N	MO	CL	PL	98		104	25
5/2/99	9/9/98	952017	43	15.4	18.5	16142	S	MO	REL	PL	98		143	52
5/2/99	9/9/98	952018	43	18.5	15.4	16142	N	MO	REL	PL	98		133	51
5/2/99	9/9/98	952019	43	15.4	18.5	16142	S	MO	LL	PL	98		133	36
5/2/99	9/9/98	95201A	43	18.5	15.4	16142	N	MO	LL	PL	98		128	32
5/2/99	6/1/98	95201B	43	15.4	11.1	5715	N	MO	REL	PL	98		119	42
5/2/99	6/1/98	95201C	43	11.1	0	2253	N	MO	REL	PL	98		158	46
5/2/99	6/1/98	95201D	43	0	11.1	2253	S	MO	REL	PL	98		142	54
5/2/99	6/1/98	95201E	43	11.1	15.4	5715	S	MO	REL	PL	98		99	32
5/3/99	9/9/98	95301K	43	18.5	15.4	16142	N	MO	CL	PL	98	1	102	29
5/3/99	9/9/98	95301L	43	15.4	18.5	16142	S	MO	CL	PL	98	1	100	28
5/3/99	6/1/98	95301M	43	15.4	11.1	5715	N	MO	CL	PL	98	4	112	35
5/2/99	9/9/98	95201F	171	15.1	0	6061	N	MO	REL	PL	98	2	123	37
5/2/99	9/9/98	95201G	171	0	15.1	6061	S	MO	REL	PL	98	2	139	50
5/3/99	9/9/98	95301N	171	0	15.1	6061	S	MO	CL	PL	98	3	143	52
5/3/99	9/9/98	95301Q	171	15.1	17.1	12942	S	MO	CL	PL	98	3	100	22
5/3/99	9/9/98	95301R	171	17.1	17.9	12942	S	MO	CL	PL	98	3	93	23
5/3/99	9/9/98	95301S	171	17.9	25.9	12942	S	MO	LEL	PL	98	3	161	54
5/3/99	9/9/98	95301T	171	25.9	17.9	12942	N	MO	LEL	PL	98	3	153	51
5/3/99	9/9/98	95301U	171	17.9	15.1	12942	N	MO	LEL	PL	98	2	107	27
5/3/99	9/9/98	95301V	171	15.1	17.9	12942	S	MO	LL	PL	98	3	164	48
5/3/99	9/9/98	95301W	171	17.9	25.9	12942	S	MO	LL	PL	98	3	200	78
5/3/99	9/9/98	95301X	171	25.9	17.9	12942	N	MO	LL	PL	98	3	199	81
5/3/99	9/9/98	95301Y	171	17.9	15.1	12942	N	MO	LL	PL	98	3	155	43

Summary of May 99 R_L Survey

(Segmented by Route)

Date R_L	Date Striped	File #	Route	Beg MP	End MP	ADT	Direction	State	Line	Material	Year	Sub Rate	Avg MCD	Std Dev
5/1/99	6/22/98*	95101O	37	21.7	0	706	N	MO	CL	PL	98		142	44
5/1/99	6/22/98*	95101N	37	25.6	21.7	3060	N	MO	CL	PL	98		119	28
5/2/99	6/22/98*	95201P	37	21.7	0	706	N	MO	REL	PL	98		144	49
5/2/99	6/22/98*	95201R	37	0	21.7	706	S	MO	REL	PL	98		144	52
5/2/99	6/22/98*	95201S	37	21.7	25.6	3060	S	MO	REL	PL	98		141	62
5/2/99	6/22/98*	95201T	37	25.6	21.7	3060	N	MO	REL	PL	98		126	55
			* Second striping one month after first marking this roadway											
5/1/99	8/25/98	95101D	59	1.5	0	5190	N	MO	CL	PL	98		94	29
5/1/99	8/25/98	9510V1	59	1.5	0	5190	N	MO	REL	PL	98		110	49
5/1/99	10/29/98	9510P1	571	0	1.5		S	MO	REL	PL	98		164	69
5/1/99	4/24/98	951014	FF	0	2	9828	E	MO	LEL	PL	98		103	37
5/1/99	4/24/98	951015	FF	2	0	9828	W	MO	LEL	PL	98		111	37
5/1/99	4/24/98	951016	FF	0	2	9828	E	MO	LL	PL	98		149	50
5/1/99	4/24/98	951017	FF	2	0	9828	W	MO	LL	PL	98		162	41
5/1/99	4/24/98	951018	FF	2	5.6	9828	E	MO	LEL	PL	98		143	40
5/1/99	4/24/98	951019	FF	5.6	2	9828	W	MO	LEL	PL	98		141	39
5/1/99	4/24/98	95101A	FF	2	5.6	9828	E	MO	LL	PL	98		143	56
5/1/99	4/24/98	95101B	FF	5	2	9828	W	MO	LL	PL	98		147	46
5/1/99	6/11/98	95101C	FF	5	11.2	2428	E	MO	CL	PL	98		154	45
5/1/99	6/11/98	9510W1	FF	11.2	5.4	2428	W	MO	REL	PL	98		157	59
5/1/99	6/11/98	9510X1	FF	5	11.2	2428	E	MO	REL	PL	98		169	54
5/3/99	4/24/98	9530H5	FF	5.6	3.6	9828	W	MO	REL	PL	98	3	154	65
5/3/99	4/24/98	9530H6	FF	3.6	5.6	9828	E	MO	REL	PL	98	3	165	62

Summary of May 99 R_L Survey

(Segmented by Route)

Date R_L	Date Striped	File #	Route	Beg MP	End MP	ADT	Direction	State	Line	Material	Year	Sub Rate	Avg MCD	Std Dev
5/4/99	8/6/98	95403D	TT	0	1	10497	E	MO	LL	TH	98	2	140	29
5/4/99	8/6/98	95403E	TT	1	0	10497	W	MO	LL	TH	98	2	133	32
5/4/99	8/6/98	95403F	TT	0	1	10497	E	MO	REL	PL	98	2	101	34
5/4/99	8/6/98	95403G	TT	1	0	10497	W	MO	REL	PL	98	2	81	31
5/4/99	8/6/98	95403H	TT	1	0	10497	W	MO	CL	TH	98	2	119	29
5/4/99	8/6/98	95403I	TT	0	1	10497	E	MO	CL	TH	98	2	96	28
5/1/99	8/6/98	9510L1	E	8.9	0	2247	W	MO	CL	PL	98		113	33
5/1/99	8/6/98	9510N1	E	0	8.9	2247	E	MO	REL	PL	98		*149	*46
5/1/99	8/6/98	9510O1	E	8.9	0	2247	W	MO	REL	PL	98		125	46
5/2/99	8/6/98	95201O	E	0	8.9	2247	E	MO	REL	PL	98		*146	*46
		* This file was collected on a different day with a different setup - notice the average retroreflectivity and standard deviation												
		They are virtually the same numbers - this demonstrates the repeatability of the equipment and operators												
5/1/99	10/6/98	95101P	A	0	1	592	E	MO	CL	PL	98		192	28
5/1/99	10/6/98	95101S	A	0	3.5	592	E	MO	CL	PL	98		193	48
5/1/99	10/6/98	95101T	A	3.4	7.1	432	E	MO	CL	PL	98		139	36
5/1/99	10/6/98	95101U	A	0	7.3	501	E	MO	CL	PL	98		173	39
5/1/99	10/6/09	9510G1	A	0	1	592	E	MO	CL	PL	98		141	53
5/2/99	4/15/98	952023	P	6.6	0	1762	W	MO	REL	PL	98		131	45
5/2/99	4/15/98	952024	P	0	2	517	E	MO	REL	PL	98		67	14
5/2/99	4/15/98	95202F	P	2	6.6	2372	E	MO	REL	PL	98		93	32
5/3/99	4/15/98	95301Z	P	6	2	2372	W	MO	CL	PL	98	3	126	45
5/3/99	4/15/98	953031	P	0	2	517	E	MO	CL	PL	98	4	189	58
5/1/99	7/6/98	95101W	M	0	4.8	477	S	MO	CL	PL	98		160	32
5/1/99	9/28/98	95101X	M	0	8.4	210	S	MO	CL	PL	98		171	39
5/1/99	4/6/98	9510B1	M	15.8	0	390	W	MO	CL	PL	98		182	35

Summary of May 99 R_L Survey

(Segmented by Route)

Date R_L	Date Striped	File #	Route	Beg MP	End MP	ADT	Direction	State	Line	Material	Year	Sub Rate	Avg MCD	Std Dev
5/1/99	8/6/98	9510C1	H	0	7.3	250	E	MO	CL	PL	98		154	35
5/1/99	8/6/98	9510D1	H	8.3	18.1	407	E	MO	CL	PL	98		168	44
5/2/99	8/6/98	952027	H	0	1.2	350	E	MO	REL	PL	98		164	61
5/2/99	8/6/98	952028	H	1.2	1	350	E	MO	REL	PL	98		192	58
5/1/99	6/9/98	951071	T	10	0	886	N	MO	CL	PL	98		176	43
5/1/99	6/9/98	951081	T	0	4	323	S	MO	CL	PL	98		167	37
5/1/99	9/24/98	9510I1	U	0	4.1	446	S	MO	CL	PL	98		114	28
5/4/99	9/24/98	954017	U	9.7	4.1	478	N	MO	CL	PL	98	2	168	54
5/4/99	9/24/98	954018	U	4.1	9.7	478	S	MO	CL	PL	98	2	156	44
5/4/99	10/23/98	95403J	V	2.3	0	2161	W	MO	REL	PL	98	1	151	64
5/4/99	10/23/98	95403K	V	0	2.3	2161	E	MO	REL	PL	98	1	165	60
5/4/99	10/23/98	95403M	V	2.2	0	2161	W	MO	CL	PL	98	2	145	38
5/1/99	5/11/98	951031	YY	4	0		W	MO	CL	PL	98		193	41
5/2/99	5/11/98	952026	YY	0	4		E	MO	REL	PL	98		188	38
5/2/99	5/11/98	95202C	YY	4	2		W	MO	REL	PL	98		174	48
5/2/99	4/15/98	952025	JJ	4	0	2162	N	MO	REL	PL	98		132	42
5/2/99	4/15/98	95202E	JJ	0	4	2162	E	MO	REL	PL	98		129	39
5/3/99	4/15/98	953021	JJ	4	0	2162	N	MO	CL	PL	98	4	170	51

