Technical Report Documentation Page

1. Report No.	2. Government Accession No.	3. Recipient's Catalog No.
TX-96/1989-1		

4. Title and Subtitle	5. Report Date
PAVEMENT MANAGEMENT INFORMATION SYSTEM CONCEPTS, EQUATIONS, AND ANALYSIS MODELS	November 1993 Revised: August 1995
	6. Performing Organization Code
7. Author(s) Bryan E. Stampley, Byron Miller, Roger E. Smith and Tom Scullion	8. Performing Organization Report No. Research Report 1989-1
9. Performing Organization Name and Address Texas Transportation Institute The Texas A&M University System College Station, Texas 77843-3135	10. Work Unit No. (TRAIS) 11. Contract or Grant No. Study No. 7-1989
12. Sponsoring Agency Name and Address Texas Department of Transportation Research and Technology Transfer Office P. O. Box 5080 Austin, Texas 78763-5080	13. Type of Report and Period Covered Final: September 1993 - August 1995 14. Sponsoring Agency Code

15. Supplementary Notes

Research performed in cooperation with the Texas Department of Transportation and the U.S. Department of Transportation, Federal Highway Administration.
Research Study Title: Pavement Management Support

16. Abstract

This report describes the proposed modules of TxDOT's new Pavement Management Information System (PMIS) including

- Utility Curves,
- Performance Curves,
- Needs Estimate Program,
- Optimization Program, and
- Impact Analysis Program.

PMIS will use the pavement condition data currently being collected for the Pavement Evaluation System (PES). Distress, ride quality, deflection, and skid resistance data collection procedures and equipment will be retained, with only minor changes to the data collection frequency and section length.

PMIS will provide network-level decision support for decision makers within TxDOT. PMIS will also support TxDOT pavement decisions at the Division, District, Area Office, and Maintenance Section level. Mainframe computers will be used at the central Division offices, while microcomputers will be used at the District offices to access and store the PMIS data. Eventually, PMIS will be able to support the use of microcomputers at the Area Office and Maintenance Section levels; for now, users in these offices will be able to access the TxDOT mainframe computer to use PMIS.

17. Key Words	18. Distribution Statement
Pavement Management, Pavement Management Systems, Pavement Management Information Systems	No restrictions. This document is available to the public through NTIS: National Technical Information Service 5285 Port Royal Road Springfield, Virginia 22161

19. Security Classif.(of this report)	20. Security Classif.(of this page)	21. No. of Pages	22. Price
Unclassified	Unclassified	395	

Form DOT F 1700.7 (8-72) Reproduction of completed page authorized

PAVEMENT MANAGEMENT INFORMATION SYSTEM CONCEPTS, EQUATIONS, AND ANALYSIS MODELS

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Research Report 1989-1
Research Study Number 7-1989
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Sponsored by
Texas Department of Transportation

November 1993
Revised: August 1995

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IMPLEMENTATION STATEMENT

This report describes concepts to be included in TxDOT's Pavement Management Information System (PMIS). It includes a discussion of the basic utility theory concepts and values used to compare pavement distress types, formulae used to calculate pavement condition and other scores, and the models used to predict future pavement conditions. This report also includes a detailed description of the analysis procedures used to estimate total pavement preventive maintenance and reliability needs, to prioritize pavement sections which can be treated within limited funding, and to assess the impacts of pavement funding and other factors on future pavement condition.

TxDOT and TTI staff worked closely during the development of PMIS. Although TxDOT has made a few minor changes while coding the PMIS computer programs, the basic concepts outlined in this report have been incorporated into PMIS.

TxDOT should use PMIS as a "first-cut" method for identifying candidate pavement sections for rehabilitation, reconstruction, and preventive maintenance. TxDOT should also use PMIS to determine the impact of different decisions on pavement performance and future pavement needs.

The pavement performance prediction models described in this report should be considered as preliminary because they are based on limited data. TxDOT should continuously review and improve these models and sponsor additional research as needed, to provide better estimates of future pavement condition.

TxDOT should also ensure that the PMIS computer programs are written to allow access by District and Area Office personnel. Training should also be provided on a periodic basis to ensure that potential users can readily enter, access, and use the PMIS data to support pavement decision-making.

DISCLAIMER

The contents of this report reflect the views of the authors who are responsible for the facts and the accuracy of the data presented herein.

This report does not constitute a standard, specification or regulation and does not necessarily represent the views or policy of the Texas Department of Transportation. Additionally, this report is not intended for construction, bidding, or permit purposes.

ACKNOWLEDGMENT

The work described was supported by the Pavements Section of the Design Division. The researchers also conducted the work under the guidance of the TxDOT Pavement Management Steering Committee.

The Pavement Management Information Systems (PMIS) concepts described in this report were developed during extensive meetings of research study and TxDOT personnel.

Mr. Bryan E. Stampley, P.E., was Project Director for this study. Ms. Karen VanHooser, C.D.P., directed the analysis, design, and programming of the PMIS for TxDOT. Mr. David E. Fink, P.E., of TxDOT developed the detailed utility and performance curve tables.

The authors would also like to thank:

> Those TxDOT employees who had the vision and foresight to test pavement management concepts in the field many years before PMIS was developed;
> The Federal Highway Administration, for having the courage to make pavement management a matter of national concern;
> The TxDOT District offices, which collect the data and operate the equipment which keeps the PMIS "running;" and
> All TxDOT employees who are now putting the PMIS concepts to the test, and making the vision of longer-lasting pavements a reality.

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SUMMARY

This report describes the proposed modules of TxDOT's new Pavement Management Information System (PMIS). These modules include:

- Utility Curves (Chapter 2),
- Performance Curves (Chapter 3),
- Needs Estimate Program (Chapter 4),
- Optimization Program (Chapter 5), and
- Impact Analysis Program (Chapter 6).

PMIS will use the pavement condition data currently being collected for the Pavement Evaluation System (PES). Distress, ride quality, deflection, and skid resistance data collection procedures and equipment will be retained, with only minor changes to the data collection frequency and section length.

PMIS will provide network-level decision support for decision makers within TxDOT. PMIS will also support TxDOT pavement decisions at the Division, District, Area Office, and Maintenance Section level. Mainframe computers will be used at the central Division offices, while microcomputers will be used at the District offices to access and store the PMIS data. Eventually, PMIS will be able to support the use of microcomputers at the Area Office and Maintenance Section levels; for now, users in these offices will be able to access the TxDOT mainframe computer to use PMIS.

PMIS decision support for pavement managers is based on analyses conducted from the annual pavement condition data collection survey. The first analysis, described in Chapter 2, uses utility curves to convert each pavement distress type, along with the ride quality, into a utility value. By computing utility values, PMIS lets the pavement manager compare distress types and ride quality, even on different types of pavement.

The second analysis, described in Chapter 3, takes the current pavement condition data and predicts the future condition of each pavement section. These results form a

critical part of the Needs Estimate, Optimization, and Impact Analysis programs.

The third analysis, described in Chapter 4, estimates total pavement needs based on pavement distress, ride quality, functional classification, traffic per lane, and average county rainfall. This Needs Estimate program can produce results for the current fiscal year, as well as for future fiscal years. PMIS uses the Needs Estimate results to identify what each pavement section needs, regardless of funding or other constraints. The Needs Estimate results are used as input into the PMIS Optimization and Impact Analysis programs.

The fourth analysis, described in Chapter 5, is the PMIS Optimization program. This program estimates the expected benefit obtained from each pavement sections' Needs Estimate treatment (if any) and compares that benefit with the available funding. The Optimization program then simulates treatment on the most cost-effective sections, within available funding. PMIS can perform Optimization for the current fiscal year, as well as for future fiscal years.

The fifth analysis, described in Chapter 6, is the PMIS Impact Analysis program. This program produces a series of reports which summarize pavement conditions before and after "optimization" to help describe the expected impacts of pavement funding, truck traffic, preventive maintenance seal coat practice, project selections, and treatment choices on current and future pavement condition. These reports are meant to help District personnel keep an overall view of the consequences of various pavement-related matters.

These five analysis procedures, along with the rest of the PMIS programs and data, provide a sound foundation for network-level pavement management, and can be used to support and guide more intensive, project-level, pavement testing and design. Over time, this project-level work should identify improvements to PMIS, in turn strengthening the support that PMIS will be able to provide to network- and project-level pavement managers.

I — INTRODUCTION

This report describes the modules of TxDOT's new Pavement Management Information System (PMIS). PMIS is the family of computer programs, which is being designed by TxDOT to support its network-level pavement management and decision-making activities. PMIS will become the major automated part of TxDOT's statewide pavement management system (PMS).

DESCRIPTION

The basic concept is for PMIS to provide network-level decision support for decision makers within TxDOT. A major goal is that PMIS will not change the lines of authority for pavement decisions within TxDOT, but that it will support and strengthen TxDOT's overall pavement management process. To do this, PMIS must support pavement management decisions at all levels within the organization: at the central Division offices, at the District offices, and at the Area and maintenance section offices. Mainframe computers will be used at the central Division offices, while microcomputers will be used at the District offices to access and store the PMIS data. Eventually, PMIS will be able to support the use of microcomputers at the Area Office and maintenance section levels; for now, users in these offices will be able to access the TxDOT mainframe computer to use PMIS.

Research study personnel made several assumptions and decisions while proposing the PMIS modules. One of the major assumptions made was that PMIS will use the pavement condition data currently being collected for the Pavement Evaluation System (PES). Distress, ride quality, deflection, and skid resistance data collection procedures and equipment will be retained. However, the "typical" pavement section length will be changed from 3.2 km (two miles) to 0.8 km (0.5 miles). The data summarization rate for ride quality will also be changed from 0.3 km (0.2 miles) to 0.1 km (0.1 miles).

Researchers and TxDOT personnel also agreed to a major change in the distress rating procedure for flexible pavements. Instead of the PES rating codes (i.e., "000," "100," "010," "001," "200," "020," and "002"), PMIS will use actual measures of area, length, or number.

Once all of these changes have been made, TxDOT plans to convert all of the existing PES data (some dating back to Fiscal Year 1984) to PMIS. PMIS will then completely replace PES as TxDOT's network-level pavement management decision support system.

Other assumptions and decisions made during this research study will be explained while describing specific PMIS modules.

PAVEMENT TYPES

TxDOT's PES covered the major types of pavement found on TxDOT highways. We propose that PMIS keep these major pavement types, along with the existing PES Pavement Type codes and definitions, as shown in Table 1.

Table 1: Proposed PMIS Pavement Types.

Pavement Type		Description
Broad	Detail	
CRCP	1	Continuously-Reinforced Concrete Pavement
JCP	2	Jointed Concrete Pavement — reinforced
	3	Jointed Concrete Pavement — unreinforced ("plain")
ACP	4	Thick Asphalt Concrete Pavement (greater than 14.0 cm thick; [5.5"])
	5	Intermediate Asphalt Concrete Pavement (6.4-14.0 cm thick; [2.5-5.5"])
	6	Thin Asphalt Concrete Pavement (less than 6.4 cm thick; [2.5"])
	7	Composite Pavement (asphalt surfaced concrete pavement)
	8	Overlaid or Widened Old Concrete Pavement
	9	Overlaid or Widened Old Flexible Pavement
	10	Thin-surfaced Flexible Base Pavement (surface treatment or seal coat)

We also propose that TxDOT use both categories of Pavement Type, as shown in Table 1. The Broad Pavement Type will be used to select "general" pavement performance curves, and the Detail Pavement Type will be used in the pavement distress rating, utility value, and score calculations.

DATA COLLECTION SAMPLE SIZE AND TYPE

Table 2 shows the original PES data collection sample size and types.

Table 2. Original PES Data Collection Sample Size and Type.

Highway System	PES Data Collection Sample	
	Size (percent)	Type
IH	100	Non-random
US	50	Random
SH	50	Random
FM	20	Random
TOTAL	**40**	**"Random"**

Many TxDOT personnel, especially those in the Districts, had long been concerned about this sample size and type. Although Districts were concerned about the large number of people needed to collect the annual pavement condition data, they also realized that the PES sample was too small to consistently cover all of the highways that they wanted to include in their rehabilitation and preventive maintenance work programs.

Many Districts also had problems with gaps, caused by the "randomness" of the PES sample. For example, a District would want to review the PES data before resurfacing the middle 16.1 km (ten miles) of a 48.3 km (30-mile) highway. Because of the random PES sample, the District would likely find PES data for many of the sections on either end of the proposed work, but would find very little (if any) PES data for the sections within the proposed work. These experiences discouraged some Districts from using PES and made it more difficult for them to justify allocation of the large number of people and time spent in collecting the data.

We therefore propose that PMIS keep the existing PES sample sizes on IH (100 percent), US (50 percent), and SH (50 percent) highways, and increase the FM sample size to 50 percent.

We also propose that PMIS use a non-random "alternating" sample type which would rate all of a highway within a county in one year, and then skip the ratings in the next year. Thus, District pavement managers would be able to pick any highway within any county and be assured that there would be no gaps in the PMIS data (assuming, of course, that all of the required PMIS pavement condition data were collected and stored).

Finally, we propose that PMIS use this "50 percent, alternating" sample only for the collection of distress and ride quality data. This proposal will be further explained later in this Chapter.

PMIS SECTIONS

Pavement managers rarely "manage" the entire length of pavement at any one time, especially when locating "problem spots" or when selecting treatments. Thus, it is helpful to split long stretches of pavement into "sections." This process is called "segmentation."

It would be beyond the scope of this report to discuss all of the aspects of segmentation, even as it pertains to pavement management systems. Thus, we will discuss only the proposed types, lengths, and locations of sections for PMIS.

The existing PES "typically" divided pavements into 3.2 km (2-mile) sections, by centerline. These 3.2 km (2-mile) sections were used for data collection and analysis

We propose that PMIS divide pavements into 0.8 km (0.5-mile) "Data Collection Sections" for use in collecting the pavement condition data. We also propose that PMIS define a new type of section — a "Management Section" — to be used for analysis. We propose that these Management Sections be variable length and that they be user-definable, to correspond to candidate projects.

PES located its sections in terms of "mileposts." A "milepost" was simply a number placed below the highway route sign at approximately 3.2 km (2-mile) intervals.

Although most other TxDOT computer systems were locating sections in terms of Control-Section or Control-Section and Milepoint, it was important for PES to use a "physical" marker which actually existed out in the field.

In Fiscal Year 1991 (September, 1990), TxDOT converted all of its mileposts to "Reference Markers" as the first part of its Texas Reference Marker (TRM) System project. We propose that PMIS use these new Reference Markers to locate pavement sections.

CONDITION DATA

TxDOT's PES included the following types of pavement condition data:

- Distress (or "visual distress"),
- Ride Quality (or "roughness"),
- Deflection, and
- Skid Resistance.

We propose that PMIS keep these types of pavement condition data. We also propose that PMIS condition data be collected in the "worst" lane of each roadbed, as was done in PES. Specific changes for each data type are described in the following sections.

Distress

We propose that PMIS use the pavement distress types and rating methods shown in Table 3 for Continuously Reinforced Concrete Pavements (CRCP). These CRCP distress types and rating methods are the same as those used in PES.

Table 3. Proposed PMIS CRCP Distress Types and Rating Methods.

CRCP Distress Type	Rating Method
Spalled Cracks	total number (0 to 999)
Punchouts	total number (0 to 999)
Asphalt Patches	total number (0 to 999)
Concrete Patches	total number (0 to 999)
Average Crack Spacing	spacing (1 to 75), to the nearest 0.1 m (foot)

We propose that PMIS use the pavement distress types and rating methods shown in Table 4 for Jointed Concrete Pavements (JCP). These JCP distress types and rating methods are the same as those used in PES.

Table 4. Proposed PMIS JCP Distress Types and Rating Methods.

JCP Distress Type	Rating Method
Failed Joints and Transverse Cracks	Total number (0 to 999)
Corner Breaks	Total number (0 to 999)
Failures	Total number (0 to 999)
Shattered (Failed) Slabs	Total number (0 to 999)
Slabs With Longitudinal Cracks	Total number (0 to 999)
Concrete Patches	Total number (0 to 999)
Apparent Joint Spacing	Spacing (15 to 75), to the nearest 0.1 m (foot)

We propose that PMIS use the pavement distress types and rating methods shown in Table 5 for Asphalt Concrete Pavement (ACP).

Table 5. Proposed PMIS ACP Distress Types and Rating Methods.

ACP Distress Type	Rating Method
Shallow (13 to 25 mm [(½" to 1"] depth) Rutting	percent of wheelpath length (0 to 100)
Deep (25 to 76 mm [1" to 3"] depth) Rutting	percent of wheelpath length (0 to 100)
Patching	percent of lane area (0 to 100)
Failures	total number (0 to 99)
Block Cracking	percent of lane area (0 to 100)
Alligator Cracking	percent of wheelpath length (0 to 100)
Longitudinal Cracking	length per 100' station (0 to 999)
Transverse Cracking	number per 100' station (0 to 99)
Raveling (optional)	none, low, medium, or high
Flushing (optional)	none, low, medium, or high

The ACP distress types in Table 5 are the same as those used in PES except for the rutting (now rated in "shallow" and "deep" categories), raveling, and flushing. The rating methods, as mentioned earlier, are much different from the old PES rating codes.

As shown in Table 2, PES used a 40 percent, "random" sample for collecting distress data. We propose that PMIS use the "50 percent, alternating" sample instead. Each District would basically have one group of pavements to be rated in even-numbered Fiscal Years and another group of pavements to be rated in odd-numbered Fiscal Years.