Summary of May 99 R_L Survey

(Segmented by Route)

Date R_L	Date Striped	File #	Route	Beg MP	End MP	ADT	Direction	State	Line	Material	Year	Sub Rate	Avg MCD	Std Dev
5/1/99	8/6/98	95101V	K	0	7.3	456	E	MO	CL	PL	98		154	42
5/1/99	8/6/98	9510F1	K	0	10.5	625	E	MO	CL	PL	98		160	41
5/1/99	9/24/98	9510J1	F	7.2	0	256	W	MO	CL	PL	97		143	35
5/1/99	*1997	9510K1	F	5.8	0	311	W	MO	CL	PL	97		155	32
5/3/99	4/13/98	9530A1	AA	6	0	823	N	MO	CL	PL	98	4	188	49
5/2/99	4/15/98	95202B	KK	0.8	0	577	W	MO	CL	PL	98		153	46
5/1/99	*1997	9510A1	N	10	0	535	W	MO	CL	PL	97		156	30
			* Roadway still has good retroreflectivity but does have snow plow damage											
5/1/99	10/1/98	951091	BB	0	6.6	437	S	MO	CL	PL	98		157	32
5/2/99	4/15/98	952029	CC	0.9	0	336	W	MO	CL	PL	98		197	52
5/1/99	10/6/98	9510H1	NN	1.4	0	218	W	MO	CL	PL	98		148	49
5/1/99	7/6/98	951051	O	6.9	0	207	N	MO	CL	PL	98		182	47
5/1/99	7/6/98	951061	J	0	9.6	176	S	MO	CL	PL	98		175	36
5/4/99	4/6/98	95403N	WOR	6.7	0		W	MO	CL	PL	98	3	143	46
			This indicates either an estimated ADT or date roadway was striped - couldn't find the right information											

SUMMARY of AUGUST 99 RL SURVEY

(Segmented by Route)

DATE OF SURVEY	FILE NUMBER	ROUTE NUMBER	BEG MP	END MP	ADT	DIR RL	SPD	LINE TYPE	MAT TYPE	DATE STRIPED	SUB RATE	AVG MCD	STD DEV	
Route I-44														
7/31/99	97V039	44	0	17	13405	E	70	LEL	PL	98	2	138	47	
7/31/99	97V03C	44	17	0	13617	W	70	LEL	PL	98	1	116	44	
7/31/99	97V035	44	8	1	10000	W	70	LEL	E	98	3	101	36	
7/31/99	97V034	44	1	8	10000	E	70	LEL	PL	98	2	100	38	
7/31/99	97V03A	44	17	22	12274	E	70	LEL	TH	98	2	88	37	
7/31/99	97V03B	44	22	17	12116	W	70	LEL	TH	98	4	88	13	
7/31/99	97V031	44	8	1	10000	W	70	LEL	E	98	3	83	28	
7/31/99	97V03G	44	17	22	12274	E	70	LL	TH	98	4	263	55	
7/31/99	97V03E	44	1	8	10000	E	70	LL	PL	98	3	213	75	
7/31/99	97V03F	44	0	17	13405	E	70	LL	PL	98	3	183	52	
7/31/99	97V03I	44	17	0	13617	W	70	LL	PL	98	3	179	45	
7/31/99	97V03H	44	22	17	12116	W	70	LL	TH	98	4	144	33	
7/31/99	97V03D	44	8	1	10000	W	70	LL	E	98	4	108	27	
7/31/99	97V053	44	1	8	10000	E	70	REL	PL	98	3	167	58	
7/31/99	97V054	44	0	17	13405	E	70	REL	PL	98	2	137	46	
7/31/99	97V04Q	44	17	0	13617	W	70	REL	PL	98	1	113	35	
7/31/99	97V055	44	17	22	12274	E	70	REL	TH	98	4	110	44	
7/31/99	97V04P	44	22	17	12116	W	70	REL	TH	98	4	104	21	
7/31/99	97V05M	44	8	1	10000	W	70	REL	E	98	2	97	45	
Route 54		Extra Files: US Route 54 from El Dorado Springs to MO Route AA												
7/18/99	97I0F1	54				W	60	CL	PL	98	3	159	56	
7/18/99	97I0F2	54				E	60	REL	TH	97	4	252	63	
7/18/99	97I0F3	54				W	60	REL	TH	97	4	222	63	
				*CL has 1 year old latex over thermoplastic										
Route 59														
7/16/99	97G09V	59	1.5	0	5190	N	50	CL	PL	99	4	227	53	
7/17/99	97H0U1	59	1.5	0	5190	N	50	REL	PL	99	4	297	57	
7/17/99	97H0V1	59	0	1.5	5190	S	50	REL	PL	99	4	244	63	

SUMMARY of AUGUST 99 RL SURVEY

(Segmented by Route)

DATE OF SURVEY	FILE NUMBER	ROUTE NUMBER	BEG MP	END MP	ADT	DIR RL	SPD	LINE TYPE	MAT TYPE	DATE STRIPED	SUB RATE	AVG MCD	STD DEV	
											GLASS			%
Route 60		VisiBead/Standard Bead test site									BEADS			CHANGE
7/18/99	97I031	60	0	1	(B)	E	55	CL	PL	99	BOTH	239	58	
7/18/99	97I061	60	0.4	0	(A)	W	55	CL	PL	99	VISI	246	57	
7/17/99	97I051	60	1	0.6	(C)	W	55	CL	PL	99	STD	208	57	18.27%
		(A) VisiBead site only: (B) Run with both Visi/Stad combined: (C) Standard Bead site only.												
Route 66														
7/18/99	97I01Y	66	9	14	10109	E	55	CL	PL	99	4	265	84	
7/18/99	97I01W	66	3	7.9	17342	E	45	CL	PL	99	4	261	91	
7/18/99	97I01X	66	7.9	9	16222	E	45	CL	PL	99	4	246	74	
7/18/99	97I01U	66	0	3	4952	E	60	CL	PL	99	4	236	44	
7/18/99	97I01Q	66	9	7.9	16222	W	45	CL	PL	99	4	229	58	
7/18/99	97I01R	66	7.9	3	17342	W	45	CL	PL	99	4	217	77	
7/18/99	97I01O	66	9	7.2	16222	W	45	CL	PL	99	4	186	37	
7/18/99	97I01T	66	3	0	5015	W	60	LEL	PL	99	4	224	45	
7/18/99	97I021	66	0	9	16222	S	70	LEL	TH	98	2	111	32	
7/17/99	97H0Q1	66	9	7.9	16222	W	45	LL	PL	99	4	350	78	
7/17/99	97H0R1	66	7.9	3	17342	W	45	LL	PL	99	4	344	84	
7/17/99	97H0M1	66	3	7.9	17342	E	40	LL	PL	99	4	343	86	
7/17/99	97H0N1	66	7.9	9	16222	E	40	LL	PL	99	4	293	87	
7/17/99	97H0L1	66	0	3	4952	E	60	LL	PL	99	4	249	44	
7/17/99	97H0K1	66	2.3	0	5015	W	60	LL	PL	99	4	242	43	
7/17/99	98H0P1	66	14.1	9	10109	W	55	REL	PL	99	4	314	88	
7/17/99	97H0J1	66	0	3.6	4952	E	60	REL	PL	99	4	226	47	
7/17/99	97H0I1	66	3.2	0	5015	W	55	REL	PL	99	4	217	52	
7/17/99	97H0O1	66	9	14.1	10109	E	55	REL	PL	99	3	195	64	

SUMMARY of AUGUST 99 RL SURVEY

(Segmented by Route)

DATE OF SURVEY	FILE NUMBER	ROUTE NUMBER	BEG MP	END MP	ADT	DIR RL	SPD	LINE TYPE	MAT TYPE	DATE STRIPED	SUB RATE	AVG MCD	STD DEV	
Route 71														
7/16/99	97G141	71	6.7	0	8000	N	70	CL	PL	98	3	142	46	
7/31/99	97V043	71	0	4	8000	S	70	LEL	PL	99	5	283	46	
7/31/99	97V042	71	4.3	0	8000	N	70	LEL	PL	99	5	238	31	
7/31/99	97V041	71	14	4.4	5835	N	70	LEL	PL	98	3	179	61	
7/18/99	97I01Z	71	0	6	8000	S	70	LEL	PL	98	3	166	51	
7/18/99	97I081	71	5.6	0	8000	N	70	LEL	PL	98	3	160	48	
7/31/99	97V044	71	4	14	5912	S	70	LEL	PL	98	3	129	41	
7/31/99	97V04C	71	21	14	9691	N	70	LEL	PL	98	2	125	55	
7/18/99	97I071	71	9	0	8000	N	70	LEL	PL	98	2	116	37	
7/31/99	97V045	71	14	21	8583	S	70	LEL	PL	98	3	102	38	
7/17/99	97H0X5	71	0	5.6	8000	S	70	LL	PL	99	4	342	75	
7/31/99	97V049	71	0	4	8000	S	70	LL	PL	99	4	313	50	
7/31/99	97V048	71	4.3	0	8000	N	70	LL	PL	99	4	293	54	
7/17/99	97H0XH	71	5.6	0	8000	N	70	LL	PL	98	4	244	56	
7/17/99	97H0XG	71	9	0	8000	W	70	LL	TH	98	3	194	46	
7/31/99	97V04B	71	14	21	8583	S	70	LL	PL	98	3	157	61	
7/31/99	97V04A	71	4	14	5912	S	70	LL	PL	98	3	141	60	
7/17/99	97H0X6	71	0	9	8000	S	70	LL	TH	98	3	140	44	
7/31/99	97V046	71	21	14	9691	N	70	LL	PL	98	3	133	50	
7/31/99	97V047	71	14	4.4	5835	N	70	LL	PL	98	3	125	38	
7/17/99	97H0X4	71	5.6	0	8000	N	70	REL	PL	99	4	310	77	
7/31/99	97V05G	71	4	0	8000	S	70	REL	PL	99	4	302	63	
7/31/99	97V05F	71	4.4	0	8000	N	70	REL	PL	99	4	270	57	
7/17/99	97H0X1	71	0	6	8000	S	70	REL	PL	99	4	252	90	
7/17/99	97H0X3	71	9	0	8000	N	70	REL	TH	98	2	176	45	
7/17/99	97H0X2	71	0	9	8000	S	70	REL	TH	98	2	154	49	
7/31/99	97V05L	71	14	21	8583	S	70	REL	PL	98	2	142	51	
7/31/99	97V05K	71	4	14	5912	S	70	REL	PL	98	2	134	50	
7/31/99	97V05A	71	21	14	9691	N	70	REL	PL	98	2	122	41	
7/31/99	97V05B	71	14	4.4	5835	N	70	REL	PL	98	2	107	32	

SUMMARY of AUGUST 99 RL SURVEY

(Segmented by Route)

DATE OF SURVEY	FILE NUMBER	ROUTE NUMBER	BEG MP	END MP	ADT	DIR RL	SPD	LINE TYPE	MAT TYPE	DATE STRIPED	SUB RATE	AVG MCD	STD DEV	
Route 86											GLASS			%
VisiBead/Standard Bead test site											BEADS			CHANGE
7/18/99	97I091	86	0	7.3		E	55	CL	PL	99	BOTH	258	54	
7/18/99	97I0B1	86	3.9	0		W	55	CL	PL	99	VISI	265	53	
7/18/99	97I0A1	86	7.3	3.9		W	55	CL	PL	99	STD	232	48	14.22%
7/17/99	97H0XD	86	3.9	7.3		E	55	REL	PL	99	STD	270	78	
7/17/99	97H0XC	86	0	3.8		E	55	REL	PL	99	VISI	243	64	11.11%
7/17/99	97H0X8	86	0	9.8		E	55	REL	PL	99	BOTH	251	71	
7/17/99	97H0X9	86	0	7		E	55	REL	PL	99	BOTH	245	71	
7/17/99	97H0XE	86	7.3	0		W	55	REL	PL	99	BOTH	212	82	
7/17/99	97H0XB	86	3.8	0		W	55	REL	PL	99	STD	235	88	
7/17/99	97H0XA	86	7.3	3.9		W	55	REL	PL	99	VISI	203	76	15.76%
* The VisiBeads on cenerline were 14% brighter; The Standard Beads were 11-15% brighter on the edge lines.														
However, lines are still not very brite on REL's. NOTE: the handhelds on the REL show a directional difference.														
Visibead lines measured in the opposite direction striped - 100 mcd brighter: no change on the Standard REL's.														
Route 96														
7/16/99	97G0C1	96	26.4	12.5	4224	W	65	CL	PL	99	4	205	47	
8/1/99	98101O	96	11.4	2.5	2089	W	55	CL	PL	99	4	184	56	
7/16/99	97G0H1	96	11.4	0	2089	W	55	CL	PL	99	4	177	58	
8/1/99	98101F	96	2.5	0	2089	W	65	CL	PL	98	3	128	36	
7/17/99	97H01P	96	26.4	12.5	4224	W	65	REL	PL	99	4	168	45	
7/17/99	97H01O	96	12.5	26.4	4224	E	65	REL	PL	99	4	163	38	
7/17/99	97H0F1	96	0	5	2089	E	55	REL	PL	98	4	163	47	
8/1/99	98101T	96	11.5	0	2089	W	55	REL	PL	98	3	140	51	
8/1/99	98101S	96	2.5	11.4	2089	E	55	REL	PL	98	3	131	39	
8/1/99	98101R	96	0	2.5	2089	E	55	REL	PL	98	3	111	29	
8/1/99	98101Q	96	2.5	0	2089	W	55	REL	PL	98	3	91	30	

SUMMARY of AUGUST 99 RL SURVEY

(Segmented by Route)

DATE OF SURVEY	FILE NUMBER	ROUTE NUMBER	BEG MP	END MP	ADT	DIR RL	SPD	LINE TYPE	MAT TYPE	DATE STRIPED	SUB RATE	AVG MCD	STD DEV
Route 171													
7/16/99	97G0K1	171	15.1	0	6061	N	65	CL	PL	99	4	184	45
7/16/99	97G1D1	171	25.9	17.9	12942	N	70	LEL	PL	99	4	229	45
7/16/99	97G121	171	17.9	25.9	12942	S	70	LEL	PL	99	4	222	41
7/16/99	97G111	171	15.1	17.9	12942	S	55	LEL	PL	99	4	213	41
7/16/99	97G1E1	171	17.9	15.1	12942	N	50	LEL	PL	99	4	206	62
7/16/99	97G0Z1	171	25.9	17.9	12942	N	65	LL	PL	99	4	261	71
7/16/99	97G0Y1	171	17.9	25.9	12942	S	55	LL	PL	99	4	250	69
7/16/99	97G0X1	171	15.1	17.9	12942	S	55	LL	PL	99	4	241	59
7/16/99	97G101	171	17.9	15.1	12942	N	45	LL	PL	99	4	227	54
7/17/99	97H01M	171	17.9	25.9	12942	S	70	REL	PL	99	4	282	52
7/17/99	97H01T	171	25.9	17.9	12942	N	70	REL	PL	99	4	276	58
7/17/99	97H01U	171	17.9	15.1	12942	N	50	REL	PL	99	4	244	60
7/17/99	97H01I	171	17.9	25.9	12942	S	70	REL	PL	99	4	225	52
7/17/99	97H031	171	0	15.1	6061	S	65	REL	PL	99	4	216	57
7/17/99	97H019	171	17.9	25.9	12942	S	70	REL	PL	99	3	174	49
7/17/99	97H041	171	15.1	0	6061	N	65	REL	PL	99	3	160	49
7/17/99	97H01V	171	15.1	0	6061	N	65	REL	PL	99	3	143	35
Route 571													
7/16/99	97G0E1	571	0.5	1.5		S	45	CL	PL	99	4	235	74
7/16/99	97G0D1	571	1.5	0		N	45	CL	PL	99	4	233	75
7/16/99	97G0G1	571	0.5	1.5		S	45	LL	PL	99	4	278	51
7/16/99	97G0F1	571	1.5	0.5		N	45	LL	PL	99	4	247	81
7/17/99	97H01N	571	0	1.5		S	30	REL	PL	99	4	278	63
7/17/99	97H01S	571	1.5	0		N	30	REL	PL	99	4	253	79

SUMMARY of AUGUST 99 RL SURVEY

(Segmented by Route)

DATE OF SURVEY	FILE NUMBER	ROUTE NUMBER	BEG MP	END MP	ADT	DIR RL	SPD	LINE TYPE	MAT TYPE	DATE STRIPED	SUB RATE	AVG MCD	STD DEV
Route A													
7/16/99	97G181	A	3	7.3	432	E	55	CL	PL	99	4	159	36
7/16/99	97G171	A	0	3.5	592	E	55	CL	PL	99	4	129	3
7/31/99	97V04L	A	0	7.3	501	E	55	CL	PL	99	4	128	33
Route AA													
8/1/99	98101A	AA	6	0	823	N	45	CL	PL	98	4	167	43
Route B71													
7/16/99	97G09J	B71	14.7	9	7000	N	45	CL	PL	99	4	244	55
7/16/99	97G09K	B71	9	14.7	7000	S	45	CL	PL	99	4	224	53
7/16/99	97G09H	B71	14.7	9.2	7000	N	45	LL	PL	99	4	294	62
7/16/99	97G09I	B71	9	14.7	7000	S	45	LL	PL	99	4	264	61
7/17/99	97H018	B71	14.7	9.2	7000	N	45	REL	PL	99	4	237	75
Route BB													
7/16/99	97G1C1	BB	6.6	0	437	N	55	CL	PL	99	4	126	33
Route CC													
7/17/99	97H051	CC	0.9	0	336	W	35	CL	PL	99	4	208	69
Route E													
7/16/99	97G09W	E	0	8.9	2247	E	45	CL	PL	99	4	196	48
7/17/99	97H01R	E	8.6	0	2247	W	45	REL	PL	99	4	198	50
8/1/99	97H01R	E	8.6	0	2247	W	45	REL	PL	99	4	198	50
7/17/99	97H01Q	E	0	8.9	2247	E	45	REL	PL	99	4	188	48