Ride Quality

In PES, TxDOT collected ride quality data continuously along the entire 3.2 km (2-mile) section and summarized that data at every 0.3 km (0.2-mile). Thus, PES had ten ride quality data points for each 3.2 km (2-mile) section. We propose that PMIS summarize its ride quality data at every 0.1 km (0.1-mile) to provide finer detail. Thus, PMIS would have five ride quality data points for each 0.8 km (0.5-mile) Data Collection Section.

As shown in Table 2, PES used a 40 percent, "random" sample for collecting ride quality data. We propose that PMIS use the "50 percent, alternating" sample instead. Each District would basically have one group of pavements to be rated in even-numbered Fiscal Years and another group of pavements to be rated in odd-numbered Fiscal Years.

Deflection

TxDOT began collecting pavement deflection data for PES in Fiscal Year 1987 (September, 1986). The data were collected on a random, 15 percent, sample at five equidistant points within each PES section. Thus, the typical 3.2 km (2-mile) PES section would have deflection data at each 0.7 km (0.4-mile). We propose that PMIS collect deflection data at the beginning of each Data Collection Section. This would provide deflection data at approximately each 0.8 km (0.5-mile). With regards to the sample size and type, we propose that PMIS use a 33 percent, alternating sample of each year's distress and ride quality sections. On a statewide basis, this would be one-third of the one-half sample size, and would thus provide almost the same amount of data as the original 15 percent PES sample.

Skid Resistance

Even before it developed PES, TxDOT had a system for collecting, storing, and reporting skid resistance data. This system was called "Skid-R," and it was started back in 1973. Skid-R divided pavements into "Construction Sections," as opposed to mileposts.

When PES began, TxDOT proposed a milepost-based method for collecting skid data, but most Districts stayed with Skid-R because it contained detailed material type and work history information. The Skid-R Construction Sections were also more closely related to Control-Sections, which, of course, were used when programming pavement work. TxDOT has since proposed development of an automated enhancement to its existing Road Life logs, which would contain much of the pavement cross-section, surface type, and work history information that was contained in the Skid-R files.

Skid-R data were usually collected at every 0.8 km (0.5-mile) within a Construction Section. Skid-R would then list the raw 0.8 km (0.5-mile) skid resistance data and summarize it for each Construction Section. Given the predominant use of Reference Markers in TxDOT operations, we propose that PMIS use Reference Markers when collecting, storing, and reporting skid resistance data. We also propose that PMIS replace Skid-R when the proposed enhancements to the Road Life logs have been finished.

As with Skid-R, collection of skid resistance data for PES was optional. Although all Districts monitored skid resistance on their pavements, they found that skid resistance data (Skid-R or PES) rarely had any relationship to accident history. Because of this lack of any clear relationship between skid resistance data and accident history, we propose that collection of the skid resistance data remain optional.

PMIS SCORES

Along with its pavement condition data, PES had eight scores that it would calculate to describe a section's condition. These scores made it easy for pavement managers to describe specific and overall pavement condition. Of these scores, only the Pavement Score was used with any consistency — and its meaning was often misunderstood. Pavement Score was designed to measure a PES section's relative need for rehabilitation, but it was often used to describe pavement condition. Very few of the other scores were ever used. The PES scores also had confusing names and acronyms, which became a problem as TxDOT tried to distribute the information to less-experienced or casual users. We propose that PMIS eliminate three of the PES scores (AVU, WVU, and PS) and rename the other five scores, as shown in Table 6.

Table 6. Proposed Use of PES Scores in PMIS.

PES	PMIS (Proposed)	
Score (and description)	Score	Description
Unadjusted Visual Utility (UVU): measures relative amount of pavement distress, from 1 (worst) to 100 (best)	Distress Score	same as PES
Adjusted Visual Utility (AVU): UVU, adjusted for climate (county rainfall and freeze-thaw cycles), from 1 (worst) to 100 (best)	not used	
Weighted Visual Utility (WVU): AVU, adjusted for traffic (ADT and 18-k ESAL), from 1 (worst) to 100 (best)	not used	
Unadjusted Pavement Score (UPS): UVU, adjusted for SI utility, from 1 (worst) to 100 (best)	Condition Score	same as PES
Pavement Score (PS): WVU, adjusted for ride and functional class, from 1 (highest rehab priority) to 100 (lowest rehab priority)	not used	
Serviceability Index (SI): average of raw ride quality values for PES section, from 0.1 (roughest) to 5.0 (smoothest)	Ride Score	same as PES
Structural Strength Index (SSI): measure of overall pavement structural strength, from 1 (weakest) to 100 (strongest)	SSI Score	same as PES
Skid Number (SN): average of raw skid resistance values for PES section, from 1 (least skid resistance) to about 70 (most skid resistance)	Skid Score	same as PES

As described in Table 6, the Ride Score is the average of the raw 0.2 km (0.1-mile) ride quality values. The SSI Score is calculated using procedures described in TTI Research Report 409-3F. Although PMIS will store more than one set of deflection test values in a Data Collection Section, it will only compute SSI Score for the first deflection test (i.e., at the beginning of the Data Collection Section). The Skid Score is also calculated only from the first test in a Data Collection Section, even though PMIS will store more than one set of skid numbers per section.

The other two PMIS scores — Distress Score and Condition Score — are calculated using pavement utility curves. Chapter 2 describes these pavement utility curves in more detail.

ANALYSIS PROCEDURES

TxDOT developed PES to report statewide pavement condition and to estimate statewide pavement rehabilitation needs. Reporting statewide pavement condition worked well because PES was good at displaying data that had already been entered into the system. However, estimating statewide pavement rehabilitation needs was not easy. The State Cost Estimating (SCE) procedure used in PES was conceptually sophisticated, but it only worked for ACP ("flexible pavement") sections, it only considered rehabilitation treatments, and it could not analyze sections that had not been rated in the current fiscal year.

As TxDOT's needs for pavement management information increased, Design Division and District personnel had to write many ad hoc computer programs to analyze PES data. Duplication of effort and currency of analysis became serious problems that threatened the credibility of TxDOT's entire pavement management system operation.

To eliminate these problems, we propose that PMIS incorporate expanded analysis procedures including, but not limited to, the following three programs:

1. Needs Estimate: to estimate pavement rehabilitation and preventive maintenance needs for the current and the next Fiscal Year;
2. Optimization: to identify pavement sections in each of the next ten Fiscal Years that can be treated within given funding, and to list those sections in order of decreasing cost-effectiveness ratio; and
3. Impact Analysis: to determine the impact of pavement funding, truck traffic changes, and preventive maintenance seal coat practices on pavement condition for each of the next ten Fiscal Years.

We also propose that these PMIS analysis procedures be made available to TxDOT employees at all levels of the organization.

II — PAVEMENT UTILITY CURVES

PMIS will contain a large amount of distress and ride quality data for each Data Collection Section. As proposed in Chapter 1, PMIS will have several scores that will make comparison of specific sections easier. However, how is it possible to combine different distress and ride quality data on different sections and get a consistent, reliable measure of each section's condition?

How can the pavement manager compare an ACP section with 25 percent Shallow Rutting to a CRCP section with 5 Punchouts and 3 Concrete Patches? Is a JCP section with 38 Failed Joints and Cracks in worse condition than an ACP section with 10 percent Alligator Cracking? And if so, then by how much?

We propose that PMIS use utility theory and pavement utility curves to answer these questions, as was done in PES.

DESCRIPTION

PES uses a system of utility values to determine the subjective value of the pavement at different levels of condition. "Utility" may be thought of as the value of the service provided by the pavement in use with a particular damage level. Utility values will vary between 1.0 (highest) and 0.0 (lowest). This value of service may be measured in two ways: structural and functional.

"Structural utility" considers the pavement section as a structure designed to carry traffic loads effectively. "Functional utility" considers the pavement section as a small link in a network which is designed to move traffic smoothly and efficiently.

For example, consider a flexible pavement with alligator cracking. A utility curve for this pavement would look something like the curve in Figure 1. As defined in PMIS, the pavement's alligator cracking could range from 0 to 100 percent of the total wheelpath length. With 0 percent alligator cracking, the pavement's utility value is 1.0 (the highest possible). Structural utility is excellent because the pavement structure is strong — there are no cracks. Functional utility is excellent because the pavement has

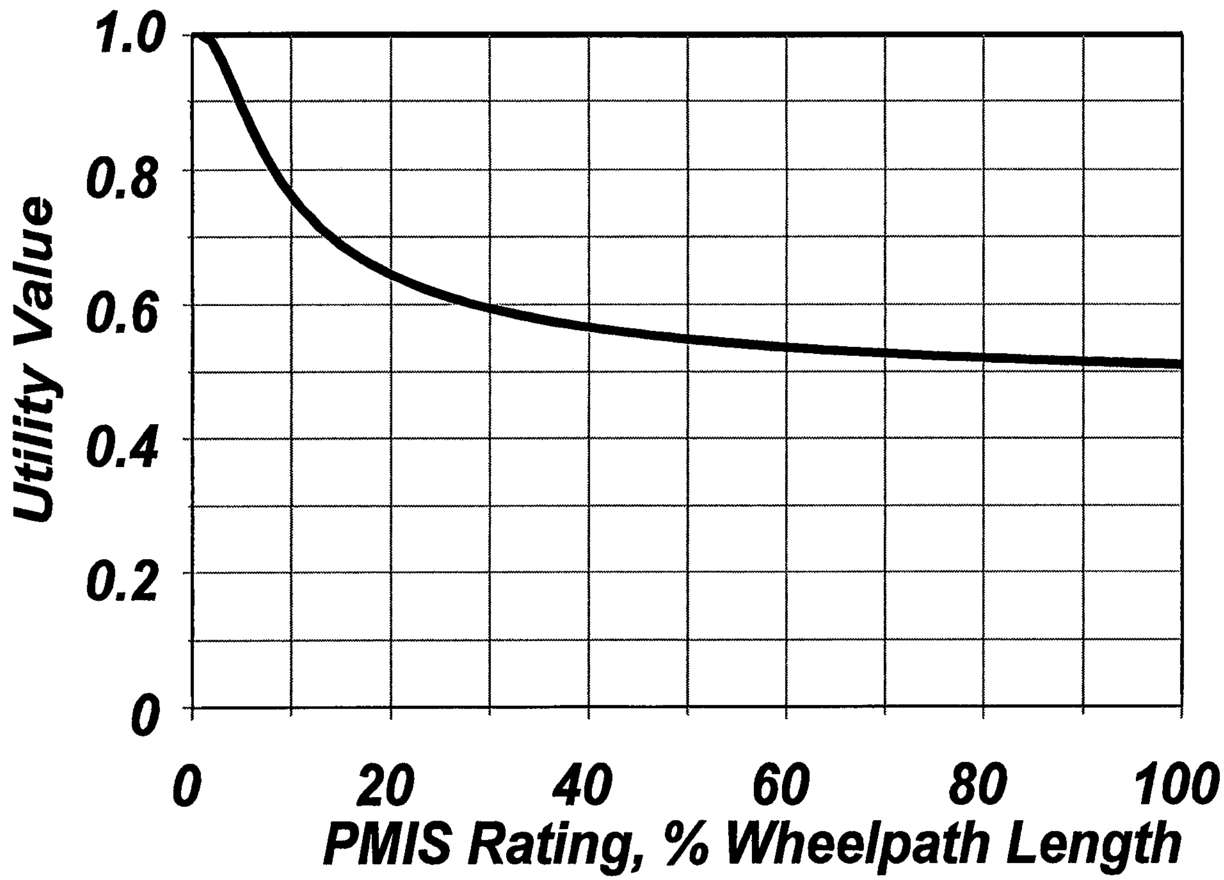

Figure 1. Utility Curve for Alligator Cracking.

no cracks to make the surface rough.

As the amount of alligator cracking increases, structural utility begins to drop. Functional utility also drops, though probably not as quickly — there are a few cracks, but not enough to make the road rough. As the alligator cracking approaches 100 percent, the pavement engineer would say that the structural utility is near zero. But the functional utility is not zero — maybe the road is somewhat rough from all the cracks, but it is still passable. Thus, the pavement's overall utility would fall to some value between 0.0 and 1.0.

Looking at the pavement's ride quality would give a different view of the utility curve. As mentioned before, PMIS ride quality values range from 0.1 (roughest) to 5.0 (smoothest). At 5.0, the pavement's functional utility is certainly 1.0. But the structural utility might not necessarily be that high — a newly-resurfaced pavement tends to be very smooth, no matter how strong the underlying pavement. As the ride quality drops, structural and functional drop as well, until eventually the road gets so rough that people complain (this will occur before the ride quality value drops to 0.1). At that point, the functional utility might be considered to be zero, but the pavement structure could still be somewhat sound. Once again, the pavement's overall utility would fall to some value between 0.0 and 1.0.

There is no exact rule that guarantees which of the two utility types will limit the pavement's overall utility. Thus, we propose that PMIS use utility values which combine structural and functional utility. Such an approach will make the utility values more appropriate to a wider range of users within TxDOT. Obviously, it will not be possible to exactly match each user's opinion of pavement utility, but this combined approach will help address the concerns of pavement engineers, designers, planners, and administrators. It will also help address the concerns of a much larger number of users: Texas' highway drivers and passengers.

DEFINING UTILITY FOR PAVEMENT DISTRESS

For pavement distress, utility can usually be defined in terms of the distress rating itself. Ratings that have been "normalized" to a percentage or other similar value (e.g., Shallow Rutting or Longitudinal Cracking) may be used directly in the utility curve equations. However, other distress types use ratings that give the total number of occurrences (e.g., Failures, Punchouts, or Slabs With Longitudinal Cracks). These distress ratings must be "normalized" before they can be used in the utility curve equations. For example, does a 0.8 km (0.5-mile) flexible pavement section with five Failures have the same subjective value as a 1.6 km (1-mile) flexible pavement section with five Failures? No. From a subjective standpoint, the shorter section has "twice" as many Failures, and thus has less value (i.e., a lower utility) than the longer section. The utility value concept intuitively "normalizes" the distress ratings.

We therefore propose that PMIS normalize any of its distress ratings that are based on total number of occurrences before use in the distress utility curve equations. This Chapter will describe how to normalize the distress ratings. We also propose that PMIS not define utility values for its optional distress types (currently, Raveling and Flushing) or for those distress types that are used to normalize other distress ratings (currently, Average Crack Spacing and Apparent Joint Spacing).

DEFINING UTILITY FOR RIDE QUALITY

For ride quality, utility cannot be defined just in terms of the ride quality "rating" (or Ride Score, in PMIS). Traffic volume and speed must also be considered. Traffic volume is important because of TxDOT's continuing goal to provide the best possible roads to as many "users" as possible. This is not a written policy or a legal requirement, but it is a very important "public service" goal. Ideally, TxDOT would provide "perfect" roads everywhere, but that is not practical considering funding and other constraints outside of the agency's control. Thus, TxDOT tries to put its "best" roads where the most "users" are, to provide the highest overall public service.

However, lower-volume roads cannot simply be "ignored" — traffic speed is also important. Many Texas highways are in rural areas where there are long distances between towns. These highways do not necessarily carry high volumes of traffic, but traffic that travels at high speeds. At the same time, many urban highways carry very high volumes of traffic, but at lower speeds.

Utility values for ride quality must balance the needs of traffic volume and traffic speed. We therefore propose that PMIS define three classes of sections, based on traffic volume (Average Daily Traffic) and speed (Speed Limit), when calculating utility values for ride quality. We propose that these three classes be based on the product of ADT and Speed Limit, as was done in PES. We also propose that PMIS define "minimum" Ride Score values, which will not cause a loss of utility. In other words, a Ride Score less than 5.0 should not necessarily cause a reduction in the utility value. Table 7 shows the proposed PMIS traffic classes and "minimum" Ride Score values.

Table 7. Proposed PMIS Traffic Classes (based on product of ADT and Speed Limit).

PMIS Traffic Class	Product of ADT and Speed Limit	ADT Range (for Speed Limit = 90 kph [55 mph])	"Minimum" Ride Score (with no loss of utility)
Low	1 to 27,500	1 to 500	2.5
Medium	27,501 to 165,000	501 to 3,000	3.0
High	165,001 to 999,999	3,001 to 999,999	3.5

BASIC PAVEMENT UTILITY CURVE EQUATION

The basic shape of a pavement's utility curve is sigmoidal (S-shaped). Most of the PMIS distress types have a utility curve, with the exception of (Raveling, Flushing, Average Crack Spacing, and Apparent Joint Spacing). This curve may be represented by the following equation:

$$U_i = 1 - \alpha e^{-\left(\frac{\rho}{L}\right)^{\beta}}$$

where:

U = utility value;

i = a PMIS distress type (e.g., deep rutting or punchouts);

e = base of the natural logarithms (e ≈ 2.71828...);

α = alpha, a horizontal asymptote factor that controls the maximum amount of utility that can be lost;

β = beta, a slope factor that controls how steeply utility is lost in the middle of the curve;

ρ = rho, a prolongation factor that controls "how long" the utility curve will "last" above a certain value; and

L = level of distress (for distress types) or ride quality lost (for ride quality).

For information about the α, β, and ρ factors, please refer to the next three sections. For information about computing the L value, please refer to the sections entitled "*Computing the L Value for Distress Types*" and "*Computing the L Value for Ride Quality*."