SUMMARY of AUGUST 99 RL SURVEY

(Segmented by Route)

DATE OF SURVEY	FILE NUMBER	ROUTE NUMBER	BEG MP	END MP	ADT	DIR RL	SPD	LINE TYPE	MAT TYPE	DATE STRIPED	SUB RATE	AVG MCD	STD DEV
Route F													
7/16/99	97G09Z	F	0	7	256	E	55	CL	PL	99	4	209	58
7/16/99	97G09Y	F	0	5.8	311	E	55	CL	PL	99	4	184	52
Route FF													
7/16/99	97G09F	FF	0	2	9828	E	40	CL	PL	99	4	304	62
7/16/99	97G09R	FF	2	0	9828	W	40	CL	PL	99	4	281	67
7/16/99	97G09U	FF	5	11	2428	E	55	CL	PL	99	4	240	50
7/16/99	97G09T	FF	2	5	9828	E	40	CL	PL	99	4	238	63
7/16/99	97G09Q	FF	5	2	9828	W	40	CL	PL	99	4	237	67
7/16/99	97G09N	FF	2	0	9828	W	40	LL	PL	99	4	323	55
7/16/99	97G09O	FF	0	2	9828	E	40	LL	PL	99	4	297	53
7/16/99	97G09M	FF	5.6	2	9828	W	45	LL	PL	99	4	285	59
7/16/99	97G09L	FF	0	2.9	9828	E	45	LL	PL	99	4	280	68
7/16/99	97G09P	FF	2	5	9828	E	40	LL	PL	99	4	258	70
7/17/99	97H0S1	FF	2	5	9828	E	50	REL	PL	99	4	354	70
7/17/99	97H0W1	FF	11.2	5.5	2428	W	55	REL	PL	99	4	334	67
7/17/99	97H0T1	FF	5	11.2	2428	E	55	REL	PL	99	4	265	59
Route H													
7/16/99	97G0L1	H	0	7.1	250	E	55	CL	PL	99	4	212	53
7/16/99	97G0M1	H	8.3	18.1	407	E	65	CL	PL	99	4	204	56
7/17/99	97H021	H	1.2	0	350	W	55	REL	PL	99	4	244	44
7/17/99	97H01Y	H	0	1.2	350	E	55	REL	PL	99	4	208	42
Route J													
7/16/99	97G0N1	J	10.6	0	176	N	65	CL	PL	99	4	207	51

SUMMARY of AUGUST 99 RL SURVEY

(Segmented by Route)

DATE OF SURVEY	FILE NUMBER	ROUTE NUMBER	BEG MP	END MP	ADT	DIR RL	SPD	LINE TYPE	MAT TYPE	DATE STRIPED	SUB RATE	AVG MCD	STD DEV
Route JJ													
8/1/99	98101B	JJ	4	0	2162	N	55	CL	PL	98	3	137	40
8/1/99	98101V	JJ	0	4	2162	S	55	REL	PL	98	3	127	42
8/1/99	98101Z	JJ	4	0	2162	N	55	REL	PL	99	3	122	38
Route K													
8/1/99	98101J	K	0	5.4	625	E	55	CL	PL	99	4	191	33
7/16/99	97G151	K	0	10.5	625	E	55	CL	PL	99	4	186	44
8/1/99	98101I	K	10.5	0	625	W	55	CL	PL	99	4	182	39
7/16/99	97G191	K	0	7.3	456	E	55	CL	PL	99	4	165	55
Route KK													
7/17/99	97H061	KK	0.8	0	577	W	55	CL	PL	99	4	182	50
Route M													
8/1/99	98101G	M	0	17	390	E	55	CL	PL	98	3	185	38
7/31/99	97V04M	M	0	15.8	345	S	55	CL	PL	98	3	182	44
Route N													
8/1/99	98101H	N	0	10	535	E	55	CL	PL	97	2	147	29
Route O													
7/16/99	97GOO1	O	0	6.9	207	S	65	CL	PL	99	4	183	49
Route P													
8/1/99	98101D	P	2	6.6	2372	E	55	CL	PL	99	4	158	31
8/1/99	98101C	P	0	2	517	E	55	CL	PL	99	3	149	38
8/1/99	98101Y	P	6.6	2	2372	N	55	REL	PL	99	4	162	37
8/1/99	98101X	P	0	6.6	1762	S	55	REL	PL	99	4	135	44
8/1/99	98101W	P	2	0	517	N	55	REL	PL	99	4	133	45

SUMMARY of AUGUST 99 RL SURVEY

(Segmented by Route)

DATE OF SURVEY	FILE NUMBER	ROUTE NUMBER	BEG MP	END MP	ADT	DIR RL	SPD	LINE TYPE	MAT TYPE	DATE STRIPED	SUB RATE	AVG MCD	STD DEV
Route T													
8/1/99	98101M	T	10	0	886	N	55	CL	PL	99	4	236	41
8/1/99	98101K	T	0	3	323	S	55	CL	PL	99	3	206	40
8/1/99	98101L	T	3	0	323	N	55	CL	PL	99	3	203	30
Route TT													
8/1/99	981018	TT	0	1	10497	E	40	CL	TH	98	3	102	28
8/1/99	981017	TT	1	0	10497	W	40	CL	TH	98	3	95	28
8/1/99	981016	TT	0	1	10497	E	40	LL	TH	98	3	131	24
8/1/99	981019	TT	1	0	10497	W	40	LL	TH	98	3	129	28
Route U													
7/16/99	97G0A1	U	9.7	4.1	478	N	55	CL	PL	99	4	208	50
7/16/99	97G0B1	U	4.1	0	446	N	55	CL	PL	99	4	197	46
Route V													
7/16/99	97G131	V	2.3	0	2161	N	45	REL	PL	99	4	196	67
Route YY													
7/16/99	97G0I1	YY	4	0		W	55	CL	PL	99	4	206	50
7/17/99	97H081	YY	0	4		E	55	REL	PL	99	4	221	71
7/17/99	97H071	YY	4	0		W	55	REL	PL	99	4	205	54
Route Z													
7/16/99	97G0J1	Z	0	2.5		E	55	CL	PL	99	4	246	60
7/17/99	97H091	Z	2.5	0		W	55	REL	PL	99	3	189	44
7/17/99	97H0A1	Z	0	2.5		E	55	REL	PL	99	3	181	45

SUMMARY OF NOVEMBER R_L SURVEY

(Segmented by Route)

DATE OF SURVEY	FILE NUMBER	ROUTE NUMBER	BEG MP	END MP	ADT	DIR RL	LINE TYPE	SPD	MAT TYPE	SUB RATE	AVG MCD	STD DEV
ROUTE 37												
11/7/99	W9B70CB	37	0	21.7		S	CL	55	PL		175	29
11/7/99	W9B70CC	37	21.7	25.6		S	CL	55	PL		173	32
11/8/99	G9B8098	37	0	25.6		S	REL	55	PL			
11/8/99	G9B8099	37	25.6	0		N	REL	55	PL			
ROUTE 43												
11/7/99	W9B702T	43	15.4	0		N	CL	55	PL		149	43
11/8/99	W9B8011	43	18.5	15.4		N	CL	45	PL	3	138	41
11/7/99	W9B702R	43	15.4	18.5		S	LEL	45	PL		192	45
11/7/99	W9B702S	43	18.5	15.4		N	LEL	45	PL		194	42
11/7/99	G9B7026	43	15.4	18.5		S	LL	45	PL	3	260	51
11/7/99	G9B7031	43	18.5	15.4		N	LL	45	PL	3	218	50
11/7/99	G9B7032	43	15.4	18.5		S	REL	45	PL	3	199	45
11/7/99	G9B7033	43	18.5	15.4		N	REL	45	PL	3	198	45
11/7/99	G9B7034	43	15.4	11.1		N	REL	55	PL	3	180	35
11/7/99	G9B7035	43	11.1	0		N	REL	55	PL	3	161	32
11/7/99	G9B7036	43	0	11.1		S	REL	55	PL	3	164	30
11/7/99	G9B7038	43	11.1	15.4		S	REL	55	PL	3	174	33

SUMMARY OF NOVEMBER R_L SURVEY

(Segmented by Route)

DATE OF SURVEY	FILE NUMBER	ROUTE NUMBER	BEG MP	END MP	ADT	DIR RL	LINE TYPE	SPD	MAT TYPE	SUB RATE	AVG MCD	STD DEV
ROUTE I-44												
11/8/99	W9B8012	I-44	0	16.9		E	LL	65	PL	4	247	63
11/8/99	W9B8013	I-44	16.9	21.9		E	LL	65	PL	4	287	52
11/8/99	W9B8014	I-44	21.9	16.9		W	LL	65	PL	4	180	52
11/8/99	W9B8015	I-44	16.9	0		W	LL	65	PL	4	270	51
11/7/99	W9B70CE	I-44	8	1		W	LEL	70	PL		238	36
11/7/99	W9B70CF	I-44	1	8		E	LEL	70	PL		232	40
11/7/99	W9B70D1	I-44	21.9	16.9		W	LEL	70	PL		76	12
11/7/99	W9B70D2	I-44	16.9	0		W	LEL	70	PL		192	32
11/7/99	W9B70D5	I-44	0	16.9		E	LEL	70	PL		201	34
11/7/99	W9B70D6	I-44	16.9	21.9		E	LEL	70	PL		201	33
11/7/99	W9B70D7	I-44	21.9	16.9		W	LEL	70	PL		65	10
11/7/99	W9B70D3	I-44	8	1		W	LL	70	PL		292	68
11/7/99	W9B70D4	I-44	1	8		E	LL	70	PL		308	64
11/7/99	G9B70E1	I-44	8	1		W	REL	70	PL	4	308	112
11/7/99	G9B70F1	I-44	1	8		E	REL	70	PL	4	337	79
11/7/99	G9B70G1	I-44	0	16.9		E	REL	70	PL	4	287	56
11/7/99	G9B70H1	I-44	16.9	21.9		E	REL	70	PL	4	285	34
11/7/99	G9B70I1	I-44	21.9	16.9		W	REL	70	PL	4	134	21
11/7/99	G9B70J1	I-44	16.9	0		W	REL	70	PL	4	270	53
ROUTE 59												
11/7/99	G9B703T	59	1.5	0		N	REL	60	PL	4	282	60
ROUTE 60												
11/8/99	G9B8026	60	0	1		E	REL		PL		282	73
11/8/99	G9B8027	60	1	0		W	REL		PL		249	49
11/8/99	W9B801Q	60	0	1		E	CL		PL	4	206	29

SUMMARY OF NOVEMBER R_L SURVEY

(Segmented by Route)

DATE OF SURVEY	FILE NUMBER	ROUTE NUMBER	BEG MP	END MP	ADT	DIR RD	LINE TYPE	SPD	MAT TYPE	SUB RATE	AVG MCD	STD DEV
ROUTE 66												
11/7/99	W9B702D	66	7.9	3.2		W	CL	45	PL	4	217	57
11/7/99	W9B702N	66	3.2	7.6		E	CL	45	PL		206	56
11/7/99	W9B702O	66	7.6	14.1		E	CL	55	PL		226	58
11/7/99	W9B702E	66	3.2	0		W	LEL	55	PL	4	190	41
11/7/99	W9B702F	66	0	3.2		E	LEL	55	PL	3	186	40
11/7/99	G9B701B	66	7.9	3.2		W	LL	45	PL	3	271	64
11/7/99	G9B703G	66	3.2	7.9		E	LL	35	PL	3	262	66
11/7/99	G9B703H	66	7.9	9		E	LL	35	PL	3	245	69
11/7/99	G9B703K	66	9	7.9		W	LL	35	PL	3	283	63
11/7/99	W9B702G	66	3.2	0		W	LL	55	PL	3	204	48
11/7/99	W9B702H	66	0	3.2		E	LL	55	PL	3	221	43
11/7/99	W9B702Z	66	3.2	0		W	LL	55	PL		185	40
11/7/99	G9B701C	66	3.2	0		W	REL	55	PL	3	176	46
11/7/99	G9B701D	66	0	3.2		E	REL	55	PL		164	34
11/7/99	G9B703I	66	9	14.1		E	REL	55	PL	3	136	44
11/7/99	G9B703J	66	14.1	9		W	REL	55	PL	3	208	70

SUMMARY OF NOVEMBER R_L SURVEY

(Segmented by Route)

DATE OF SURVEY	FILE NUMBER	ROUTE NUMBER	BEG MP	END MP	ADT	DIR RL	LINE TYPE	SPD	MAT TYPE	SUB RATE	AVG MCD	STD DEV
ROUTE 71												
11/8/99	W9B801K	71	0	9		S	LEL	55	PL	4	199	80
11/8/99	W9B801N	71	6	0		N	LEL	55	PL	4	271	30
11/8/99	W9B801P	71	0	6		S	LEL	55	PL	4	258	29
11/8/99	W9B801S	71	9	3		N	LEL	55	PL	3	142	57
11/7/99	G9B7071	71	21	14		N	LL	70	PL	4	206	96
11/7/99	G9B70A1	71	14	0		N	LL	70	PL	3	177	93
11/7/99	G9B70B1	71	0	14		S	LL	70	PL	3	205	102
11/7/99	G9B70C1	71	14	21		S	LL	70	PL	3	231	93
11/8/99	G9B8028	71	6	0		N	LL	55	PL		369	53
11/8/99	W9B801R	71	6	0		N	LL	55	PL	4	296	41
11/8/99	W9B801T	71	0	6		S	LL	55	PL	4	285	59
11/8/99	W9B801U	71	0	8.5		N	LL	55	PL	4	302	44
11/8/99	W9B801V	71	9.5	0		N	LL	55	PL	4	297	43
11/8/99	W9B801W	71	6	0		N	LL	55	PL	4	215	49
11/7/99	G9B703U	71	21	14		N	REL	70	PL	4	223	90
11/7/99	G9B7061	71	14	21		S	REL	70	PL	4	253	72
11/7/99	G9B7081	71	14	0		S	REL	70	PL	4	191	83
11/7/99	G9B7091	71	0	14		S	REL	70	PL	4	239	81
11/8/99	G9B8021	71	9	0		S	REL	70		4	289	94
11/8/99	G9B8023	71	6	0		N	REL	70	PL		284	67
11/8/99	G9B8025	71	0	6		S	REL	55	PL		334	66
11/8/99	G9B8029	71	9	0		N	REL	70	PL		289	76
11/7/99	W9B70D8	71	21	14		N	LEL	70	PL		184	64
11/7/99	W9B70D9	71	14	0		N	LEL	70	PL		173	57
11/7/99	W9B70DA	71	0	14		S	LEL	70	PL		155	66
11/7/99	W9B70DB	71	14	21		S	LEL	70	PL		160	65

SUMMARY OF NOVEMBER R_L SURVEY

(Segmented by Route)

DATE OF SURVEY	FILE NUMBER	ROUTE NUMBER	BEG MP	END MP	ADT	DIR RL	LINE TYPE	SPD	MAT TYPE	SUB RATE	AVG MCD	STD DEV
ROUTE 96												
11/7/99	W9B7061	96	0	11.4		E	CL	65	PL		181	59
11/8/99	W9B8016	96	12.52	26.42		E	CL	55	PL	4	190	36
11/7/99	G9B703P	96	11.4	0		W	REL	65	PL	3	152	57
11/7/99	G9B703Q	96	0	11.4		E	REL	65	PL	3	131	39
11/7/99	G9B703V	96	11.4	12.5		E	REL	35	PL	3	264	81
11/7/99	G9B703W	96	12.5	11.4		W	REL	35	PL	3	231	76
11/7/99	G9B7041	96	12.5	26.4		E	REL	65	PL	3	146	32
11/7/99	G9B7051	96	26.4	12.5		W	REL	65	PL	3	149	38
ROUTE 171												
11/7/99	W9B702V	171	0	15.1		S	CL	55	PL		163	46
11/7/99	W9B702W	171	15.1	6.6		N	CL	55	PL		159	43
11/7/99	W9B7071	171	25.9	17.9		N	LEL	70	PL		233	57
11/7/99	W9B7081	171	17.9	25.9		S	LEL	70	PL		229	54
11/7/99	G9B703L	171	17.9	15.1		W	LL	45	PL		223	60
11/7/99	G9B703N	171	15.1	17.9		E	LL	45	PL	3	222	61
11/7/99	G9B703O	171	17.9	25.9		W	LL	70	PL	3	257	66
11/7/99	G9B703R	171	25.9	17.9		W	LL	70	PL	3	277	98
11/7/99	G9B703A	171	15.1	0		N	REL	55	PL	3	123	33
11/7/99	G9B703B	171	0	15.1		S	REL	55	PL	3	145	32
11/7/99	G9B703C	171	15.1	17.9		S	REL	50	PL	3	219	57
11/7/99	G9B703D	171	17.9	25.9		S	REL	70	PL	4	299	61
11/7/99	G9B703E	171	25.9	17.9		N	REL	70	PL	4	294	73
11/7/99	G9B703F	171	17.9	15.1		N	REL	50	PL	4	208	63
ROUTE 571												
11/8/99	W9B801H	571	0	1.5		N	CL	45	PL	3	168	55

SUMMARY OF NOVEMBER R_L SURVEY

(Segmented by Route)

DATE OF SURVEY	FILE NUMBER	ROUTE NUMBER	BEG MP	END MP	ADT	DIR RL	LINE TYPE	SPD	MAT TYPE	SUB RATE	AVG MCD	STD DEV
ROUTE A												
11/7/99	W9B70CA	A	0	1		E	CL	55	PL		125	42
11/8/99	W9B801D	A	0	7		E	CL	55	PL	4	150	32
ROUTE AA												
11/7/99	W9B702P	AA	6	0		N	CL	55	PL		185	51
ROUTE B71												
11/7/99	W9B7022	B71	8.8	14.7		S	CL	45	PL	4	221	59
11/7/99	W9B7023	B71	14.7	8.8		N	CL	45	PL	4	216	55
11/7/99	G9B7011	B71	14.7	8.8		N	LL	45	PL	3	278	53
11/7/99	G9B7012	B71	8.8	14.7		S	LL	45	PL	3	268	48
11/7/99	G9B7013	B71	14.7	8.8		N	REL	45	PL	2	260	67
11/7/99	G9B7014	B71	8.8	14.7		S	REL	45	PL	3	274	68
ROUTE BB												
11/7/99	W9B70C4	BB	6.6	0		N	CL	55	PL		126	24
ROUTE CC												
11/7/99	W9B7021	CC	0.9	0		W	CL		PL		212	43
11/7/99	W9B7031	CC	0	0.9		E	CL		PL		221	37
ROUTE E												
11/8/99	W9B801I	E	0	8.9		E	CL	55	PL	3	176	33
11/7/99	G9B703Y	E	0	8.9		E	REL	65	PL	.3	143	332
11/7/99	G9B703Z	E	8.9	0		W	REL	65	PL	3	149	37