Alpha Factor

Alpha (α) is a horizontal asymptote factor, which controls the maximum amount of utility that can be lost. Subtracting Alpha from 1.0000 will give the curve's minimum utility value. Figure 2 shows the effect of Alpha on the utility curve.

When the alpha value equals 1.0, the utility value can have a value between 1.0 (highest value) and 0.0 (no value). When the alpha value is less than 1.0, say 0.5, the utility value can have a value between 1.0 and 1.0 minus the alpha value, in this case 0.5. Thus, when the damage being considered is at its maximum value, the pavement surface still has some value to the user, in this case one-half the value with no damage.

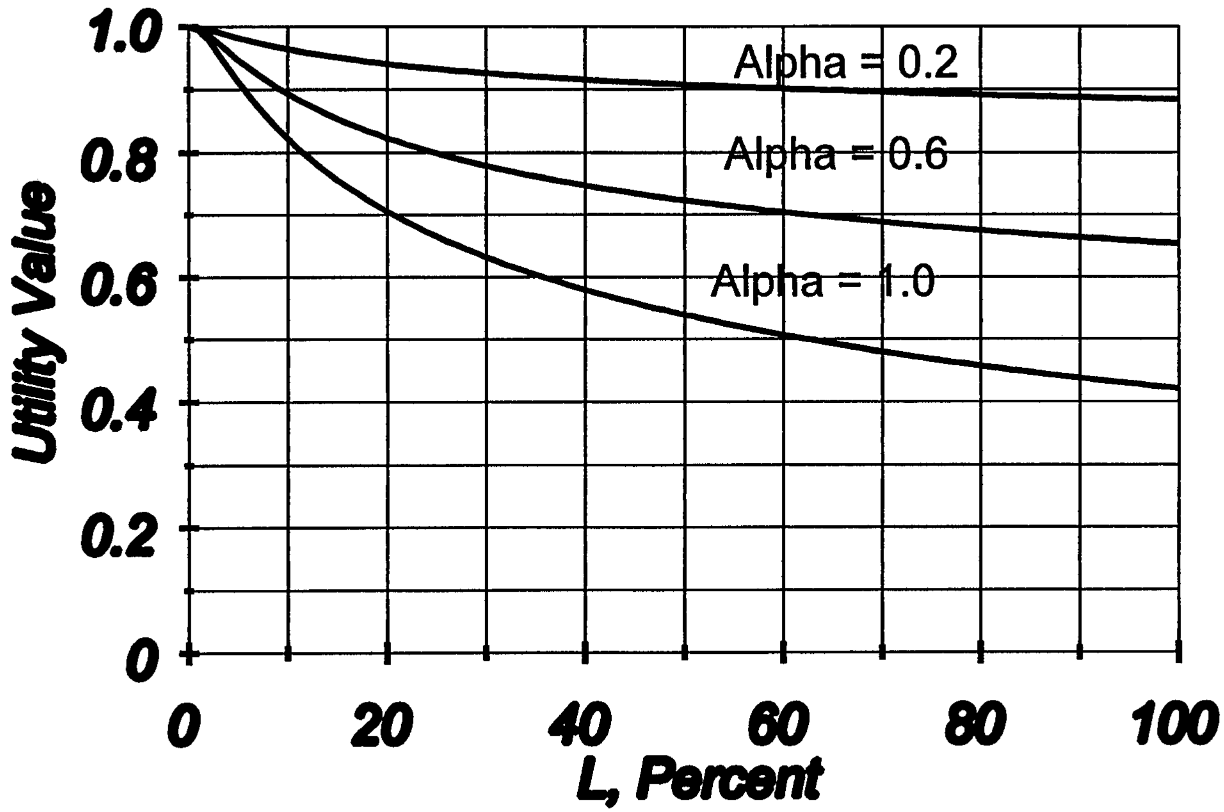

Figure 2. Effect of Alpha Factor on Utility Curve.

Beta Factor

Beta (β) is a slope factor, which controls how steeply utility is lost in the middle of the curve. Specifically, it is the slope of the utility curve at its inflection point. Figure 3 shows the effect of Beta on the utility curve. If the beta value is very small, the utility curve will have a sharp initial slope followed by a gradual approach to the minimum utility value. If beta value is large, there will be a slow initial rate of deterioration followed by a steep rate of deterioration. The final slope will asymptotically approach the alpha value.

Rho Factor

Rho (ρ) is a prolongation factor, which controls "how long" the utility curve will "last" above a certain value. Specifically, Rho is defined as the level of distress at which the utility value will have the value of $(1-.36\alpha)$. In the case where $\alpha = 1.0$, Rho is the level of distress to achieve a utility value of 0.64. Figure 4 shows the effect of Rho on the utility curve.

As the Rho value increases, the point along the X-axis at which the inflection point occurs increases. The Rho is the main factor in relating level of distress to utility value. As observed in Figure 4 to obtain a utility value of 0.7 requires only 10% distress for a Rho value of 15, but 30% distress for a Rho value of 45.

Computing the L Value

Some distress types must be "normalized" before they can be used in the utility equation. This is done through use of "L" value and is discussed in the following sections.

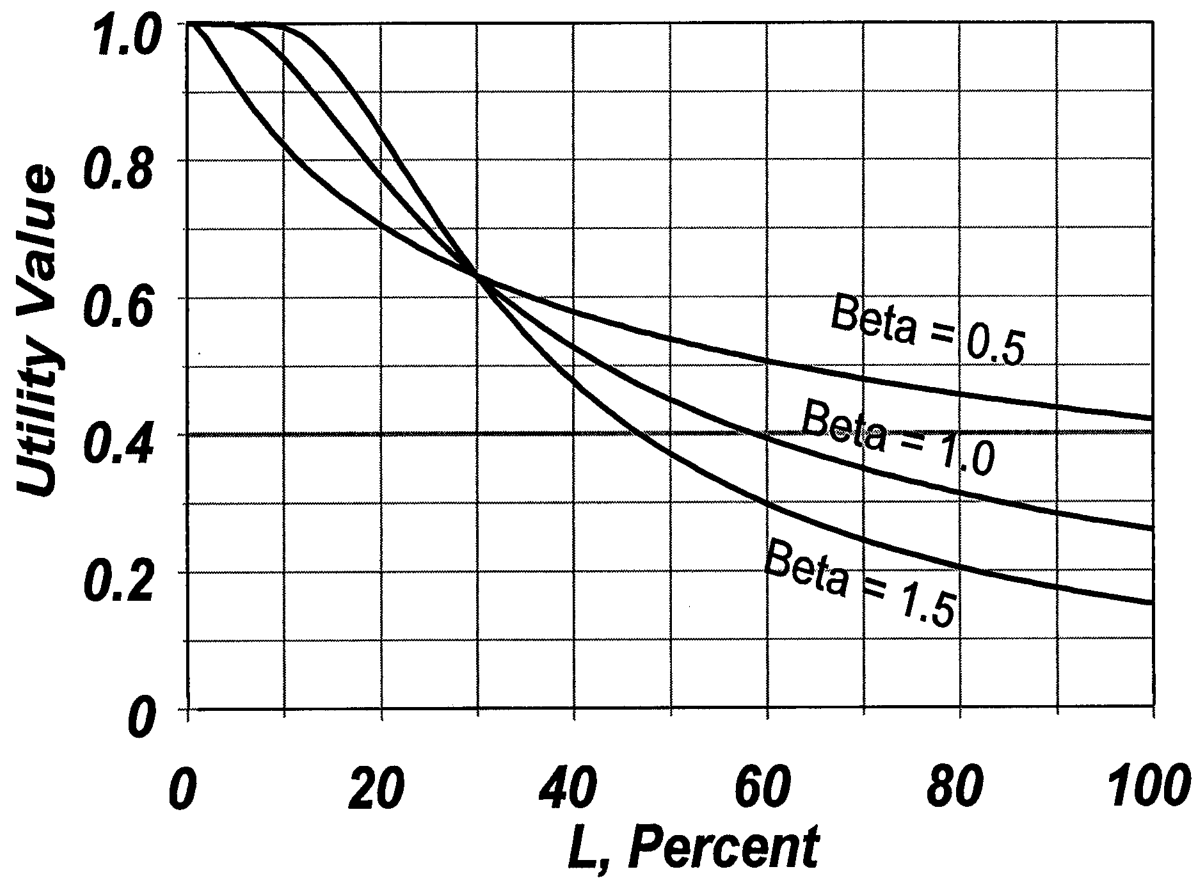

Figure 3. Effect of Beta Factor on Utility Curve.

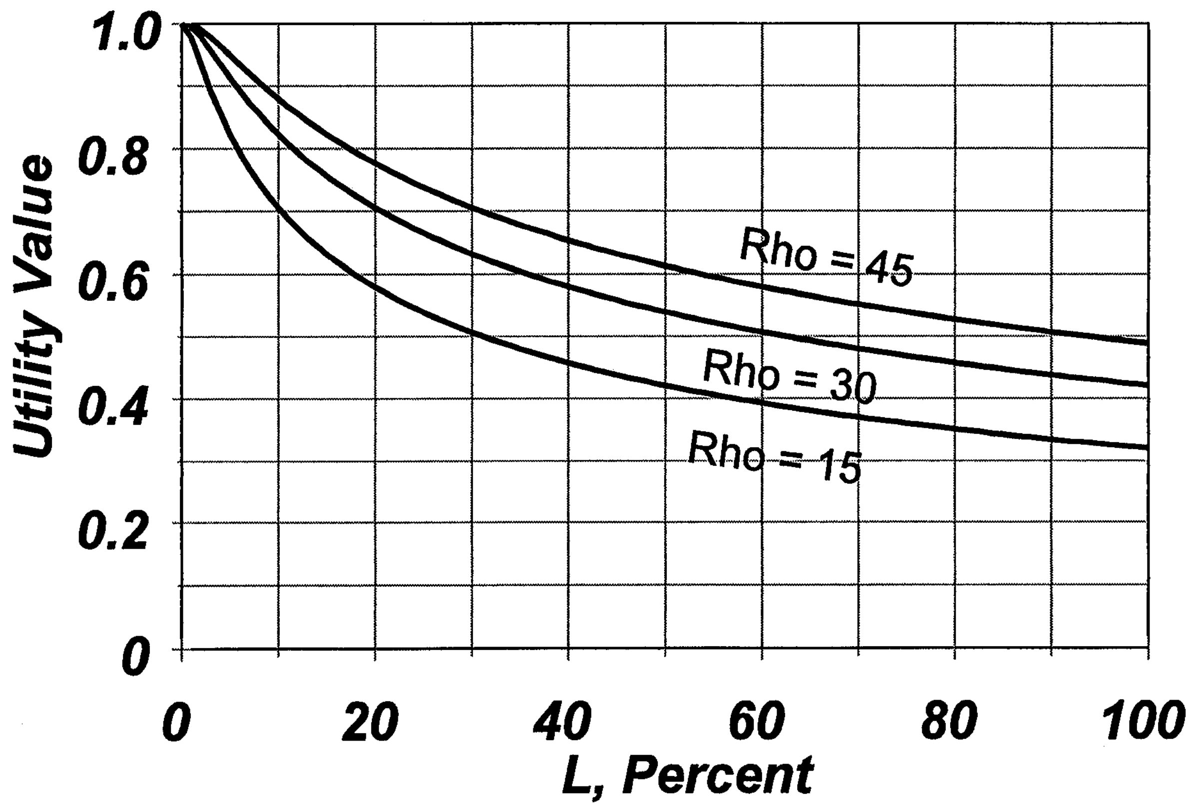

Figure 4. Effect of Rho Factor on Utility Curve.

For Distress Types

We propose that PMIS use the methods shown in Table 8 for computing L values for CRCP distress types.

Table 8. Computing the L Value for CRCP Distress Types.

CRCP Distress Type	PMIS Rating	Computing L Value
Spalled Cracks	total number (0 to 999)	L = percent of cracks that are spalled (see equation below this table)
Punchouts	total number (0 to 999)	L = number per mile (see equation below this table)
Asphalt Patches	total number (0 to 999)	L = number per mile (see equation below this table)
Concrete Patches	total number (0 to 999)	L = number per mile (see equation below this table)
Average Crack Spacing	spacing (1 to 75), to the nearest foot (0.1 m)	none

For Spalled Cracks, use the following equation to compute L:

$$L = 100 \times \left[\frac{Spall}{\left(\frac{5280 \times Len}{ACS} \right)} \right]$$

where:

Spall	=	Spalled Cracks (use the PMIS rating);
5280	=	number of feet per mile;
Len	=	Section Length, in miles; and
ACS	=	Average Crack Spacing.

For Punchouts, Concrete Patches, and Asphalt Patches, use the following equation to compute L:

$$L = \frac{Rat}{Len}$$

where:

Rat = Punchouts, Asphalt Patches, or Concrete Patches (use the PMIS rating); and

Len = Section Length, in miles.

When calculating utility values from this table, when L = 0, the utility value is pre-defined to be equal to 1.0000 (this prevents "division by zero" errors).

We propose that PMIS use the methods shown below in Table 9 for computing L values for JCP distress types.

Table 9. Computing the L Value for JCP Distress Types.

JCP Distress Type	PMIS Rating	Computing L Value
Failed Joints and Cracks	total number (0 to 999)	L = percent of joints and cracks that are failed (see equation below this table)
Failures	total number (0 to 999)	L = number per mile (see equation below this table)
Shattered (Failed) Slabs	total number (0 to 999)	L = percent of slabs that are failed (see equation below this table)
Slabs With Longitudinal Cracks	total number (0 to 999)	L = percent of slabs that have longitudinal cracks (see equation below this table)
Concrete Patches	total number (0 to 999)	L = number per mile (see equation below this table)
Apparent Joint Spacing	spacing (15 to 75), to the nearest foot (0.1 m)	none

For Failed Joints and Cracks, Shattered (Failed) Slabs, and Slabs With Longitudinal Cracks, use the following equation to compute L:

$$L = 100 \times \left[\frac{Rat}{\left(\frac{5280 \times Len}{AJS} \right)} \right]$$

where:

Rat	=	Failed Joints and Cracks, Shattered (Failed) Slabs, and Slabs With Longitudinal Cracks (use the PMIS rating);
5280	=	number of feet per mile;
Len	=	Section Length, in miles; and
AJS	=	Apparent Joint Spacing.

For Failures and Concrete Patches, use the following equation to compute L:

$$L = \frac{Rat}{Len}$$

where:

Rat = Failures or Concrete Patches (use the PMIS rating); and

Len = Section Length, in miles.

When calculating utility values from this table, when L = 0, the utility value is predefined to be equal to 1.0000 (this prevents "division by zero" errors).

We propose that PMIS use the methods shown below in Table 10 for computing L values for ACP distress types.

Table 10. Computing the L Value for ACP Distress Types.

ACP Distress Type	PMIS Rating	Computing L Value
Shallow Rutting	percent of wheelpath length (0 to 100)	L = PMIS rating
Deep Rutting	percent of wheelpath length (0 to 100)	L = PMIS rating
Patching	percent of lane area (0 to 100)	L = PMIS rating
Failures	total number (0 to 99)	L = number of failures per mile (see equation below this table)
Block Cracking	percent of lane area (0 to 100)	L = PMIS rating
Alligator Cracking	percent of wheelpath length (0 to 100)	L = PMIS rating
Longitudinal Cracking	length per 100' station (0 to 999)	L = PMIS rating
Transverse Cracking	number per 100' station (0 to 99)	L = PMIS rating
Raveling	none, low, medium, or high	none
Flushing	none, low, medium, or high	none

For Failures, use the following equation to compute L:

$$L = \frac{Fail}{Len}$$

where:

Fail = Failures (use the PMIS rating); and

Len = Section Length, in miles.

When calculating utility values from this table, when L = 0, the utility value is pre-defined to be equal to 1.0000 (this prevents "division by zero" errors).

For Ride Quality

As mentioned earlier, PMIS should not use just the Ride Score to compute utility values

For "Low" Traffic Class pavements, use the following equation to compute L:

$$L = 100 \times \left(\frac{2.5 - RS}{2.5} \right)$$

where:

L = level of ride quality lost,

2.5 = "minimum" Ride Score, and

RS = Ride Score.

For "Medium" Traffic Class pavements, use the following equation to compute L:

$$L = 100 \times \left(\frac{3.0 - RS}{3.0} \right)$$

where:

L = level of ride quality lost,

3.0 = "minimum" Ride Score, and

RS = Ride Score.

For "High" Traffic Class pavements, use the following equation to compute L:

$$L = 100 \times \left(\frac{3.5 - RS}{3.5} \right)$$

where:

L = level of ride quality lost,

3.5 = "minimum" Ride Score, and

RS = Ride Score.

UTILITY CURVE COEFFICIENTS

We propose that PMIS use the utility curve coefficients shown in Table 11 for pavement distress. The coefficients were generated using regression analysis on a series of curves developed by experienced TxDOT engineers. These initial curves ranked the relative importance of each distress type.

The coefficients for JCP Failures will produce negative utility values when a PMIS Data Collection Section has more than 60 per mile. We propose that PMIS have an "underflow limit," which sets the minimum calculated utility value equal to 0.0001 to prevent errors resulting from negative values.

We also propose that PMIS use the utility curve coefficients shown in Tables 12 through 21 for ride quality. These coefficients will not be used to calculate the Ride Score; they are only meant to calculate a utility value for ride quality (i.e., a utility value for the Ride Score). This utility value will be used to compute the PMIS Condition Score, as described later in this Chapter.