SUMMARY OF NOVEMBER R_L SURVEY
(Segmented by Route)

DATE OF SURVEY	FILE NUMBER	ROUTE NUMBER	BEG MP	END MP	ADT	DIR RL	LINE TYPE	SPD	MAT TYPE	SUB RATE	AVG MCD	STD DEV
ROUTE F												
11/8/99	W9B8018	F	0	7.2		S	CL	55	PL	4	197	42
11/8/99	W9B801J	F	0	5.8		E	CL	55	PL	4	164	46
ROUTE FF												
11/7/99	W9B7029	FF	2	0		W	CL	35	PL	4	230	70
11/7/99	W9B702A	FF	0	2		E	CL	35	PL	4	240	63
11/7/99	W9B702B	FF	2	5.6		E	CL	45	PL	4	218	54
11/7/99	W9B702C	FF	5.6	2		W	CL	45	PL	4	213	52
11/7/99	W9B70DC	FF	11.9	5.6		W	CL	60	PL		214	30
11/7/99	G9B7017	FF	2	0		W	LL	35	PL	3	284	41
11/7/99	G9B7018	FF	0	2		E	LL	35	PL	4	269	46
11/7/99	G9B7019	FF	2	5		E	LL	45	PL	3	242	51
11/7/99	G9B701A	FF	5	2		W	LL	45	PL	3	276	48
11/7/99	G9B703S	FF	5	11.2		E	REL	60	PL	4	249	47
ROUTE H												
11/7/99	W9B702U	H	0	7.2		W	CL	55	PL		207	43
11/7/99	W9B7051	H	18.1	7.2		W	CL	55	PL		243	47
ROUTE J												
11/7/99	W9B70C7	J	0	9.6		S	CL	55	PL		172	37
11/7/99	W9B70C8	J	0	1		S	CL	55	PL		165	41
ROUTE JJ												
11/7/99	W9B702L	JJ	0	4		S	CL	55	PL		205	44
11/7/99	G9B701H	JJ	4	0		N	REL	55	PL	3	172	43
11/7/99	G9B7021	JJ	0	4		S	REL	55	PL	3	182	38

SUMMARY OF NOVEMBER R_L SURVEY

(Segmented by Route)

DATE OF SURVEY	FILE NUMBER	ROUTE NUMBER	BEG MP	END MP	ADT	DIR.	LINE TYPE	SPD	MAT TYPE	SUB RATE	AVG MCD	STD DEV
ROUTE K												
11/7/99	W9B70C9	K	0	10.5		E	CL	55	PL		169	36
11/8/99	W9B801B	K	7.3	0		N	CL	55	PL	4	180	42
ROUTE KK												
11/7/99	W9B702X	KK	0.8	0		W	CL	55	PL		198	39
11/7/99	W9B702Y	KK	0	0.8		E	CL	55	PL		202	39
ROUTE M												
11/7/99	W9B7041	M	0	16.8		E	CL	55	PL		282	54
11/8/99	W9B801A	M	4.7	0		N	CL	55	PL	4	183	42
11/8/99	W9B8019	M	0	15.2		S	CL	55	PL	4	216	47
ROUTE N												
11/7/99	W9B70B1	N	0	10		E	CL	55	PL		269	39
ROUTE NN												
11/7/99	W9B70C1	NN	1.4	0		W	CL	55	PL		272	38
ROUTE O												
11/8/99	W9B801F	O	6.9	0		N	CL	55	PL	4	94	23

SUMMARY OF NOVEMBER R_L SURVEY

(Segmented by Route)

DATE OF SURVEY	FILE NUMBER	ROUTE NUMBER	BEG MP	END MP	ADT	DIR RL	LINE TYPE	SPD	MAT TYPE	SUB RATE	AVG MCD	STD DEV
ROUTE P												
11/7/99	W9B702I	P	0	2.1		E	CL	55	PL	4	185	40
11/7/99	W9B702M	P	2	6.6		S	CL	55	PL		174	56
11/7/99	G9B701E	P	6.6	2		W	REL	55	PL	3	170	41
11/7/99	G9B701F	P	0	2		E	REL	55	PL	1	98	23
11/7/99	G9B701G	P	2	6.6		E	REL	55	PL	3	168	37
ROUTE T												
11/7/99	W9B70C5	T	3	0		N	CL	55	PL		198	29
11/8/99	W9B801G	T	0	10		S	CL	55	PL	4	237	63
ROUTE TT												
11/7/99	W9B7024	TT	0	1		E	CL	35	TH	2	124	31
11/7/99	W9B7025	TT	1	0		W	CL	35	TH	2	108	34
11/7/99	W9B7026	TT	0	1		E	LL	35	PL	2	164	34
11/7/99	W9B7027	TT	1	0		W	LL	35	PL	2	163	34
11/7/99	G9B7015	TT	0	1		E	REL	35	PL	4	295	47
11/7/99	G9B7016	TT	0	1		W	REL	35	PL	3	303	49
ROUTE U												
11/8/99	W9B8017	U	0	9.7		S	CL	55	PL	4	182	38
ROUTE V												
11/7/99	W9B7091	V	2.3	0		W	CL	45	PL		238	49

SUMMARY OF NOVEMBER R_L SURVEY

(Segmented by Route)

DATE OF SURVEY	FILE NUMBER	ROUTE NUMBER	BEG MP	END MP	ADT	DIR RL	LINE TYPE	SPD	MAT TYPE	SUB RATE	AVG MCD	STD DEV
ROUTE WOR 71												
11/7/99	W9B70A1	WOR71	6.7	0		N	CL	55	PL		165	61
ROUTE YY												
11/7/99	W9B702J	YY	4.1	0		W	CL	55	PL		246	51
11/7/99	G9B7024	YY	0	4		E	REL	55	PL	3	215	43
11/7/99	G9B7025	YY	4	0		W	REL	55	PL	3	180	42
ROUTE Z												
11/7/99	W9B702K	Z	0	2.7		E	CL	55	PL		234	59
11/8/99	W9B801C	Z	0	7.3		E	CL	55	PL	4	267	50
11/7/99	G9B7022	Z	0	2.7		E	REL	55	PL	2	141	33
11/7/99	G9B7023	Z	2.7	0		W	REL	55	PL	2	142	38

1,134.40 TOTAL MILES SURVEYED

Summary of April 00 R_L Survey

(Segmented by Route)

Date / R_K	File #	Route	Beg MP	End MP	ADT	Direction	Line	Speed	Material	Year	Sub$_L$ Rate	Avg MCD	Std Dev
ROUTE 37													
03/31/00	G03V024	37	21.7	25.6	3060	S	REL	55	PL	99	3	143	45
03/31/00	G03V025	37	25.6	21.7	3060	N	REL	55	PL	99	3	149	46
03/31/00	G03V026	37	21.7	0	706	N	REL	55	PL	99	3	154	44
03/31/00	G03V027	37	0	21.7	706	S	REL	55	PL	99	3	163	55
03/31/00	W03V021	37	21.7	25.6	3060	S	CL	55	PL	99	3	133	37
03/31/00	W03V022	37	25.6	21.7	3060	N	CL	55	PL	99	3	139	37
03/31/00	W03V023	37	21.7	0	706	N	CL	55	PL	99	3	171	58
ROUTE 43													
03/31/00	G03V02U	43	15.4	11.1	5715	N	REL	65	PL	99	3	127	46
03/31/00	G03V02V	43	11.1	0	2253	N	REL	65	PL	99	3	158	43
03/31/00	G03V02W	43	0	11.1	2253	S	REL	65	PL	99	3	153	42
03/31/00	G03V02X	43	11.1	15.4	5715	S	REL	65	PL	99	3	140	37
03/31/00	G03V02Z	43	15.4	18.5	16142	S	REL	45	PL	99	2	110	41
03/31/00	G03V031	43	18.5	15.4	16142	N	REL	45	PL	99	2	115	43
03/31/00	G03V041	43	15.4	18.5	16142	S	LL	45	PL	99	2	127	40
03/31/00	G03V051	43	18.5	15.4	16142	N	LL	45	PL	99	2	124	39
03/31/00	W03V03D	43	0	11.1	2253	S	CL	55	PL	99	2	113	32
03/31/00	W03V03F	43	11.1	15.4	5715	S	CL	55	PL	99	2	98	34
03/31/00	W03V03G	43	15.4	18.5	16142	S	CL	55	PL	99	1	101	36
03/31/00	W03V03H	43	18.5	15.4	16142	N	CL	55	PL	99	1	106	37

Summary of April 00 R_L Survey

(Segmented by Route)