The coefficients for ride quality will produce negative utility values when Ride Score is below 0.5 for "Medium" traffic and below 0.9 for "High" traffic. Again earlier, PMIS should have an "underflow limit" which sets the minimum calculated utility value equal to 0.0001 to prevent errors resulting from negative values.

UTILITY VALUES FOR DISTRESS TYPES AND RIDE SCORE

For reference purposes we have included Tables 22-91, which list utility values for distress ratings, based on the above-described utility curve coefficients.

Use of these Tables will answer the two questions posed at the beginning of this Chapter.

Question #1: How can the pavement manager compare an ACP section with 25 percent Shallow Rutting to a CRCP section with 5 Punchouts and 3 Concrete Patches?

Table 11. Distress Utility Factors.

Detailed Pavement Type: 01			
Distress Type	ALPHA	BETA	RHO
Spalled Cracks	0.9369	1	62.7
Punchouts	0.9849	1	5.14
Asphalt Patches	0.9849	1	5.14
Concrete Patches	0.8649	1	8.2
Detailed Pavement Type: 02			
Distress Type	ALPHA	BETA	RHO
Failed Joints and Cracks	0.5298	1	21.4
JCP Failures	1.4555	1	22.15
Slabs with Longitudinal Cracks	1.0058	1	47.8
Shattered Slabs	1.171	1	16.31
Concrete Patching	1.067	1	24.24
Detailed Pavement Type: 03			
Distress Type	ALPHA	BETA	RHO
Failed Joints and Cracks	0.5298	1	21.4
JCP Failures	1.4555	1	22.15
Slabs with Longitudinal Cracks	1.0058	1	47.8
Shattered Slabs	1.171	1	16.31
Concrete Patching	1.067	1	24.24
Detailed Pavement Type: 04			
Distress Type	ALPHA	BETA	RHO
Shallow Rutting	0.31	1	19.72
Deep Rutting	0.69	1	16.27
Patching	0.45	1	10.15
Failures	1	1	4.7
Block Cracking	0.49	1	9.78
Alligator Cracking	0.53	1	8.01
Longitudinal Cracking	0.87	1	184
Transverse Cracking	0.69	1	10.39
Detailed Pavement Type: 05			
Distress Type	ALPHA	BETA	RHO
Shallow Rutting	0.31	1	19.72
Deep Rutting	0.69	1	16.27
Patching	0.45	1	10.15
Failures	1	1	4.7
Block Cracking	0.49	1	9.78
Alligator Cracking	0.53	1	8.01
Longitudinal Cracking	0.87	1	184
Transverse Cracking	0.69	1	10.39

Table 11 (Continued). Distress Utility Factors.

Detailed Pavement Type: 06			
Distress Type	ALPHA	BETA	RHO
Shallow Rutting	0.31	1	19.72
Deep Rutting	0.69	1	16.27
Patching	0.45	1	10.15
Failures	1	1	4.7
Block Cracking	0.49	1	9.78
Alligator Cracking	0.53	1	8.01
Longitudinal Cracking	0.87	1	184
Transverse Cracking	0.69	1	10.39
Detailed Pavement Type: 07			
Distress Type	ALPHA	BETA	RHO
Shallow Rutting	0.23	1	17.55
Deep Rutting	0.32	1	9.04
Patching	0.32	1	17.28
Failures	1	1	4.7
Block Cracking	0.31	1	13.79
Alligator Cracking	0.42	1	18.77
Longitudinal Cracking	0.37	1	136.9
Transverse Cracking	0.43	1	9.56
Detailed Pavement Type: 08			
Distress Type	ALPHA	BETA	RHO
Shallow Rutting	0.23	1	17.55
Deep Rutting	0.32	1	9.04
Patching	0.32	1	17.28
Failures	1	1	4.7
Block Cracking	0.31	1	13.79
Alligator Cracking	0.42	1	18.77
Longitudinal Cracking	0.37	1	136.9
Transverse Cracking	0.43	1	9.56
Detailed Pavement Type: 09			
Distress Type	ALPHA	BETA	RHO
Shallow Rutting	0.31	1	19.72
Deep Rutting	0.69	1	16.27
Patching	0.45	1	10.15
Failures	1	1	4.7
Block Cracking	0.49	1	9.78
Alligator Cracking	0.53	1	8.01
Longitudinal Cracking	0.87	1	184
Transverse Cracking	0.69	1	10.39

Table 11 (Continued). Distress Utility Factors.

Detailed Pavement Type: 10			
Distress Type	ALPHA	BETA	RHO
Shallow Rutting	0.31	1	19.72
Deep Rutting	0.69	1	16.27
Patching	0.45	1	10.15
Failures	1	1	4.7
Block Cracking	0.49	1	9.78
Alligator Cracking	0.53	1	8.01
Longitudinal Cracking	0.87	1	184
Transverse Cracking	0.69	1	10.39

Table 12. Ride Score Utility Factors for Detailed Pavement Type 01.

How Rated: Percent of Ride Quality Lost (0-1)

	Low Traffic	Medium Traffic	High Traffic
Alpha:	1.8180	1.7600	1.7300
Beta:	1.0000	1.0000	1.0000
Rho:	58.5000	48.1000	41.0000

	Utility Values by Traffic		
Ride Score	Low	Medium	High
5	1	1	1
4.9	1	1	1
4.8	1	1	1
4.7	1	1	1
4.6	1	1	1
4.5	1	1	1
4.4	1	1	1
4.3	1	1	1
4.2	1	1	1
4.1	1	1	1
4	1	1	1
3.9	1	1	1
3.8	1	1	1
3.7	1	1	1
3.6	1	1	1
3.5	1	1	1
3.4	1	1	0.999999
3.3	1	1	0.998676
3.2	1	1	0.985523
3.1	1	1	0.952135
3	1	1	0.901911
2.9	1	0.999999	0.841745
2.8	1	0.998706	0.777289
2.7	1	0.98566	0.71224
2.6	1	0.95227	0.648773

	Utility Values by Traffic		
Ride Score	Low	Medium	High
2.5	1	0.901794	0.58806
2.4	0.999999	0.841133	0.530658
2.3	0.998787	0.776001	0.476758
2.2	0.986119	0.710163	0.426344
2.1	0.953043	0.645845	0.379282
2	0.902438	0.584256	0.335384
1.9	0.841145	0.525979	0.294433
1.8	0.774976	0.471222	0.25621
1.7	0.707821	0.419976	0.220499
1.6	0.642015	0.372116	0.187096
1.5	0.578849	0.327455	0.155811
1.4	0.518962	0.285778	0.126469
1.3	0.4626	0.246864	0.098911
1.2	0.409782	0.210498	0.072991
1.1	0.360396	0.176474	0.048576
1	0.314264	0.1446	0.025547
0.9	0.271178	0.1147	0.003794
0.8	0.230918	0.086613	-0.01678
0.7	0.193267	0.06019	-0.03626
0.6	0.158021	0.035298	-0.05474
0.5	0.124984	0.011816	-0.07228
0.4	0.093978	-0.01037	-0.08895
0.3	0.064838	-0.03135	-0.10482
0.2	0.037415	-0.05123	-0.11994
0.1	0.011571	-0.07007	-0.13435

Table 13. Ride Score Utility Factors for Detailed Pavement Type 02.

How Rated: Percent of Ride Quality Lost (0-1)

	Low Traffic	Medium Traffic	High Traffic
Alpha:	1.8180	1.7600	1.7300
Beta:	1.0000	1.0000	1.0000
Rho:	58.5000	48.1000	41.0000

	Utility Values by Traffic		
Ride Score	Low	Medium	High
5	1	1	1
4.9	1	1	1
4.8	1	1	1
4.7	1	1	1
4.6	1	1	1
4.5	1	1	1
4.4	1	1	1
4.3	1	1	1
4.2	1	1	1
4.1	1	1	1
4	1	1	1
3.9	1	1	1
3.8	1	1	1
3.7	1	1	1
3.6	1	1	1
3.5	1	1	1
3.4	1	1	0.999999
3.3	1	1	0.998676
3.2	1	1	0.985523
3.1	1	1	0.952135
3	1	1	0.901911
2.9	1	0.999999	0.841745
2.8	1	0.998706	0.777289
2.7	1	0.98566	0.71224
2.6	1	0.95227	0.648773

	Utility Values by Traffic		
Ride Score	Low	Medium	High
2.5	1	0.901794	0.58806
2.4	0.999999	0.841133	0.530658
2.3	0.998787	0.776001	0.476758
2.2	0.986119	0.710163	0.426344
2.1	0.953043	0.645845	0.379282
2	0.902438	0.584256	0.335384
1.9	0.841145	0.525979	0.294433
1.8	0.774976	0.471222	0.25621
1.7	0.707821	0.419976	0.220499
1.6	0.642015	0.372116	0.187096
1.5	0.578849	0.327455	0.155811
1.4	0.518962	0.285778	0.126469
1.3	0.4626	0.246864	0.098911
1.2	0.409782	0.210498	0.072991
1.1	0.360396	0.176474	0.048576
1	0.314264	0.1446	0.025547
0.9	0.271178	0.1147	0.003794
0.8	0.230918	0.086613	-0.01678
0.7	0.193267	0.06019	-0.03626
0.6	0.158021	0.035298	-0.05474
0.5	0.124984	0.011816	-0.07228
0.4	0.093978	-0.01037	-0.08895
0.3	0.064838	-0.03135	-0.10482
0.2	0.037415	-0.05123	-0.11994
0.1	0.011571	-0.07007	-0.13435

Table 14. Ride Score Utility Factors for Detailed Pavement Type 03.

How Rated: Percent of Ride Quality Lost (0-1)

	Low Traffic	Medium Traffic	High Traffic
Alpha:	1.8180	1.7600	1.7300
Beta:	1.0000	1.0000	1.0000
Rho:	58.5000	48.1000	41.0000

	Utility Values by Traffic		
Ride Score	Low	Medium	High
5	1	1	1
4.9	1	1	1
4.8	1	1	1
4.7	1	1	1
4.6	1	1	1
4.5	1	1	1
4.4	1	1	1
4.3	1	1	1
4.2	1	1	1
4.1	1	1	1
4	1	1	1
3.9	1	1	1
3.8	1	1	1
3.7	1	1	1
3.6	1	1	1
3.5	1	1	1
3.4	1	1	0.999999
3.3	1	1	0.998676
3.2	1	1	0.985523
3.1	1	1	0.952135
3	1	1	0.901911
2.9	1	0.999999	0.841745
2.8	1	0.998706	0.777289
2.7	1	0.98566	0.71224
2.6	1	0.95227	0.648773

	Utility Values by Traffic		
Ride Score	Low	Medium	High
2.5	1	0.901794	0.58806
2.4	0.999999	0.841133	0.530658
2.3	0.998787	0.776001	0.476758
2.2	0.986119	0.710163	0.426344
2.1	0.953043	0.645845	0.379282
2	0.902438	0.584256	0.335384
1.9	0.841145	0.525979	0.294433
1.8	0.774976	0.471222	0.25621
1.7	0.707821	0.419976	0.220499
1.6	0.642015	0.372116	0.187096
1.5	0.578849	0.327455	0.155811
1.4	0.518962	0.285778	0.126469
1.3	0.4626	0.246864	0.098911
1.2	0.409782	0.210498	0.072991
1.1	0.360396	0.176474	0.048576
1	0.314264	0.1446	0.025547
0.9	0.271178	0.1147	0.003794
0.8	0.230918	0.086613	-0.01678
0.7	0.193267	0.06019	-0.03626
0.6	0.158021	0.035298	-0.05474
0.5	0.124984	0.011816	-0.07228
0.4	0.093978	-0.01037	-0.08895
0.3	0.064838	-0.03135	-0.10482
0.2	0.037415	-0.05123	-0.11994
0.1	0.011571	-0.07007	-0.13435

Table 15. Ride Score Utility Factors for Detailed Pavement Type 04.

How Rated: Percent of Ride Quality Lost (0-1)

	Low Traffic	Medium Traffic	High Traffic
Alpha:	1.8180	1.7600	1.7300
Beta:	1.0000	1.0000	1.0000
Rho:	58.5000	48.1000	41.0000

	Utility Values by Traffic		
Ride Score	Low	Medium	High
5	1	1	1
4.9	1	1	1
4.8	1	1	1
4.7	1	1	1
4.6	1	1	1
4.5	1	1	1
4.4	1	1	1
4.3	1	1	1
4.2	1	1	1
4.1	1	1	1
4	1	1	1
3.9	1	1	1
3.8	1	1	1
3.7	1	1	1
3.6	1	1	1
3.5	1	1	1
3.4	1	1	0.999999
3.3	1	1	0.998676
3.2	1	1	0.985523
3.1	1	1	0.952135
3	1	1	0.901911
2.9	1	0.999999	0.841745
2.8	1	0.998706	0.777289
2.7	1	0.98566	0.71224
2.6	1	0.95227	0.648773

	Utility Values by Traffic		
Ride Score	Low	Medium	High
2.5	1	0.901794	0.58806
2.4	0.999999	0.841133	0.530658
2.3	0.998787	0.776001	0.476758
2.2	0.986119	0.710163	0.426344
2.1	0.953043	0.645845	0.379282
2	0.902438	0.584256	0.335384
1.9	0.841145	0.525979	0.294433
1.8	0.774976	0.471222	0.25621
1.7	0.707821	0.419976	0.220499
1.6	0.642015	0.372116	0.187096
1.5	0.578849	0.327455	0.155811
1.4	0.518962	0.285778	0.126469
1.3	0.4626	0.246864	0.098911
1.2	0.409782	0.210498	0.072991
1.1	0.360396	0.176474	0.048576
1	0.314264	0.1446	0.025547
0.9	0.271178	0.1147	0.003794
0.8	0.230918	0.086613	-0.01678
0.7	0.193267	0.06019	-0.03626
0.6	0.158021	0.035298	-0.05474
0.5	0.124984	0.011816	-0.07228
0.4	0.093978	-0.01037	-0.08895
0.3	0.064838	-0.03135	-0.10482
0.2	0.037415	-0.05123	-0.11994
0.1	0.011571	-0.07007	-0.13435

Table 16. Ride Score Utility Factors for Detailed Pavement Type 05.

How Rated: Percent of Ride Quality Lost (0-1)

	Low Traffic	Medium Traffic	High Traffic
Alpha:	**1.8180**	**1.7600**	**1.7300**
Beta:	**1.0000**	**1.0000**	**1.0000**
Rho:	**58.5000**	**48.1000**	**41.0000**

	Utility Values by Traffic		
Ride Score	Low	Medium	High
5	1	1	1
4.9	1	1	1
4.8	1	1	1
4.7	1	1	1
4.6	1	1	1
4.5	1	1	1
4.4	1	1	1
4.3	1	1	1
4.2	1	1	1
4.1	1	1	1
4	1	1	1
3.9	1	1	1
3.8	1	1	1
3.7	1	1	1
3.6	1	1	1
3.5	1	1	1
3.4	1	1	0.999999
3.3	1	1	0.998676
3.2	1	1	0.985523
3.1	1	1	0.952135
3	1	1	0.901911
2.9	1	0.999999	0.841745
2.8	1	0.998706	0.777289
2.7	1	0.98566	0.71224
2.6	1	0.95227	0.648773

	Utility Values by Traffic		
Ride Score	Low	Medium	High
2.5	1	0.901794	0.58806
2.4	0.999999	0.841133	0.530658
2.3	0.998787	0.776001	0.476758
2.2	0.986119	0.710163	0.426344
2.1	0.953043	0.645845	0.379282
2	0.902438	0.584256	0.335384
1.9	0.841145	0.525979	0.294433
1.8	0.774976	0.471222	0.25621
1.7	0.707821	0.419976	0.220499
1.6	0.642015	0.372116	0.187096
1.5	0.578849	0.327455	0.155811
1.4	0.518962	0.285778	0.126469
1.3	0.4626	0.246864	0.098911
1.2	0.409782	0.210498	0.072991
1.1	0.360396	0.176474	0.048576
1	0.314264	0.1446	0.025547
0.9	0.271178	0.1147	0.003794
0.8	0.230918	0.086613	-0.01678
0.7	0.193267	0.06019	-0.03626
0.6	0.158021	0.035298	-0.05474
0.5	0.124984	0.011816	-0.07228
0.4	0.093978	-0.01037	-0.08895
0.3	0.064838	-0.03135	-0.10482
0.2	0.037415	-0.05123	-0.11994
0.1	0.011571	-0.07007	-0.13435

Table 17. Ride Score Utility Factors for Detailed Pavement Type 06.