Date / R_L	File #	Route	Beg MP	End MP	ADT	Direction	Line	Speed	Material	Year	Sub Rate	Avg MCD	Std Dev
ROUTE I-44													
03/30/00	G03U015	44	21.9	16.9	12274	W	REL	70	TH	98	3	101	17
03/30/00	G03U016	44	16.9	0	13405	W	REL	70	PL	99	3	158	46
03/30/00	G03U017	44	8	1	10000	W	REL	70	PL	99	3	170	65
03/30/00	G03U018	44	1	8	10000	E	REL	70	PL	99	3	151	48
03/30/00	G03U019	44	0	16.9	13405	E	REL	70	PL	99	3	149	47
03/30/00	G03U01A	44	16.9	21.9	12274	E	REL	70	TH	98	3	120	41
03/30/00	G03U01B	44	21.8	16.9	12274	W	LL	70	TH	99	3	127	28
03/30/00	G03U01D	44	16.9	0	13405	W	LL	70	PL	99	3	171	44
03/30/00	G03U01E	44	8	1	10000	W	LL	70	PL	99	3	201	49
03/30/00	G03U01F	44	1	8	10000	E	LL	70	PL	99	3	206	44
03/30/00	G03U01G	44	0	16.9	13405	E	LL	70	PL	99	3	158	45
03/30/00	G03U01H	44	16.9	21.9	12274	E	LL	70	PL	99	3	174	32
03/30/00	G03U01I	44	21.9	16.9	12274	W	REL	70	PL	99	3	90	14
04/01/00	G041015	44	1	8	10000	S	REL	75	PL	99	3	143	68
04/01/00	W041012	44	8	1	10000	W	LEL	70	PL	99	2	129	77
04/01/00	W041013	44	1	8	10000	E	LEL	70	PL	99	2	123	66
04/01/00	W041014	44	0	16.9	13405	E	LEL	70	PL	99	2	173	55
04/01/00	W041015	44	16	21.9	12274	E	LEL	70	TH	99	2	100	46
04/01/00	W041016	44	21.9	16.9	12274	W	LEL	70	TH	99	3	81	12
04/01/00	W041017	44	16.9	0	13405	W	LEL	70	PL	99	2	179	53
ROUTE 59													
03/30/00	G03U01N	59	0	1.5	5190	S	REL	55	PL	99	1	88	35
03/30/00	G03U01O	59	1.5	0	5190	N	REL	55	PL	99	1	118	47
03/31/00	W03V01C	59	1.5	0	5190	N	CL	55	PL	99	2	148	46

Summary of April 00 R_L Survey

(Segmented by Route)

Date R_L	File #	Route	Beg MP	End MP	ADT	Direction	Line	Speed	Material	Year	Sub Rate	Avg MCD	Std Dev
ROUTE 60													
04/02/00	W042013	60	0	0.5		E	CL	55	PL	99	3	150	31
04/02/00	W042014	60	0.5	1		E	CL	55	PL	99	3	151	40
04/02/00	W042015	60	1	0		W	CL	55	PL	99	3	125	29
ROUTE 66													
04/01/00	G041016	66	3.2	0	5015	W	REL	60	PL	99	3	139	40
04/01/00	G041017	66	0	3.2	4952	E	REL	60	PL	99	3	101	33
04/01/00	G041018	66	3.2	0	5015	W	LL	60	PL	99	3	139	41
04/01/00	G041019	66	0	3.2	4952	E	LL	60	PL	99	3	120	29
04/01/00	G04101G	66	3.2	7.9	17342	E	LL	35	PL	99	2	135	64
04/01/00	G04101H	66	7.9	9	16222	E	LL	35	PL	99	2	198	62
04/01/00	G04101I	66	9	14.1	10109	E	REL	55	PL	99	2	112	49
04/01/00	G04101J	66	14.1	9	10109	W	REL	55	PL	99	2	121	51
04/01/00	G04101K	66	9	7.9	16222	W	LL	35	PL	99	2	182	70
04/01/00	G04101L	66	7.9	3.2	17342	W	LL	35	PL	99	2	131	89
04/01/00	W04101L	66	3.2	0	5015	W	LEL	60	PL	99	2	128	45
04/01/00	W04101M	66	0	3.2	4952	E	LEL	60	PL	99	2	119	40
04/01/00	W04101N	66	3.2	9	17342	E	CL	45	PL	99	2	145	60
04/01/00	W04101O	66	9	14.1	10109	E	CL	55	PL	99	2	161	52

Summary of April 00 R_L Survey

(Segmented by Route)

Date											Sub	Avg	Std
R_L	File #	Route	Beg MP	End MP	ADT	Direction	Line	Speed	Material	Year	Rate	MCD	Dev
ROUTE 71													
03/30/00	G03U01J	71	21	14	9700	N	REL	70	PL	99	1	132	49
03/30/00	G03U01K	71	14	0	5800	N	REL	70	PL	99	2	110	38
03/30/00	G03U01L	71	0	14	5800	S	REL	70	PL	99	2	134	46
03/30/00	G03U01M	71	14	21	9700	S	REL	70	PL	99	2	134	42
03/30/00	G03U01P	71	21	14	9700	N	LL	70	PL	99	1	108	40
03/30/00	G03U01Q	71	14	0	5800	N	LL	70	PL	99	1	92	32
03/30/00	G03U01T	71	0	14	5800	S	LL	70	PL	99	1	88	39
03/30/00	G03U01U	71	14	21	9700	S	LL	70	PL	99	1	89	41
03/31/00	W03V01D	71	21	14	9700	N	LEL	70	PL	99	2	139	55
03/31/00	W03V01E	71	14	0	5800	N	LEL	70	PL	99	2	167	58
03/31/00	W03V01F	71	0	14	5800	S	LEL	70	PL	99	2	133	52
03/31/00	W03V01G	71	14	21	5800	S	LEL	70	PL	99	2	123	55
04/01/00	G04101S	71NEW	0	6	8000	S	REL	70	PL	98	2	154	61
04/01/00	G04101V	71NEW	9	0	8000	N	REL	70	TH	98	3	160	64
04/01/00	G04101W	71NEW	0	9	8000	S	REL	70	TH	98	3	186	62
04/01/00	G04101X	71NEW	9	0	8000	N	LL	70	TH	98	3	252	47
04/01/00	G04101Y	71NEW	0	9	8000	S	LL	70	TH	98	3	277	51
04/01/00	G04101Z	71NEW	6	0	8000	N	REL	70	PL	98	3	204	68
04/01/00	G041021	71NEW	0	6	8000	S	LL	70	PL	98	3	230	60
04/01/00	G041031	71NEW	6	0	8000	N	LL	70	PL	98	3	149	41
04/02/00	W042011	71NEW	0	6	8000	S	LEL	70	PL	98	1	106	42
04/02/00	W042012	71NEW	0	9	8000	S	LEL	70	PL	99	4	193	45
04/02/00	W042016	71NEW	9	0	8000	N	LEL	70	PL	99	3	164	49
04/02/00	W042017	71NEW	6	0	8000	N	LEL	70	PL	98	1	91	25

Summary of April 00 R_L Survey

(Segmented by Route)

Date / R_L	File #	Route	Beg MP	End MP	ADT	Direction	Line	Speed	Material	Year	Sub Rate	Avg MCD	Std Dev
ROUTE 71 B													
04/01/00	W041018	71BUS	14.7	8.8	7000	N	CL	45	PL	99	2	102	40
04/01/00	W04101S	71BUS	8.8	14.7	7000	S	CL	45	PL	99	2	100	39
04/01/00	G041041	71BUS	14.7	9.2	7000	N	REL	45	PL	99	2	163	67
04/01/00	G041051	71BUS	9.2	14.7	7000	S	REL	45	PL	99	2	145	58
04/01/00	G041061	71BUS	14.7	9.2	7000	N	LL	45	PL	99	2	101	56
04/02/00	G042012	71BUS	14.7	8.8	7000	N	LL	45	PL	99	2	92	30
04/02/00	G042013	71BUS	8.8	14.7	7000	S	LL	45	PL	99	2	101	34
ROUTE 96													
03/31/00	G03V02A	96	26.4	12.5	4224	W	REL	65	PL	99	3	104	37
03/31/00	G03V02F	96	11.4	12.5	4224	E	LL	35	PL	99	3	267	186
03/31/00	G03V02G	96	12.5	26.4	4224	E	REL	65	PL	99	2	90	29
03/31/00	G03V02H	96	12.5	11.4	4224	W	LL	35	PL	99	3	263	174
03/31/00	G03V02O	96	0	11.4	2089	E	REL	55	PL	99	2	122	45
03/31/00	G03V02P	96	11.4	0	2089	W	REL	55	PL	99	2	136	61
03/31/00	W03V033	96	12.5	26.4	4224	E	CL	65	PL	99	2	130	37
04/01/00	W04101R	96	11.4	0	2089	W	CL	55	PL	99	2	138	45

Summary of April 00 R_L Survey

(Segmented by Route)