How Rated: Percent of Ride Quality Lost (0-1)

	Low Traffic	Medium Traffic	High Traffic
Alpha:	1.8180	1.7600	1.7300
Beta:	1.0000	1.0000	1.0000
Rho:	58.5000	48.1000	41.0000

	Utility Values by Traffic		
Ride Score	Low	Medium	High
5	1	1	1
4.9	1	1	1
4.8	1	1	1
4.7	1	1	1
4.6	1	1	1
4.5	1	1	1
4.4	1	1	1
4.3	1	1	1
4.2	1	1	1
4.1	1	1	1
4	1	1	1
3.9	1	1	1
3.8	1	1	1
3.7	1	1	1
3.6	1	1	1
3.5	1	1	1
3.4	1	1	0.999999
3.3	1	1	0.998676
3.2	1	1	0.985523
3.1	1	1	0.952135
3	1	1	0.901911
2.9	1	0.999999	0.841745
2.8	1	0.998706	0.777289
2.7	1	0.98566	0.71224
2.6	1	0.95227	0.648773

	Utility Values by Traffic		
Ride Score	Low	Medium	High
2.5	1	0.901794	0.58806
2.4	0.999999	0.841133	0.530658
2.3	0.998787	0.776001	0.476758
2.2	0.986119	0.710163	0.426344
2.1	0.953043	0.645845	0.379282
2	0.902438	0.584256	0.335384
1.9	0.841145	0.525979	0.294433
1.8	0.774976	0.471222	0.25621
1.7	0.707821	0.419976	0.220499
1.6	0.642015	0.372116	0.187096
1.5	0.578849	0.327455	0.155811
1.4	0.518962	0.285778	0.126469
1.3	0.4626	0.246864	0.098911
1.2	0.409782	0.210498	0.072991
1.1	0.360396	0.176474	0.048576
1	0.314264	0.1446	0.025547
0.9	0.271178	0.1147	0.003794
0.8	0.230918	0.086613	-0.01678
0.7	0.193267	0.06019	-0.03626
0.6	0.158021	0.035298	-0.05474
0.5	0.124984	0.011816	-0.07228
0.4	0.093978	-0.01037	-0.08895
0.3	0.064838	-0.03135	-0.10482
0.2	0.037415	-0.05123	-0.11994
0.1	0.011571	-0.07007	-0.13435

Table 18. Ride Score Utility Factors for Detailed Pavement Type 07.

How Rated: Percent of Ride Quality Lost (0-1)

	Low Traffic	Medium Traffic	High Traffic
Alpha:	1.8180	1.7600	1.7300
Beta:	1.0000	1.0000	1.0000
Rho:	58.5000	48.1000	41.0000

	Utility Values by Traffic		
Ride Score	Low	Medium	High
5	1	1	1
4.9	1	1	1
4.8	1	1	1
4.7	1	1	1
4.6	1	1	1
4.5	1	1	1
4.4	1	1	1
4.3	1	1	1
4.2	1	1	1
4.1	1	1	1
4	1	1	1
3.9	1	1	1
3.8	1	1	1
3.7	1	1	1
3.6	1	1	1
3.5	1	1	1
3.4	1	1	0.999999
3.3	1	1	0.998676
3.2	1	1	0.985523
3.1	1	1	0.952135
3	1	1	0.901911
2.9	1	0.999999	0.841745
2.8	1	0.998706	0.777289
2.7	1	0.98566	0.71224
2.6	1	0.95227	0.648773

	Utility Values by Traffic		
Ride Score	Low	Medium	High
2.5	1	0.901794	0.58806
2.4	0.999999	0.841133	0.530658
2.3	0.998787	0.776001	0.476758
2.2	0.986119	0.710163	0.426344
2.1	0.953043	0.645845	0.379282
2	0.902438	0.584256	0.335384
1.9	0.841145	0.525979	0.294433
1.8	0.774976	0.471222	0.25621
1.7	0.707821	0.419976	0.220499
1.6	0.642015	0.372116	0.187096
1.5	0.578849	0.327455	0.155811
1.4	0.518962	0.285778	0.126469
1.3	0.4626	0.246864	0.098911
1.2	0.409782	0.210498	0.072991
1.1	0.360396	0.176474	0.048576
1	0.314264	0.1446	0.025547
0.9	0.271178	0.1147	0.003794
0.8	0.230918	0.086613	-0.01678
0.7	0.193267	0.06019	-0.03626
0.6	0.158021	0.035298	-0.05474
0.5	0.124984	0.011816	-0.07228
0.4	0.093978	-0.01037	-0.08895
0.3	0.064838	-0.03135	-0.10482
0.2	0.037415	-0.05123	-0.11994
0.1	0.011571	-0.07007	-0.13435

Table 19. Ride Score Utility Factors for Detailed Pavement Type 08.

How Rated: Percent of Ride Quality Lost (0-1)

	Low Traffic	Medium Traffic	High Traffic
Alpha:	1.8180	1.7600	1.7300
Beta:	1.0000	1.0000	1.0000
Rho:	58.5000	48.1000	41.0000

	Utility Values by Traffic		
Ride Score	Low	Medium	High
5	1	1	1
4.9	1	1	1
4.8	1	1	1
4.7	1	1	1
4.6	1	1	1
4.5	1	1	1
4.4	1	1	1
4.3	1	1	1
4.2	1	1	1
4.1	1	1	1
4	1	1	1
3.9	1	1	1
3.8	1	1	1
3.7	1	1	1
3.6	1	1	1
3.5	1	1	1
3.4	1	1	0.999999
3.3	1	1	0.998676
3.2	1	1	0.985523
3.1	1	1	0.952135
3	1	1	0.901911
2.9	1	0.999999	0.841745
2.8	1	0.998706	0.777289
2.7	1	0.98566	0.71224
2.6	1	0.95227	0.648773

	Utility Values by Traffic		
Ride Score	Low	Medium	High
2.5	1	0.901794	0.58806
2.4	0.999999	0.841133	0.530658
2.3	0.998787	0.776001	0.476758
2.2	0.986119	0.710163	0.426344
2.1	0.953043	0.645845	0.379282
2	0.902438	0.584256	0.335384
1.9	0.841145	0.525979	0.294433
1.8	0.774976	0.471222	0.25621
1.7	0.707821	0.419976	0.220499
1.6	0.642015	0.372116	0.187096
1.5	0.578849	0.327455	0.155811
1.4	0.518962	0.285778	0.126469
1.3	0.4626	0.246864	0.098911
1.2	0.409782	0.210498	0.072991
1.1	0.360396	0.176474	0.048576
1	0.314264	0.1446	0.025547
0.9	0.271178	0.1147	0.003794
0.8	0.230918	0.086613	-0.01678
0.7	0.193267	0.06019	-0.03626
0.6	0.158021	0.035298	-0.05474
0.5	0.124984	0.011816	-0.07228
0.4	0.093978	-0.01037	-0.08895
0.3	0.064838	-0.03135	-0.10482
0.2	0.037415	-0.05123	-0.11994
0.1	0.011571	-0.07007	-0.13435

Table 20. Ride Score Utility Factors for Detailed Pavement Type 09.

How Rated: Percent of Ride Quality Lost (0-1)

	Low Traffic	Medium Traffic	High Traffic
Alpha:	1.8180	1.7600	1.7300
Beta:	1.0000	1.0000	1.0000
Rho:	58.5000	48.1000	41.0000

	Utility Values by Traffic		
Ride Score	Low	Medium	High
5	1	1	1
4.9	1	1	1
4.8	1	1	1
4.7	1	1	1
4.6	1	1	1
4.5	1	1	1
4.4	1	1	1
4.3	1	1	1
4.2	1	1	1
4.1	1	1	1
4	1	1	1
3.9	1	1	1
3.8	1	1	1
3.7	1	1	1
3.6	1	1	1
3.5	1	1	1
3.4	1	1	0.999999
3.3	1	1	0.998676
3.2	1	1	0.985523
3.1	1	1	0.952135
3	1	1	0.901911
2.9	1	0.999999	0.841745
2.8	1	0.998706	0.777289
2.7	1	0.98566	0.71224
2.6	1	0.95227	0.648773

	Utility Values by Traffic		
Ride Score	Low	Medium	High
2.5	1	0.901794	0.58806
2.4	0.999999	0.841133	0.530658
2.3	0.998787	0.776001	0.476758
2.2	0.986119	0.710163	0.426344
2.1	0.953043	0.645845	0.379282
2	0.902438	0.584256	0.335384
1.9	0.841145	0.525979	0.294433
1.8	0.774976	0.471222	0.25621
1.7	0.707821	0.419976	0.220499
1.6	0.642015	0.372116	0.187096
1.5	0.578849	0.327455	0.155811
1.4	0.518962	0.285778	0.126469
1.3	0.4626	0.246864	0.098911
1.2	0.409782	0.210498	0.072991
1.1	0.360396	0.176474	0.048576
1	0.314264	0.1446	0.025547
0.9	0.271178	0.1147	0.003794
0.8	0.230918	0.086613	-0.01678
0.7	0.193267	0.06019	-0.03626
0.6	0.158021	0.035298	-0.05474
0.5	0.124984	0.011816	-0.07228
0.4	0.093978	-0.01037	-0.08895
0.3	0.064838	-0.03135	-0.10482
0.2	0.037415	-0.05123	-0.11994
0.1	0.011571	-0.07007	-0.13435

Table 21. Ride Score Utility Factors for Detailed Pavement Type 10.

How Rated: Percent of Ride Quality Lost (0-1)

	Low Traffic	Medium Traffic	High Traffic
Alpha:	1.8180	1.7600	1.7300
Beta:	1.0000	1.0000	1.0000
Rho:	58.5000	48.1000	41.0000

	Utility Values by Traffic		
Ride Score	Low	Medium	High
5	1	1	1
4.9	1	1	1
4.8	1	1	1
4.7	1	1	1
4.6	1	1	1
4.5	1	1	1
4.4	1	1	1
4.3	1	1	1
4.2	1	1	1
4.1	1	1	1
4	1	1	1
3.9	1	1	1
3.8	1	1	1
3.7	1	1	1
3.6	1	1	1
3.5	1	1	1
3.4	1	1	0.999999
3.3	1	1	0.998676
3.2	1	1	0.985523
3.1	1	1	0.952135
3	1	1	0.901911
2.9	1	0.999999	0.841745
2.8	1	0.998706	0.777289
2.7	1	0.98566	0.71224
2.6	1	0.95227	0.648773

	Utility Values by Traffic		
Ride Score	Low	Medium	High
2.5	1	0.901794	0.58806
2.4	0.999999	0.841133	0.530658
2.3	0.998787	0.776001	0.476758
2.2	0.986119	0.710163	0.426344
2.1	0.953043	0.645845	0.379282
2	0.902438	0.584256	0.335384
1.9	0.841145	0.525979	0.294433
1.8	0.774976	0.471222	0.25621
1.7	0.707821	0.419976	0.220499
1.6	0.642015	0.372116	0.187096
1.5	0.578849	0.327455	0.155811
1.4	0.518962	0.285778	0.126469
1.3	0.4626	0.246864	0.098911
1.2	0.409782	0.210498	0.072991
1.1	0.360396	0.176474	0.048576
1	0.314264	0.1446	0.025547
0.9	0.271178	0.1147	0.003794
0.8	0.230918	0.086613	-0.01678
0.7	0.193267	0.06019	-0.03626
0.6	0.158021	0.035298	-0.05474
0.5	0.124984	0.011816	-0.07228
0.4	0.093978	-0.01037	-0.08895
0.3	0.064838	-0.03135	-0.10482
0.2	0.037415	-0.05123	-0.11994
0.1	0.011571	-0.07007	-0.13435

Table 22. Distress Utility Factors for Spalled Cracks for Detailed Pavement Type: 01.

Alpha: 0.9369 **How Rated: Total Number**

Beta: 1.0000

Rho: 62.7000

Percent of Transverse Cracks spalled	UTILITY VALUE	Percent of Transverse Cracks spalled	UTILITY VALUE	Percent of Transverse Cracks spalled	UTILITY VALUE	Percent of Transverse Cracks spalled	UTILITY VALUE
1	1.0000	26	0.9160	51	0.7260	76	0.5894
2	1.0000	27	0.9081	52	0.7194	77	0.5850
3	1.0000	28	0.9002	53	0.7130	78	0.5806
4	1.0000	29	0.8922	54	0.7066	79	0.5764
5	1.0000	30	0.8841	55	0.7004	80	0.5721
6	1.0000	31	0.8760	56	0.6942	81	0.5680
7	0.9999	32	0.8679	57	0.6881	82	0.5639
8	0.9996	33	0.8599	58	0.6822	83	0.5598
9	0.9991	34	0.8518	59	0.6763	84	0.5559
10	0.9982	35	0.8438	60	0.6705	85	0.5519
11	0.9969	36	0.8358	61	0.6648	86	0.5481
12	0.9950	37	0.8279	62	0.6592	87	0.5443
13	0.9925	38	0.8201	63	0.6537	88	0.5405
14	0.9894	39	0.8123	64	0.6483	89	0.5368
15	0.9857	40	0.8046	65	0.6429	90	0.5332
16	0.9814	41	0.7970	66	0.6377	91	0.5296
17	0.9766	42	0.7895	67	0.6325	92	0.5261
18	0.9712	43	0.7820	68	0.6274	93	0.5226
19	0.9654	44	0.7747	69	0.6224	94	0.5192
20	0.9592	45	0.7674	70	0.6174	95	0.5158
21	0.9527	46	0.7603	71	0.6126	96	0.5124
22	0.9458	47	0.7532	72	0.6078	97	0.5091
23	0.9387	48	0.7463	73	0.6031	98	0.5059
24	0.9313	49	0.7394	74	0.5985	99	0.5027
25	0.9237	50	0.7326	75	0.5939	100	0.4995

Table 23. Distress Utility Factors for Punchouts for Detailed Pavement Type: 01.

Alpha: **0.9849** **How Rated: Total Number**

Beta: **1.0000**

Rho: **5.1400**

Number Per Mile	UTILITY VALUE	Number Per Mile	UTILITY VALUE	Number Per Mile	UTILITY VALUE	Number Per Mile	UTILITY VALUE
1	0.9942	26	0.1918	51	0.1095	76	0.0795
2	0.9246	27	0.1858	52	0.1078	77	0.0787
3	0.8225	28	0.1803	53	0.1061	78	0.0779
4	0.7275	29	0.1751	54	0.1045	79	0.0771
5	0.6477	30	0.1702	55	0.1030	80	0.0764
6	0.5818	31	0.1656	56	0.1015	81	0.0757
7	0.5274	32	0.1612	57	0.1000	82	0.0749
8	0.4820	33	0.1572	58	0.0986	83	0.0742
9	0.4436	34	0.1533	59	0.0973	84	0.0736
10	0.4109	35	0.1496	60	0.0960	85	0.0729
11	0.3828	36	0.1461	61	0.0947	86	0.0722
12	0.3582	37	0.1428	62	0.0935	87	0.0716
13	0.3367	38	0.1397	63	0.0923	88	0.0710
14	0.3177	39	0.1367	64	0.0911	89	0.0704
15	0.3008	40	0.1339	65	0.0900	90	0.0698
16	0.2857	41	0.1311	66	0.0889	91	0.0692
17	0.2721	42	0.1285	67	0.0878	92	0.0686
18	0.2598	43	0.1261	68	0.0868	93	0.0681
19	0.2485	44	0.1237	69	0.0858	94	0.0675
20	0.2383	45	0.1214	70	0.0848	95	0.0670
21	0.2289	46	0.1192	71	0.0839	96	0.0664
22	0.2203	47	0.1171	72	0.0830	97	0.0659
23	0.2123	48	0.1151	73	0.0821	98	0.0654
24	0.2050	49	0.1132	74	0.0812	99	0.0649
25	0.1981	50	0.1113	75	0.0803	100	0.0644

Table 24. Distress Utility Factors for Asphalt Patches for Detailed Pavement Type: 01.

Alpha: **0.9849** **How Rated: Total Number**

Beta: **1.0000**

Rho: **5.1400**

Number Per Mile	UTILITY VALUE	Number Per Mile	UTILITY VALUE	Number Per Mile	UTILITY VALUE	Number Per Mile	UTILITY VALUE
1	0.9942	26	0.1918	51	0.1095	76	0.0795
2	0.9246	27	0.1858	52	0.1078	77	0.0787
3	0.8225	28	0.1803	53	0.1061	78	0.0779
4	0.7275	29	0.1751	54	0.1045	79	0.0771
5	0.6477	30	0.1702	55	0.1030	80	0.0764
6	0.5818	31	0.1656	56	0.1015	81	0.0757
7	0.5274	32	0.1612	57	0.1000	82	0.0749
8	0.4820	33	0.1572	58	0.0986	83	0.0742
9	0.4436	34	0.1533	59	0.0973	84	0.0736
10	0.4109	35	0.1496	60	0.0960	85	0.0729
11	0.3828	36	0.1461	61	0.0947	86	0.0722
12	0.3582	37	0.1428	62	0.0935	87	0.0716
13	0.3367	38	0.1397	63	0.0923	88	0.0710
14	0.3177	39	0.1367	64	0.0911	89	0.0704
15	0.3008	40	0.1339	65	0.0900	90	0.0698
16	0.2857	41	0.1311	66	0.0889	91	0.0692
17	0.2721	42	0.1285	67	0.0878	92	0.0686
18	0.2598	43	0.1261	68	0.0868	93	0.0681
19	0.2485	44	0.1237	69	0.0858	94	0.0675
20	0.2383	45	0.1214	70	0.0848	95	0.0670
21	0.2289	46	0.1192	71	0.0839	96	0.0664
22	0.2203	47	0.1171	72	0.0830	97	0.0659
23	0.2123	48	0.1151	73	0.0821	98	0.0654
24	0.2050	49	0.1132	74	0.0812	99	0.0649
25	0.1981	50	0.1113	75	0.0803	100	0.0644

Table 25. Distress Utility Factors for Concrete Patches for Detailed Pavement Type: 01.

Alpha: 0.8649 **How Rated: Total Number**

Beta: 1.0000

Rho: 8.2000

Number Per Mile	UTILITY VALUE	Number Per Mile	UTILITY VALUE	Number Per Mile	UTILITY VALUE	Number Per Mile	UTILITY VALUE
1	0.9998	26	0.3690	51	0.2636	76	0.2236
2	0.9857	27	0.3616	52	0.2613	77	0.2225
3	0.9438	28	0.3547	53	0.2591	78	0.2214
4	0.8887	29	0.3481	54	0.2570	79	0.2204
5	0.8322	30	0.3420	55	0.2549	80	0.2194
6	0.7795	31	0.3361	56	0.2529	81	0.2184
7	0.7319	32	0.3306	57	0.2510	82	0.2174
8	0.6897	33	0.3254	58	0.2491	83	0.2165
9	0.6522	34	0.3204	59	0.2473	84	0.2155
10	0.6191	35	0.3157	60	0.2456	85	0.2146
11	0.5896	36	0.3113	61	0.2439	86	0.2138
12	0.5633	37	0.3070	62	0.2422	87	0.2129
13	0.5397	38	0.3030	63	0.2407	88	0.2121
14	0.5185	39	0.2991	64	0.2391	89	0.2112
15	0.4993	40	0.2954	65	0.2376	90	0.2104
16	0.4819	41	0.2919	66	0.2361	91	0.2096
17	0.4661	42	0.2885	67	0.2347	92	0.2089
18	0.4516	43	0.2853	68	0.2334	93	0.2081
19	0.4383	44	0.2822	69	0.2320	94	0.2074
20	0.4260	45	0.2792	70	0.2307	95	0.2066
21	0.4147	46	0.2763	71	0.2294	96	0.2059
22	0.4042	47	0.2736	72	0.2282	97	0.2052
23	0.3945	48	0.2709	73	0.2270	98	0.2045
24	0.3854	49	0.2684	74	0.2258	99	0.2039
25	0.3770	50	0.2659	75	0.2247	100	0.2032

Table 26. Distress Utility Factors for Failed Joints and Cracks for Detailed Pavement Type: 02.

Alpha: **0.5298** **How Rated: Total Number**

Beta: **1.0000**

Rho: **21.4000**

Percent Joints & Cracks Failed	UTILITY VALUE	Percent Joints & Cracks Failed	UTILITY VALUE	Percent Joints & Cracks Failed	UTILITY VALUE	Percent Joints & Cracks Failed	UTILITY VALUE
1	1.0000	26	0.7674	51	0.6518	76	0.6002
2	1.0000	27	0.7602	52	0.6489	77	0.5988
3	0.9996	28	0.7533	53	0.6462	78	0.5973
4	0.9975	29	0.7467	54	0.6435	79	0.5959
5	0.9927	30	0.7404	55	0.6410	80	0.5945
6	0.9850	31	0.7344	56	0.6385	81	0.5932
7	0.9751	32	0.7286	57	0.6360	82	0.5919
8	0.9635	33	0.7230	58	0.6337	83	0.5906
9	0.9509	34	0.7177	59	0.6314	84	0.5894
10	0.9377	35	0.7125	60	0.6291	85	0.5881
11	0.9243	36	0.7076	61	0.6270	86	0.5869
12	0.9110	37	0.7029	62	0.6248	87	0.5857
13	0.8979	38	0.6983	63	0.6228	88	0.5846
14	0.8851	39	0.6939	64	0.6208	89	0.5834
15	0.8728	40	0.6897	65	0.6188	90	0.5823
16	0.8609	41	0.6856	66	0.6169	91	0.5812
17	0.8495	42	0.6817	67	0.6151	92	0.5802
18	0.8386	43	0.6779	68	0.6132	93	0.5791
19	0.8282	44	0.6742	69	0.6115	94	0.5781
20	0.8183	45	0.6707	70	0.6098	95	0.5771
21	0.8088	46	0.6673	71	0.6081	96	0.5761
22	0.7997	47	0.6640	72	0.6064	97	0.5751
23	0.7911	48	0.6608	73	0.6048	98	0.5741
24	0.7828	49	0.6577	74	0.6032	99	0.5732
25	0.7749	50	0.6547	75	0.6017	100	0.5723

Table 27. Distress Utility Factors for JCP Failures for Detailed Pavement Type: 02.

Alpha: 1.4555 **How Rated: Total Number**

Beta: 1.0000

Rho: 22.1500

Number Per Mile	UTILITY VALUE	Number Per Mile	UTILITY VALUE	Number Per Mile	UTILITY VALUE	Number Per Mile	UTILITY VALUE
1	1.0000	26	0.3791	51	0.0573	76	-0.0875
2	1.0000	27	0.3592	52	0.0494	77	-0.0916
3	0.9991	28	0.3401	53	0.0417	78	-0.0957
4	0.9943	29	0.3219	54	0.0342	79	-0.0996
5	0.9827	30	0.3044	55	0.0270	80	-0.1035
6	0.9637	31	0.2876	56	0.0200	81	-0.1073
7	0.9385	32	0.2716	57	0.0132	82	-0.1110
8	0.9087	33	0.2561	58	0.0065	83	-0.1146
9	0.8758	34	0.2413	59	0.0001	84	-0.1181
10	0.8411	35	0.2270	60	-0.0062	85	-0.1216
11	0.8057	36	0.2133	61	-0.0123	86	-0.1250
12	0.7702	37	0.2001	62	-0.0183	87	-0.1283
13	0.7351	38	0.1874	63	-0.0240	88	-0.1316
14	0.7008	39	0.1752	64	-0.0297	89	-0.1348
15	0.6676	40	0.1634	65	-0.0352	90	-0.1380
16	0.6354	41	0.1520	66	-0.0405	91	-0.1410
17	0.6045	42	0.1410	67	-0.0458	92	-0.1441
18	0.5748	43	0.1304	68	-0.0509	93	-0.1470
19	0.5464	44	0.1202	69	-0.0558	94	-0.1499
20	0.5191	45	0.1103	70	-0.0607	95	-0.1528
21	0.4931	46	0.1007	71	-0.0654	96	-0.1556
22	0.4682	47	0.0915	72	-0.0701	97	-0.1584
23	0.4444	48	0.0825	73	-0.0746	98	-0.1611
24	0.4216	49	0.0738	74	-0.0790	99	-0.1637
25	0.3999	50	0.0654	75	-0.0833	100	-0.1663

Figure 28. Distress Utility Factors for Slabs with Longitudinal Cracks for Detailed Pavement Type: 02.

Alpha: 1.0058 **How Rated: Total Number**

Beta: 1.0000

Rho: 47.8000

Percent of Slabs with Long. Cracks	UTILITY VALUE	Percent of Slabs with Long. Cracks	UTILITY VALUE	Percent of Slabs with Long. Cracks	UTILITY VALUE	Percent of Slabs with Long. Cracks	UTILITY VALUE
1	1.0000	26	0.8400	51	0.6060	76	0.4638
2	1.0000	27	0.8287	52	0.5989	77	0.4594
3	1.0000	28	0.8176	53	0.5918	78	0.4550
4	1.0000	29	0.8065	54	0.5850	79	0.4508
5	0.9999	30	0.7956	55	0.5782	80	0.4466
6	0.9997	31	0.7848	56	0.5716	81	0.4425
7	0.9989	32	0.7742	57	0.5652	82	0.4385
8	0.9974	33	0.7637	58	0.5588	83	0.4345
9	0.9950	34	0.7534	59	0.5526	84	0.4307
10	0.9916	35	0.7433	60	0.5466	85	0.4268
11	0.9870	36	0.7334	61	0.5406	86	0.4231
12	0.9813	37	0.7237	62	0.5348	87	0.4194
13	0.9746	38	0.7141	63	0.5290	88	0.4157
14	0.9669	39	0.7047	64	0.5234	89	0.4122
15	0.9585	40	0.6955	65	0.5179	90	0.4086
16	0.9493	41	0.6865	66	0.5125	91	0.4052
17	0.9396	42	0.6777	67	0.5072	92	0.4018
18	0.9293	43	0.6691	68	0.5020	93	0.3984
19	0.9187	44	0.6606	69	0.4969	94	0.3951
20	0.9078	45	0.6523	70	0.4919	95	0.3919
21	0.8967	46	0.6442	71	0.4870	96	0.3887
22	0.8855	47	0.6362	72	0.4822	97	0.3855
23	0.8741	48	0.6284	73	0.4774	98	0.3824
24	0.8627	49	0.6208	74	0.4728	99	0.3794
25	0.8514	50	0.6133	75	0.4682	100	0.3764

Table 29. Distress Utility Factors for Shattered Slabs for Detailed Pavement Type: 02.

Alpha: 1.1710 **How Rated: Total Number**

Beta: 1.0000

Rho: 16.3100

Percent of Slabs Failed	UTILITY VALUE	Percent of Slabs Failed	UTILITY VALUE	Percent of Slabs Failed	UTILITY VALUE	Percent of Slabs Failed	UTILITY VALUE
1	1.0000	26	0.3747	51	0.1495	76	0.0552
2	0.9997	27	0.3600	52	0.1443	77	0.0525
3	0.9949	28	0.3460	53	0.1392	78	0.0500
4	0.9802	29	0.3327	54	0.1343	79	0.0474
5	0.9551	30	0.3201	55	0.1295	80	0.0450
6	0.9227	31	0.3081	56	0.1249	81	0.0426
7	0.8861	32	0.2966	57	0.1204	82	0.0402
8	0.8475	33	0.2857	58	0.1160	83	0.0379
9	0.8088	34	0.2752	59	0.1118	84	0.0357
10	0.7708	35	0.2652	60	0.1077	85	0.0335
11	0.7342	36	0.2556	61	0.1037	86	0.0313
12	0.6992	37	0.2464	62	0.0999	87	0.0292
13	0.6660	38	0.2377	63	0.0961	88	0.0271
14	0.6347	39	0.2292	64	0.0924	89	0.0251
15	0.6052	40	0.2211	65	0.0889	90	0.0231
16	0.5775	41	0.2133	66	0.0854	91	0.0211
17	0.5514	42	0.2058	67	0.0820	92	0.0192
18	0.5268	43	0.1986	68	0.0787	93	0.0174
19	0.5037	44	0.1917	69	0.0755	94	0.0155
20	0.4819	45	0.1850	70	0.0724	95	0.0137
21	0.4614	46	0.1786	71	0.0693	96	0.0120
22	0.4421	47	0.1723	72	0.0664	97	0.0102
23	0.4238	48	0.1663	73	0.0635	98	0.0085
24	0.4065	49	0.1605	74	0.0606	99	0.0069
25	0.3901	50	0.1549	75	0.0579	100	0.0052

Table 30. Distress Utility Factors for Concrete Patching for Detailed Pavement Type: 02.

Alpha: 1.0670 **How Rated: Total Number**

Beta: 1.0000

Rho: 24.2400

Number Per Mile	UTILITY VALUE	Number Per Mile	UTILITY VALUE	Number Per Mile	UTILITY VALUE	Number Per Mile	UTILITY VALUE
1	1.0000	26	0.5800	51	0.3366	76	0.2244
2	1.0000	27	0.5652	52	0.3306	77	0.2212
3	0.9997	28	0.5511	53	0.3246	78	0.2180
4	0.9975	29	0.5375	54	0.3189	79	0.2149
5	0.9916	30	0.5244	55	0.3133	80	0.2119
6	0.9812	31	0.5118	56	0.3079	81	0.2090
7	0.9666	32	0.4998	57	0.3026	82	0.2061
8	0.9484	33	0.4881	58	0.2975	83	0.2032
9	0.9278	34	0.4770	59	0.2925	84	0.2005
10	0.9055	35	0.4662	60	0.2876	85	0.1977
11	0.8822	36	0.4558	61	0.2829	86	0.1951
12	0.8585	37	0.4458	62	0.2783	87	0.1925
13	0.8347	38	0.4362	63	0.2738	88	0.1899
14	0.8111	39	0.4269	64	0.2694	89	0.1874
15	0.7880	40	0.4179	65	0.2651	90	0.1849
16	0.7655	41	0.4093	66	0.2610	91	0.1825
17	0.7436	42	0.4009	67	0.2569	92	0.1801
18	0.7225	43	0.3928	68	0.2529	93	0.1778
19	0.7021	44	0.3850	69	0.2491	94	0.1755
20	0.6825	45	0.3774	70	0.2453	95	0.1733
21	0.6636	46	0.3700	71	0.2416	96	0.1711
22	0.6455	47	0.3629	72	0.2380	97	0.1689
23	0.6281	48	0.3561	73	0.2345	98	0.1668
24	0.6114	49	0.3494	74	0.2310	99	0.1647
25	0.5954	50	0.3429	75	0.2277	100	0.1627

Table 31. Distress Utility Factors for Failed Joints and Cracks for Detailed Pavement Type: 03.

Alpha: **0.5298** **How Rated: Total Number**

Beta: **1.0000**

Rho: **21.4000**

Percent of Joints & Cracks Failed	UTILITY VALUE	Percent of Joints & Cracks Failed	UTILITY VALUE	Percent of Joints & Cracks Failed	UTILITY VALUE	Percent of Joints & Cracks Failed	UTILITY VALUE
1	1.0000	26	0.7674	51	0.6518	76	0.6002
2	1.0000	27	0.7602	52	0.6489	77	0.5988
3	0.9996	28	0.7533	53	0.6462	78	0.5973
4	0.9975	29	0.7467	54	0.6435	79	0.5959
5	0.9927	30	0.7404	55	0.6410	80	0.5945
6	0.9850	31	0.7344	56	0.6385	81	0.5932
7	0.9751	32	0.7286	57	0.6360	82	0.5919
8	0.9635	33	0.7230	58	0.6337	83	0.5906
9	0.9509	34	0.7177	59	0.6314	84	0.5894
10	0.9377	35	0.7125	60	0.6291	85	0.5881
11	0.9243	36	0.7076	61	0.6270	86	0.5869
12	0.9110	37	0.7029	62	0.6248	87	0.5857
13	0.8979	38	0.6983	63	0.6228	88	0.5846
14	0.8851	39	0.6939	64	0.6208	89	0.5834
15	0.8728	40	0.6897	65	0.6188	90	0.5823
16	0.8609	41	0.6856	66	0.6169	91	0.5812
17	0.8495	42	0.6817	67	0.6151	92	0.5802
18	0.8386	43	0.6779	68	0.6132	93	0.5791
19	0.8282	44	0.6742	69	0.6115	94	0.5781
20	0.8183	45	0.6707	70	0.6098	95	0.5771
21	0.8088	46	0.6673	71	0.6081	96	0.5761
22	0.7997	47	0.6640	72	0.6064	97	0.5751
23	0.7911	48	0.6608	73	0.6048	98	0.5741
24	0.7828	49	0.6577	74	0.6032	99	0.5732
25	0.7749	50	0.6547	75	0.6017	100	0.5723

Table 32. Distress Utility Factors for JCP Failures for Detailed Pavement Type: 03.

Alpha: 1.4555 **How Rated: Total Number**

Beta: 1.0000

Rho: 22.1500

Number Per Mile	UTILITY VALUE	Number Per Mile	UTILITY VALUE	Number Per Mile	UTILITY VALUE	Number Per Mile	UTILITY VALUE
1	1.0000	26	0.3791	51	0.0573	76	-0.0875
2	1.0000	27	0.3592	52	0.0494	77	-0.0916
3	0.9991	28	0.3401	53	0.0417	78	-0.0957
4	0.9943	29	0.3219	54	0.0342	79	-0.0996
5	0.9827	30	0.3044	55	0.0270	80	-0.1035
6	0.9637	31	0.2876	56	0.0200	81	-0.1073
7	0.9385	32	0.2716	57	0.0132	82	-0.1110
8	0.9087	33	0.2561	58	0.0065	83	-0.1146
9	0.8758	34	0.2413	59	0.0001	84	-0.1181
10	0.8411	35	0.2270	60	-0.0062	85	-0.1216
11	0.8057	36	0.2133	61	-0.0123	86	-0.1250
12	0.7702	37	0.2001	62	-0.0183	87	-0.1283
13	0.7351	38	0.1874	63	-0.0240	88	-0.1316
14	0.7008	39	0.1752	64	-0.0297	89	-0.1348
15	0.6676	40	0.1634	65	-0.0352	90	-0.1380
16	0.6354	41	0.1520	66	-0.0405	91	-0.1410
17	0.6045	42	0.1410	67	-0.0458	92	-0.1441
18	0.5748	43	0.1304	68	-0.0509	93	-0.1470
19	0.5464	44	0.1202	69	-0.0558	94	-0.1499
20	0.5191	45	0.1103	70	-0.0607	95	-0.1528
21	0.4931	46	0.1007	71	-0.0654	96	-0.1556
22	0.4682	47	0.0915	72	-0.0701	97	-0.1584
23	0.4444	48	0.0825	73	-0.0746	98	-0.1611
24	0.4216	49	0.0738	74	-0.0790	99	-0.1637
25	0.3999	50	0.0654	75	-0.0833	100	-0.1663

Table 33. Distress Utility Factors for Shattered Slabs for Detailed Pavement Type: 03.