Date / R_L	File #	Route	Beg MP	End MP	ADT	Direction	Line	Speed	Material	Year	Sub Rate	Avg MCD	Std Dev
ROUTE 171													
03/31/00	G03V02B	171	25.9	17.9	2089	W	REL	70	PL	99	3	125	49
03/31/00	G03V02C	171	17.9	25.9	2089	E	REL	70	PL	99	3	129	48
03/31/00	G03V02D	171	25.9	17.9	4224	W	LL	70	PL	99	3	125	41
03/31/00	G03V02E	171	17.9	25.9	4224	E	LL	70	PL	99	3	128	42
03/31/00	G03V02J	171	17.9	15.4	12942	N	REL	65	PL	99	3	106	33
03/31/00	G03V02K	171	15.4	0	12942	N	REL	55	PL	99	3	93	24
03/31/00	G03V02L	171	0	15.4	12942	S	REL	55	PL	99	3	125	39
03/31/00	G03V02M	171	15.4	17.9	12942	S	REL	45	PL	99	3	107	35
03/31/00	G03V02N	171	17.9	15.4	12942	N	LL	45	PL	99	3	100	36
03/31/00	W03V031	171	25.9	17.9	12942	N	LEL	70	PL	99	2	122	44
03/31/00	W03V032	171	17.9	25.9	12942	S	LEL	70	PL	99	2	131	45
04/01/00	W041019	171	17.9	15.1	12942	N	CL	50	PL	99	2	105	37
04/01/00	W04101A	171	15.1	0	6061	N	CL	55	PL	99	3	142	51
04/01/00	W04101Q	171	15.1	17.9	12942	S	CL	55	PL	99	2	95	29
04/02/00	G042014	171	17.1	25.9	12942	S	REL	70	PL	99	3	129	45
04/02/00	G042015	171	25.9	17.1	12942	N	REL	70	PL	99	3	107	39
04/02/00	G042016	171	17.1	25.9	12942	S	LL	70	PL	99	3	129	42
ROUTE 571													
04/02/00	W042018	571	0	1.5		S	LEL	45	PL	99	2	124	38
04/02/00	W042019	571	1.5	0		N	LEL	45	PL	99	2	113	41
ROUTE A													
03/31/00	W03V024	A	0	1	592	E	CL	55	PL	99	2	134	31
03/31/00	W03V025	A	0	7.1	592	E	CL	55	PL	99	2	137	30

Summary of April 00 R_L Survey

(Segmented by Route)

Date / R_L	File #	Route	Beg MP	End MP	ADT	Direction	Line	Speed	Material	Year	Sub Rate	Avg MCD	Std Dev
ROUTE AA													
04/01/00	W04101P	AA	6	0		N	CL	55	PL	99	3	142	43
ROUTE BB													
03/31/00	W03V037	BB	0	6.6		S	CL	55	PL	99	2	140	24
ROUTE CC													
04/01/00	W04101E	CC	0.9	0		W	CL	55	PL	99	4	209	40
ROUTE E													
03/31/00	G03V028	E	8.9	0	2247	W	REL	55	PL	99	3	140	39
03/31/00	G03V029	E	0	8.9	2247	E	REL	55	PL	99	3	136	37
03/31/00	W03V02E	E	8.9	0	2247	W	CL	55	PL	99	3	176	41
ROUTE F													
03/31/00	W03V02B	F	0	7.2		E	CL	55	PL	99	3	173	36
03/31/00	W03V02D	F	5.8	0		W	CL	55	PL	99	3	180	50

Summary of April 00 R_L Survey

(Segmented by Route)

Date / R_L	File #	Route	Beg MP	End MP	ADT	Direction	Line	Speed	Material	Year	Sub Rate	Avg MCD	Std Dev
ROUTE FF													
03/30/00	G03U01V	FF	11.2	5.6	2428	W	REL	55	PL	99	1	121	38
03/30/00	G03U01W	FF	5.4	2	9828	W	REL	55	PL	99	3	112	54
03/31/00	G03V014	FF	2	5.4	9828	E	LL	55	PL	99	3	119	54
03/31/00	G03V015	FF	5.4	2	9828	W	LL	55	PL	99	1	97	55
03/31/00	G03V017	FF	2	5	9828	E	REL	55	PL	99	2	134	65
03/31/00	G03V022	FF	5.6	11.2	2428	E	REL	55	PL	99	3	136	49
03/31/00	W03V017	FF	2	5.4	9828	E	LL	45	PL	99	2	167	65
03/31/00	W03V019	FF	5.4	2	9828	W	LL	45	PL	99	3	159	57
03/31/00	W03V01A	FF	2	5.4	9828	E	LEL	45	PL	99	3	144	48
03/31/00	W03V01B	FF	5.4	11.2	2428	E	CL	55	PL	99	4	185	46
04/01/00	W04101T	FF	2	0	9828	W	CL	45	PL	99	2	121	46
04/01/00	W04101U	FF	0	2	9828	E	CL	40	PL	99	2	110	43
04/01/00	W04101V	FF	2	0	9828	W	LL	40	PL	99	2	158	44
04/01/00	W04101W	FF	0	2	9828	E	LL	40	PL	99	2	169	46
04/01/00	W04101X	FF	2	5.2	9828	E	CL	45	PL	99	3	131	43
04/01/00	W04101Y	FF	5.2	2	9828	W	CL	45	PL	99	3	125	41
ROUTE H													
04/01/00	W04101B	H	0	7.3	250	E	CL	55	PL	99	4	203	40
04/01/00	W04101C	H	8.3	18.1	407	E	CL	55	PL	99	4	189	48
ROUTE J													
03/31/00	W03V03A	J	0	9.6		S	CL	55	PL	99	2	176	39
03/31/00	W03V03B	J	0	1		S	CL	55	PL	99	2	175	43

Summary of April 00 R_L Survey

(Segmented by Route)

Date / R_L	File #	Route	Beg MP	End MP	ADT	Direction	Line	Speed	Material	Year	Sub Rate	Avg MCD	Std Dev
ROUTE JJ													
04/01/00	G04101B	JJ	4	0	2162	N	REL	45	PL	99	3	122	36
04/01/00	G04101C	JJ	0	4	2162	S	REL	45	PL	99	3	136	43
04/01/00	W04101I	JJ	0	4	2162	S	CL	50	PL	99	4	172	38
ROUTE K													
03/31/00	W03V027	K	0	7.3		E	CL	55	PL	99	3	163	44
03/31/00	W03V036	K	0	10.5		E	CL	55	PL	99	3	180	42
ROUTE KK													
04/01/00	W04101F	KK	0.8	0		W	CL	55	PL	99	4	171	38
ROUTE M													
03/31/00	W03V028	M	0	4.8	477	S	CL	55	PL	99	3	166	36
03/31/00	W03V029	M	0	8.4	210	S	CL	55	PL	99	4	213	49
04/01/00	W04101D	M	15.8	0	390	W	CL	55	PL	99	4	213	44
ROUTE N													
03/31/00	W03V035	N	10	0		W	CL	55	PL	99	3	209	39
ROUTE O													
03/31/00	W03V03C	O	6.9	0		N	CL	55	PL	99	3	226	53

Summary of April 00 R_L Survey

(Segmented by Route)

Date / R_L	File #	Route	Beg MP	End MP	ADT	Direction	Line	Speed	Material	Year	Sub Rate	Avg MCD	Std Dev
ROUTE P													
04/01/00	G04101A	P	6.6	2	1762	W	REL	35	PL	99	2	97	44
04/01/00	G04101D	P	2	0	517	W	REL	45	PL	99	3	114	43
04/01/00	G04101E	P	0	2	517	E	REL	45	PL	99	3	64	13
04/01/00	G04101F	P	2	6.6	2372	E	REL	35	PL	99	3	91	32
04/01/00	W04101J	P	0	2	517	E	CL	55	PL	99	3	163	44
04/01/00	W04101K	P	2	6	2372	E	CL	45	PL	99	2	132	45
ROUTE T													
03/31/00	W03V038	T	4	0	323	N	CL	55	PL	99	3	194	33
03/31/00	W03V039	T	10	0	886	N	CL	55	PL	99	3	193	47
ROUTE TT													
04/01/00	G04101M	TT	0	1	10497	E	REL	30	PL	99	3	113	37
04/01/00	G04101N	TT	1	0	10497	W	REL	30	PL	99	3	91	36
04/01/00	G04101O	TT	0	1	10497	E	LL	30	TH	9?	3	114	27
04/01/00	G04101P	TT	1	0	10497	W	LL	30	TH	9?	3	128	35
04/01/00	G04101Q	TT	0	1	10497	E	CL	30	TH	9?	3	89	22
04/01/00	G04101R	TT	1	0	10497	W	CL	30	PL	9?	3	83	23
ROUTE U													
03/31/00	W03V02A	U	0	4.1	446	S	CL	55	PL	99	3	176	35
03/31/00	W03V02C	U	9.7	4.1	478	N	CL	55	PL	99	3	175	35

Summary of April 00 R_L Survey

(Segmented by Route)

Date											Sub	Avg	Std
R_L	File #	Route	Beg MP	End MP	ADT	Direction	Line	Speed	Material	Year	Rate	MCD	Dev.
ROUTE V													
04/02/00	W04201A	V	2.3	0		N	CL	55	PL	99	2	133	46
ROUTE 71 WOR													
04/02/00	W04201B	WOR	6.7	0		N	CL	55	PL	99	2	115	40
ROUTE YY													
03/31/00	G03V02Q	YY	4	0		W	REL	55	PL	99	4	157	48
03/31/00	G03V02R	YY	0	4		E	REL	55	PL	99	4	178	43
04/01/00	W04101G	YY	4	0		W	CL	55	PL	99	4	194	45
ROUTE Z													
03/31/00	G03V02S	Z	2.2	0		W	REL	35	PL	99	3	129	38
03/31/00	G03V02T	Z	0	2.2		E	REL	35	PL	99	3	116	36
03/31/00	W03V026	Z	0	7.4		E	CL	55	PL	99	4	220	57
04/01/00	W04101H	Z	0	2.7		E	CL	40	PL	99	3	170	53