Alpha: 1.1710 **How Rated:** Total Number

Beta: 1.0000

Rho: 16.3100

Percent of Slabs Failed	UTILITY VALUE	Percent of Slabs Failed	UTILITY VALUE	Percent of Slabs Failed	UTILITY VALUE	Percent of Slabs Failed	UTILITY VALUE
1	1.0000	26	0.3747	51	0.1495	76	0.0552
2	0.9997	27	0.3600	52	0.1443	77	0.0525
3	0.9949	28	0.3460	53	0.1392	78	0.0500
4	0.9802	29	0.3327	54	0.1343	79	0.0474
5	0.9551	30	0.3201	55	0.1295	80	0.0450
6	0.9227	31	0.3081	56	0.1249	81	0.0426
7	0.8861	32	0.2966	57	0.1204	82	0.0402
8	0.8475	33	0.2857	58	0.1160	83	0.0379
9	0.8088	34	0.2752	59	0.1118	84	0.0357
10	0.7708	35	0.2652	60	0.1077	85	0.0335
11	0.7342	36	0.2556	61	0.1037	86	0.0313
12	0.6992	37	0.2464	62	0.0999	87	0.0292
13	0.6660	38	0.2377	63	0.0961	88	0.0271
14	0.6347	39	0.2292	64	0.0924	89	0.0251
15	0.6052	40	0.2211	65	0.0889	90	0.0231
16	0.5775	41	0.2133	66	0.0854	91	0.0211
17	0.5514	42	0.2058	67	0.0820	92	0.0192
18	0.5268	43	0.1986	68	0.0787	93	0.0174
19	0.5037	44	0.1917	69	0.0755	94	0.0155
20	0.4819	45	0.1850	70	0.0724	95	0.0137
21	0.4614	46	0.1786	71	0.0693	96	0.0120
22	0.4421	47	0.1723	72	0.0664	97	0.0102
23	0.4238	48	0.1663	73	0.0635	98	0.0085
24	0.4065	49	0.1605	74	0.0606	99	0.0069
25	0.3901	50	0.1549	75	0.0579	100	0.0052

Table 34. Distress Utility Factors for Slabs with Longitudinal Cracks for Detailed Pavement Type: 03.

Alpha: **1.0058** **How Rated: Total Number**

Beta: **1.0000**

Rho: **47.8000**

Percent of Slabs with Long. Cracks	UTILITY VALUE	Percent of Slabs with Long. Cracks	UTILITY VALUE	Percent of Slabs with Long. Cracks	UTILITY VALUE	Percent of Slabs with Long. Cracks	UTILITY VALUE
1	1.0000	26	0.8400	51	0.6060	76	0.4638
2	1.0000	27	0.8287	52	0.5989	77	0.4594
3	1.0000	28	0.8176	53	0.5918	78	0.4550
4	1.0000	29	0.8065	54	0.5850	79	0.4508
5	0.9999	30	0.7956	55	0.5782	80	0.4466
6	0.9997	31	0.7848	56	0.5716	81	0.4425
7	0.9989	32	0.7742	57	0.5652	82	0.4385
8	0.9974	33	0.7637	58	0.5588	83	0.4345
9	0.9950	34	0.7534	59	0.5526	84	0.4307
10	0.9916	35	0.7433	60	0.5466	85	0.4268
11	0.9870	36	0.7334	61	0.5406	86	0.4231
12	0.9813	37	0.7237	62	0.5348	87	0.4194
13	0.9746	38	0.7141	63	0.5290	88	0.4157
14	0.9669	39	0.7047	64	0.5234	89	0.4122
15	0.9585	40	0.6955	65	0.5179	90	0.4086
16	0.9493	41	0.6865	66	0.5125	91	0.4052
17	0.9396	42	0.6777	67	0.5072	92	0.4018
18	0.9293	43	0.6691	68	0.5020	93	0.3984
19	0.9187	44	0.6606	69	0.4969	94	0.3951
20	0.9078	45	0.6523	70	0.4919	95	0.3919
21	0.8967	46	0.6442	71	0.4870	96	0.3887
22	0.8855	47	0.6362	72	0.4822	97	0.3855
23	0.8741	48	0.6284	73	0.4774	98	0.3824
24	0.8627	49	0.6208	74	0.4728	99	0.3794
25	0.8514	50	0.6133	75	0.4682	100	0.3764

Table 35. Distress Utility Factors for Concrete Patching for Detailed Pavement Type: 03.

Alpha: 1.0670 **How Rated: Total Number**

Beta: 1.0000

Rho: 24.2400

Number Per Mile	UTILITY VALUE	Number Per Mile	UTILITY VALUE	Number Per Mile	UTILITY VALUE	Number Per Mile	UTILITY VALUE
1	1.0000	26	0.5800	51	0.3366	76	0.2244
2	1.0000	27	0.5652	52	0.3306	77	0.2212
3	0.9997	28	0.5511	53	0.3246	78	0.2180
4	0.9975	29	0.5375	54	0.3189	79	0.2149
5	0.9916	30	0.5244	55	0.3133	80	0.2119
6	0.9812	31	0.5118	56	0.3079	81	0.2090
7	0.9666	32	0.4998	57	0.3026	82	0.2061
8	0.9484	33	0.4881	58	0.2975	83	0.2032
9	0.9278	34	0.4770	59	0.2925	84	0.2005
10	0.9055	35	0.4662	60	0.2876	85	0.1977
11	0.8822	36	0.4558	61	0.2829	86	0.1951
12	0.8585	37	0.4458	62	0.2783	87	0.1925
13	0.8347	38	0.4362	63	0.2738	88	0.1899
14	0.8111	39	0.4269	64	0.2694	89	0.1874
15	0.7880	40	0.4179	65	0.2651	90	0.1849
16	0.7655	41	0.4093	66	0.2610	91	0.1825
17	0.7436	42	0.4009	67	0.2569	92	0.1801
18	0.7225	43	0.3928	68	0.2529	93	0.1778
19	0.7021	44	0.3850	69	0.2491	94	0.1755
20	0.6825	45	0.3774	70	0.2453	95	0.1733
21	0.6636	46	0.3700	71	0.2416	96	0.1711
22	0.6455	47	0.3629	72	0.2380	97	0.1689
23	0.6281	48	0.3561	73	0.2345	98	0.1668
24	0.6114	49	0.3494	74	0.2310	99	0.1647
25	0.5954	50	0.3429	75	0.2277	100	0.1627

Table 36. Distress Utility Factors for Shallow Rutting for Detailed Pavement Type: 04.

Alpha: **0.3100** **How Rated: Percent of wheelpath length**

Beta: **1.0000**

Rho: **19.7200**

Percent of Wheelpath Length	UTILITY VALUE	Percent of Wheelpath Length	UTILITY VALUE	Percent of Wheelpath Length	UTILITY VALUE	Percent of Wheelpath Length	UTILITY VALUE
1	1.0000	26	0.8548	51	0.7894	76	0.7608
2	1.0000	27	0.8507	52	0.7878	77	0.7600
3	0.9996	28	0.8467	53	0.7863	78	0.7593
4	0.9978	29	0.8429	54	0.7848	79	0.7585
5	0.9940	30	0.8393	55	0.7834	80	0.7577
6	0.9884	31	0.8359	56	0.7820	81	0.7570
7	0.9815	32	0.8326	57	0.7807	82	0.7563
8	0.9736	33	0.8295	58	0.7794	83	0.7556
9	0.9653	34	0.8264	59	0.7781	84	0.7549
10	0.9569	35	0.8235	60	0.7768	85	0.7542
11	0.9484	36	0.8207	61	0.7756	86	0.7535
12	0.9401	37	0.8181	62	0.7745	87	0.7529
13	0.9320	38	0.8155	63	0.7733	88	0.7522
14	0.9242	39	0.8130	64	0.7722	89	0.7516
15	0.9167	40	0.8107	65	0.7711	90	0.7510
16	0.9096	41	0.8084	66	0.7701	91	0.7504
17	0.9028	42	0.8062	67	0.7690	92	0.7498
18	0.8964	43	0.8040	68	0.7680	93	0.7492
19	0.8902	44	0.8020	69	0.7671	94	0.7487
20	0.8843	45	0.8000	70	0.7661	95	0.7481
21	0.8788	46	0.7981	71	0.7652	96	0.7476
22	0.8735	47	0.7962	72	0.7643	97	0.7470
23	0.8685	48	0.7944	73	0.7634	98	0.7465
24	0.8637	49	0.7927	74	0.7625	99	0.7460
25	0.8591	50	0.7910	75	0.7617	100	0.7455

Table 37. Distress Utility Factors for Deep Rutting for Detailed Pavement Type: 04.

Alpha: **0.6900** **How Rated: Percent of wheelpath length**

Beta: **1.0000**

Rho: **16.2700**

Percent of Wheelpath Length	UTILITY VALUE	Percent of Wheelpath Length	UTILITY VALUE	Percent of Wheelpath Length	UTILITY VALUE	Percent of Wheelpath Length	UTILITY VALUE
1	1.0000	26	0.6310	51	0.4985	76	0.4430
2	0.9998	27	0.6223	52	0.4954	77	0.4414
3	0.9970	28	0.6141	53	0.4924	78	0.4399
4	0.9882	29	0.6063	54	0.4895	79	0.4384
5	0.9734	30	0.5988	55	0.4867	80	0.4370
6	0.9542	31	0.5918	56	0.4840	81	0.4356
7	0.9325	32	0.5850	57	0.4813	82	0.4342
8	0.9097	33	0.5786	58	0.4788	83	0.4328
9	0.8868	34	0.5724	59	0.4763	84	0.4315
10	0.8644	35	0.5665	60	0.4739	85	0.4302
11	0.8428	36	0.5609	61	0.4715	86	0.4289
12	0.8222	37	0.5555	62	0.4693	87	0.4277
13	0.8026	38	0.5503	63	0.4670	88	0.4265
14	0.7842	39	0.5454	64	0.4649	89	0.4253
15	0.7668	40	0.5406	65	0.4628	90	0.4241
16	0.7504	41	0.5360	66	0.4608	91	0.4230
17	0.7350	42	0.5316	67	0.4588	92	0.4218
18	0.7206	43	0.5274	68	0.4568	93	0.4207
19	0.7069	44	0.5233	69	0.4549	94	0.4197
20	0.6941	45	0.5194	70	0.4531	95	0.4186
21	0.6820	46	0.5156	71	0.4513	96	0.4176
22	0.6706	47	0.5119	72	0.4496	97	0.4165
23	0.6599	48	0.5084	73	0.4479	98	0.4156
24	0.6497	49	0.5050	74	0.4462	99	0.4146
25	0.6401	50	0.5017	75	0.4446	100	0.4136

Table 38. Distress Utility Factors for Patching for Detailed Pavement Type: 04.

Alpha: **0.4500** **How Rated: Percent of lane area**

Beta: **1.0000**

Rho: **10.1500**

Percent of Lane Area	UTILITY VALUE	Percent of Lane Area	UTILITY VALUE	Percent of Lane Area	UTILITY VALUE	Percent of Lane Area	UTILITY VALUE
1	1.0000	26	0.6954	51	0.6312	76	0.6063
2	0.9972	27	0.6910	52	0.6298	77	0.6056
3	0.9847	28	0.6868	53	0.6284	78	0.6049
4	0.9644	29	0.6829	54	0.6271	79	0.6043
5	0.9409	30	0.6792	55	0.6258	80	0.6036
6	0.9171	31	0.6756	56	0.6246	81	0.6030
7	0.8944	32	0.6723	57	0.6234	82	0.6024
8	0.8735	33	0.6691	58	0.6222	83	0.6018
9	0.8543	34	0.6661	59	0.6211	84	0.6012
10	0.8369	35	0.6633	60	0.6200	85	0.6007
11	0.8212	36	0.6606	61	0.6190	86	0.6001
12	0.8069	37	0.6580	62	0.6180	87	0.5996
13	0.7939	38	0.6555	63	0.6170	88	0.5990
14	0.7821	39	0.6531	64	0.6160	89	0.5985
15	0.7713	40	0.6509	65	0.6151	90	0.5980
16	0.7614	41	0.6487	66	0.6141	91	0.5975
17	0.7523	42	0.6466	67	0.6133	92	0.5970
18	0.7440	43	0.6446	68	0.6124	93	0.5965
19	0.7362	44	0.6427	69	0.6116	94	0.5961
20	0.7291	45	0.6409	70	0.6107	95	0.5956
21	0.7225	46	0.6391	71	0.6099	96	0.5951
22	0.7163	47	0.6374	72	0.6092	97	0.5947
23	0.7106	48	0.6358	73	0.6084	98	0.5943
24	0.7052	49	0.6342	74	0.6077	99	0.5939
25	0.7002	50	0.6327	75	0.6070	100	0.5934

Table 39. Distress Utility Factors for Failures for Detailed Pavement Type: 04.

Alpha: 1.0000 **How Rated: Total Number**

Beta: 1.0000

Rho: 4.7000

Number Per Mile	UTILITY VALUE	Number Per Mile	UTILITY VALUE	Number Per Mile	UTILITY VALUE	Number Per Mile	UTILITY VALUE
1	0.9909	26	0.1654	51	0.0880	76	0.0600
2	0.9046	27	0.1598	52	0.0864	77	0.0592
3	0.7913	28	0.1545	53	0.0849	78	0.0585
4	0.6912	29	0.1496	54	0.0834	79	0.0578
5	0.6094	30	0.1450	55	0.0819	80	0.0571
6	0.5431	31	0.1407	56	0.0805	81	0.0564
7	0.4890	32	0.1366	57	0.0791	82	0.0557
8	0.4443	33	0.1327	58	0.0778	83	0.0551
9	0.4068	34	0.1291	59	0.0766	84	0.0544
10	0.3750	35	0.1257	60	0.0753	85	0.0538
11	0.3477	36	0.1224	61	0.0742	86	0.0532
12	0.3241	37	0.1193	62	0.0730	87	0.0526
13	0.3034	38	0.1163	63	0.0719	88	0.0520
14	0.2852	39	0.1135	64	0.0708	89	0.0514
15	0.2690	40	0.1109	65	0.0698	90	0.0509
16	0.2545	41	0.1083	66	0.0687	91	0.0503
17	0.2415	42	0.1059	67	0.0677	92	0.0498
18	0.2298	43	0.1035	68	0.0668	93	0.0493
19	0.2191	44	0.1013	69	0.0658	94	0.0488
20	0.2094	45	0.0992	70	0.0649	95	0.0483
21	0.2005	46	0.0971	71	0.0641	96	0.0478
22	0.1924	47	0.0952	72	0.0632	97	0.0473
23	0.1848	48	0.0933	73	0.0624	98	0.0468
24	0.1779	49	0.0915	74	0.0615	99	0.0464
25	0.1714	50	0.0897	75	0.0607	100	0.0459

Table 40. Distress Utility Factors for Block Cracking for Detailed Pavement Type: 04.

Alpha: **0.4900** **How Rated: Percent of lane area**

Beta: **1.0000**

Rho: **9.7800**

Percent of Lane Area	UTILITY VALUE	Percent of Lane Area	UTILITY VALUE	Percent of Lane Area	UTILITY VALUE	Percent of Lane Area	UTILITY VALUE
1	1.0000	26	0.6636	51	0.5955	76	0.5692
2	0.9963	27	0.6589	52	0.5940	77	0.5684
3	0.9812	28	0.6545	53	0.5926	78	0.5677
4	0.9575	29	0.6503	54	0.5912	79	0.5671
5	0.9307	30	0.6463	55	0.5898	80	0.5664
6	0.9040	31	0.6426	56	0.5885	81	0.5657
7	0.8788	32	0.6390	57	0.5873	82	0.5651
8	0.8557	33	0.6357	58	0.5860	83	0.5645
9	0.8347	34	0.6325	59	0.5848	84	0.5639
10	0.8157	35	0.6295	60	0.5837	85	0.5633
11	0.7986	36	0.6266	61	0.5826	86	0.5627
12	0.7831	37	0.6238	62	0.5815	87	0.5621
13	0.7691	38	0.6212	63	0.5805	88	0.5615
14	0.7563	39	0.6187	64	0.5794	89	0.5610
15	0.7447	40	0.6163	65	0.5784	90	0.5605
16	0.7341	41	0.6140	66	0.5775	91	0.5599
17	0.7244	42	0.6118	67	0.5766	92	0.5594
18	0.7154	43	0.6097	68	0.5756	93	0.5589
19	0.7071	44	0.6077	69	0.5748	94	0.5584
20	0.6995	45	0.6057	70	0.5739	95	0.5579
21	0.6924	46	0.6038	71	0.5731	96	0.5575
22	0.6859	47	0.6021	72	0.5722	97	0.5570
23	0.6797	48	0.6003	73	0.5714	98	0.5565
24	0.6740	49	0.5987	74	0.5707	99	0.5561
25	0.6686	50	0.5971	75	0.5699	100	0.5557

Table 41. Distress Utility Factors for Alligator Cracking for Detailed Pavement Type: 04.

Alpha: 0.5300 **How Rated: Percent of wheelpath length**

Beta: 1.0000

Rho: 8.0100

Percent of Wheelpath Length	UTILITY VALUE	Percent of Wheelpath Length	UTILITY VALUE	Percent of Wheelpath Length	UTILITY VALUE	Percent of Wheelpath Length	UTILITY VALUE
1	0.9998	26	0.6105	51	0.5470	76	0.5230
2	0.9903	27	0.6061	52	0.5457	77	0.5224
3	0.9633	28	0.6019	53	0.5443	78	0.5217
4	0.9285	29	0.5979	54	0.5431	79	0.5211
5	0.8932	30	0.5942	55	0.5418	80	0.5205
6	0.8605	31	0.5907	56	0.5406	81	0.5199
7	0.8312	32	0.5874	57	0.5395	82	0.5193
8	0.8053	33	0.5842	58	0.5384	83	0.5188
9	0.7824	34	0.5812	59	0.5373	84	0.5182
10	0.7621	35	0.5784	60	0.5362	85	0.5177
11	0.7441	36	0.5757	61	0.5352	86	0.5171
12	0.7281	37	0.5732	62	0.5342	87	0.5166
13	0.7138	38	0.5707	63	0.5333	88	0.5161
14	0.7009	39	0.5684	64	0.5323	89	0.5156
15	0.6893	40	0.5662	65	0.5314	90	0.5151
16	0.6787	41	0.5641	66	0.5306	91	0.5147
17	0.6691	42	0.5620	67	0.5297	92	0.5142
18	0.6604	43	0.5601	68	0.5289	93	0.5137
19	0.6523	44	0.5582	69	0.5281	94	0.5133
20	0.6449	45	0.5564	70	0.5273	95	0.5129
21	0.6381	46	0.5547	71	0.5265	96	0.5124
22	0.6317	47	0.5530	72	0.5258	97	0.5120
23	0.6259	48	0.5515	73	0.5251	98	0.5116
24	0.6204	49	0.5499	74	0.5244	99	0.5112
25	0.6153	50	0.5485	75	0.5237	100	0.5108

Table 42. Distress Utility Factors for Longitudinal Cracking for Detailed Pavement Type: 04.

Alpha: **0.8700** **How Rated: Length per 100' station**

Beta: **1.0000**

Rho: **184.0000**

Length Per Station	UTILITY VALUE	Length Per Station	UTILITY VALUE	Length Per Station	UTILITY VALUE	Length Per Station	UTILITY VALUE
5	1.0000	130	0.7887	255	0.5772	380	0.4639
10	1.0000	135	0.7774	260	0.5713	385	0.4605
15	1.0000	140	0.7663	265	0.5655	390	0.4572
20	0.9999	145	0.7554	270	0.5599	395	0.4540
25	0.9994	150	0.7449	275	0.5544	400	0.4508
30	0.9981	155	0.7346	280	0.5491	405	0.4477
35	0.9955	160	0.7245	285	0.5438	410	0.4446
40	0.9913	165	0.7148	290	0.5387	415	0.4416
45	0.9854	170	0.7052	295	0.5337	420	0.4386
50	0.9781	175	0.6960	300	0.5289	425	0.4357
55	0.9693	180	0.6870	305	0.5241	430	0.4329
60	0.9595	185	0.6782	310	0.5194	435	0.4301
65	0.9487	190	0.6697	315	0.5149	440	0.4273
70	0.9372	195	0.6614	320	0.5104	445	0.4246
75	0.9252	200	0.6533	325	0.5061	450	0.4220
80	0.9128	205	0.6454	330	0.5018	455	0.4194
85	0.9001	210	0.6378	335	0.4977	460	0.4168
90	0.8874	215	0.6303	340	0.4936	465	0.4143
95	0.8746	220	0.6230	345	0.4896	470	0.4118
100	0.8618	225	0.6160	350	0.4857	475	0.4094
105	0.8492	230	0.6091	355	0.4819	480	0.4070
110	0.8367	235	0.6024	360	0.4781	485	0.4047
115	0.8244	240	0.5958	365	0.4745	490	0.4024
120	0.8122	245	0.5895	370	0.4709	495	0.4001
125	0.8004	250	0.5832	375	0.4674	500	0.3979

Table 43. Distress Utility Factors for Transverse Cracking for Detailed Pavement Type: 04.

Alpha: 0.6900 **How Rated: Number per 100' station**

Beta: 1.0000

Rho: 10.3900

Number Per Station	UTILITY VALUE	Number Per Station	UTILITY VALUE	Number Per Station	UTILITY VALUE	Number Per Station	UTILITY VALUE
1	1.0000	26	0.5373	51	0.4372	76	0.0000
2	0.9962	27	0.5304	52	0.4350	77	0.3971
3	0.9784	28	0.5239	53	0.4328	78	0.3961
4	0.9486	29	0.5178	54	0.4308	79	0.3950
5	0.9136	30	0.5120	55	0.4288	80	0.3940
6	0.8779	31	0.5065	56	0.4268	81	0.3931
7	0.8436	32	0.5013	57	0.4250	82	0.3921
8	0.8117	33	0.4964	58	0.4232	83	0.3912
9	0.7825	34	0.4917	59	0.4214	84	0.3903
10	0.7559	35	0.4872	60	0.4197	85	0.3894
11	0.7317	36	0.4830	61	0.4181	86	0.3885
12	0.7097	37	0.4789	62	0.4165	87	0.3877
13	0.6897	38	0.4751	63	0.4149	88	0.3868
14	0.6715	39	0.4714	64	0.4134	89	0.3860
15	0.6548	40	0.4678	65	0.4119	90	0.3852
16	0.6396	41	0.4645	66	0.4105	91	0.3845
17	0.6255	42	0.4612	67	0.4091	92	0.3837
18	0.6126	43	0.4581	68	0.4078	93	0.3829
19	0.6006	44	0.4551	69	0.4065	94	0.3822
20	0.5896	45	0.4523	70	0.4052	95	0.3815
21	0.5793	46	0.4495	71	0.4039	96	0.3808
22	0.5697	47	0.4469	72	0.4027	97	0.3801
23	0.5608	48	0.4443	73	0.4015	98	0.3794
24	0.5525	49	0.4418	74	0.4004	99	0.3787
25	0.5446	50	0.4395	75	0.3993	100	0.3781

Table 44. Distress Utility Factors for Shallow Rutting for Detailed Pavement Type: 05.

Alpha: **0.3100** **How Rated: Percent of wheelpath length**

Beta: **1.0000**

Rho: **19.7200**

Percent of Wheelpath Length	UTILITY VALUE	Percent of Wheelpath Length	UTILITY VALUE	Percent of Wheelpath Length	UTILITY VALUE	Percent of Wheelpath Length	UTILITY VALUE
1	1.0000	26	0.8548	51	0.7894	76	0.0000
2	1.0000	27	0.8507	52	0.7878	77	0.7600
3	0.9996	28	0.8467	53	0.7863	78	0.7593
4	0.9978	29	0.8429	54	0.7848	79	0.7585
5	0.9940	30	0.8393	55	0.7834	80	0.7577
6	0.9884	31	0.8359	56	0.7820	81	0.7570
7	0.9815	32	0.8326	57	0.7807	82	0.7563
8	0.9736	33	0.8295	58	0.7794	83	0.7556
9	0.9653	34	0.8264	59	0.7781	84	0.7549
10	0.9569	35	0.8235	60	0.7768	85	0.7542
11	0.9484	36	0.8207	61	0.7756	86	0.7535
12	0.9401	37	0.8181	62	0.7745	87	0.7529
13	0.9320	38	0.8155	63	0.7733	88	0.7522
14	0.9242	39	0.8130	64	0.7722	89	0.7516
15	0.9167	40	0.8107	65	0.7711	90	0.7510
16	0.9096	41	0.8084	66	0.7701	91	0.7504
17	0.9028	42	0.8062	67	0.7690	92	0.7498
18	0.8964	43	0.8040	68	0.7680	93	0.7492
19	0.8902	44	0.8020	69	0.7671	94	0.7487
20	0.8843	45	0.8000	70	0.7661	95	0.7481
21	0.8788	46	0.7981	71	0.7652	96	0.7476
22	0.8735	47	0.7962	72	0.7643	97	0.7470
23	0.8685	48	0.7944	73	0.7634	98	0.7465
24	0.8637	49	0.7927	74	0.7625	99	0.7460
25	0.8591	50	0.7910	75	0.7617	100	0.7455

Table 45. Distress Utility Factors for Deep Rutting for Detailed Pavement Type: 05.

Alpha: **0.6900** **How Rated: Percent of wheelpath length**

Beta: **1.0000**

Rho: **16.2700**

Percent of Wheelpath Length	UTILITY VALUE	Percent of Wheelpath Length	UTILITY VALUE	Percent of Wheelpath Length	UTILITY VALUE	Percent of Wheelpath Length	UTILITY VALUE
1	1.0000	26	0.6310	51	0.4985	76	0.0000
2	0.9998	27	0.6223	52	0.4954	77	0.4414
3	0.9970	28	0.6141	53	0.4924	78	0.4399
4	0.9882	29	0.6063	54	0.4895	79	0.4384
5	0.9734	30	0.5988	55	0.4867	80	0.4370
6	0.9542	31	0.5918	56	0.4840	81	0.4356
7	0.9325	32	0.5850	57	0.4813	82	0.4342
8	0.9097	33	0.5786	58	0.4788	83	0.4328
9	0.8868	34	0.5724	59	0.4763	84	0.4315
10	0.8644	35	0.5665	60	0.4739	85	0.4302
11	0.8428	36	0.5609	61	0.4715	86	0.4289
12	0.8222	37	0.5555	62	0.4693	87	0.4277
13	0.8026	38	0.5503	63	0.4670	88	0.4265
14	0.7842	39	0.5454	64	0.4649	89	0.4253
15	0.7668	40	0.5406	65	0.4628	90	0.4241
16	0.7504	41	0.5360	66	0.4608	91	0.4230
17	0.7350	42	0.5316	67	0.4588	92	0.4218
18	0.7206	43	0.5274	68	0.4568	93	0.4207
19	0.7069	44	0.5233	69	0.4549	94	0.4197
20	0.6941	45	0.5194	70	0.4531	95	0.4186
21	0.6820	46	0.5156	71	0.4513	96	0.4176
22	0.6706	47	0.5119	72	0.4496	97	0.4165
23	0.6599	48	0.5084	73	0.4479	98	0.4156
24	0.6497	49	0.5050	74	0.4462	99	0.4146
25	0.6401	50	0.5017	75	0.4446	100	0.4136

Table 46. Distress Utility Factors for Patching for Detailed Pavement Type: 05.

Alpha: 0.4500 **How Rated: Percent of lane area**

Beta: 1.0000

Rho: 10.1500

Percent of Lane Area	UTILITY VALUE	Percent of Lane Area	UTILITY VALUE	Percent of Lane Area	UTILITY VALUE	Percent of Lane Area	UTILITY VALUE
1	1.0000	26	0.6954	51	0.6312	76	0.0000
2	0.9972	27	0.6910	52	0.6298	77	0.6056
3	0.9847	28	0.6868	53	0.6284	78	0.6049
4	0.9644	29	0.6829	54	0.6271	79	0.6043
5	0.9409	30	0.6792	55	0.6258	80	0.6036
6	0.9171	31	0.6756	56	0.6246	81	0.6030
7	0.8944	32	0.6723	57	0.6234	82	0.6024
8	0.8735	33	0.6691	58	0.6222	83	0.6018
9	0.8543	34	0.6661	59	0.6211	84	0.6012
10	0.8369	35	0.6633	60	0.6200	85	0.6007
11	0.8212	36	0.6606	61	0.6190	86	0.6001
12	0.8069	37	0.6580	62	0.6180	87	0.5996
13	0.7939	38	0.6555	63	0.6170	88	0.5990
14	0.7821	39	0.6531	64	0.6160	89	0.5985
15	0.7713	40	0.6509	65	0.6151	90	0.5980
16	0.7614	41	0.6487	66	0.6141	91	0.5975
17	0.7523	42	0.6466	67	0.6133	92	0.5970
18	0.7440	43	0.6446	68	0.6124	93	0.5965
19	0.7362	44	0.6427	69	0.6116	94	0.5961
20	0.7291	45	0.6409	70	0.6107	95	0.5956
21	0.7225	46	0.6391	71	0.6099	96	0.5951
22	0.7163	47	0.6374	72	0.6092	97	0.5947
23	0.7106	48	0.6358	73	0.6084	98	0.5943
24	0.7052	49	0.6342	74	0.6077	99	0.5939
25	0.7002	50	0.6327	75	0.6070	100	0.5934

Table 47. Distress Utility Factors for Failures for Detailed Pavement Type: 05.

Alpha: 1.0000 **How Rated: Total Number**

Beta: 1.0000

Rho: 4.7000

Number Per Mile	UTILITY VALUE	Number Per Mile	UTILITY VALUE	Number Per Mile	UTILITY VALUE	Number Per Mile	UTILITY VALUE
1	0.9909	26	0.1654	51	0.0880	76	0.0000
2	0.9046	27	0.1598	52	0.0864	77	0.0592
3	0.7913	28	0.1545	53	0.0849	78	0.0585
4	0.6912	29	0.1496	54	0.0834	79	0.0578
5	0.6094	30	0.1450	55	0.0819	80	0.0571
6	0.5431	31	0.1407	56	0.0805	81	0.0564
7	0.4890	32	0.1366	57	0.0791	82	0.0557
8	0.4443	33	0.1327	58	0.0778	83	0.0551
9	0.4068	34	0.1291	59	0.0766	84	0.0544
10	0.3750	35	0.1257	60	0.0753	85	0.0538
11	0.3477	36	0.1224	61	0.0742	86	0.0532
12	0.3241	37	0.1193	62	0.0730	87	0.0526
13	0.3034	38	0.1163	63	0.0719	88	0.0520
14	0.2852	39	0.1135	64	0.0708	89	0.0514
15	0.2690	40	0.1109	65	0.0698	90	0.0509
16	0.2545	41	0.1083	66	0.0687	91	0.0503
17	0.2415	42	0.1059	67	0.0677	92	0.0498
18	0.2298	43	0.1035	68	0.0668	93	0.0493
19	0.2191	44	0.1013	69	0.0658	94	0.0488
20	0.2094	45	0.0992	70	0.0649	95	0.0483
21	0.2005	46	0.0971	71	0.0641	96	0.0478
22	0.1924	47	0.0952	72	0.0632	97	0.0473
23	0.1848	48	0.0933	73	0.0624	98	0.0468
24	0.1779	49	0.0915	74	0.0615	99	0.0464
25	0.1714	50	0.0897	75	0.0607	100	0.0459

Table 48. Distress Utility Factors for Block Cracking for Detailed Pavement Type: 05.

Alpha: **0.4900** **How Rated: Percent of lane area**

Beta: **1.0000**

Rho: **9.7800**

Percent of Lane Area	UTILITY VALUE	Percent of Lane Area	UTILITY VALUE	Percent of Lane Area	UTILITY VALUE	Percent of Lane Area	UTILITY VALUE
1	1.0000	26	0.6636	51	0.5955	76	0.0000
2	0.9963	27	0.6589	52	0.5940	77	0.5684
3	0.9812	28	0.6545	53	0.5926	78	0.5677
4	0.9575	29	0.6503	54	0.5912	79	0.5671
5	0.9307	30	0.6463	55	0.5898	80	0.5664
6	0.9040	31	0.6426	56	0.5885	81	0.5657
7	0.8788	32	0.6390	57	0.5873	82	0.5651
8	0.8557	33	0.6357	58	0.5860	83	0.5645
9	0.8347	34	0.6325	59	0.5848	84	0.5639
10	0.8157	35	0.6295	60	0.5837	85	0.5633
11	0.7986	36	0.6266	61	0.5826	86	0.5627
12	0.7831	37	0.6238	62	0.5815	87	0.5621
13	0.7691	38	0.6212	63	0.5805	88	0.5615
14	0.7563	39	0.6187	64	0.5794	89	0.5610
15	0.7447	40	0.6163	65	0.5784	90	0.5605
16	0.7341	41	0.6140	66	0.5775	91	0.5599
17	0.7244	42	0.6118	67	0.5766	92	0.5594
18	0.7154	43	0.6097	68	0.5756	93	0.5589
19	0.7071	44	0.6077	69	0.5748	94	0.5584
20	0.6995	45	0.6057	70	0.5739	95	0.5579
21	0.6924	46	0.6038	71	0.5731	96	0.5575
22	0.6859	47	0.6021	72	0.5722	97	0.5570
23	0.6797	48	0.6003	73	0.5714	98	0.5565
24	0.6740	49	0.5987	74	0.5707	99	0.5561
25	0.6686	50	0.5971	75	0.5699	100	0.5557

Table 49. Distress Utility Factors for Alligator Cracking for Detailed Pavement Type: 05.

Alpha: **0.5300** **How Rated: Percent of wheelpath length**

Beta: **1.0000**

Rho: **8.0100**

Percent of Wheelpath Length	UTILITY VALUE	Percent of Wheelpath Length	UTILITY VALUE	Percent of Wheelpath Length	UTILITY VALUE	Percent of Wheelpath Length	UTILITY VALUE
1	0.9998	26	0.6105	51	0.5470	76	0.0000
2	0.9903	27	0.6061	52	0.5457	77	0.5224
3	0.9633	28	0.6019	53	0.5443	78	0.5217
4	0.9285	29	0.5979	54	0.5431	79	0.5211
5	0.8932	30	0.5942	55	0.5418	80	0.5205
6	0.8605	31	0.5907	56	0.5406	81	0.5199
7	0.8312	32	0.5874	57	0.5395	82	0.5193
8	0.8053	33	0.5842	58	0.5384	83	0.5188
9	0.7824	34	0.5812	59	0.5373	84	0.5182
10	0.7621	35	0.5784	60	0.5362	85	0.5177
11	0.7441	36	0.5757	61	0.5352	86	0.5171
12	0.7281	37	0.5732	62	0.5342	87	0.5166
13	0.7138	38	0.5707	63	0.5333	88	0.5161
14	0.7009	39	0.5684	64	0.5323	89	0.5156
15	0.6893	40	0.5662	65	0.5314	90	0.5151
16	0.6787	41	0.5641	66	0.5306	91	0.5147
17	0.6691	42	0.5620	67	0.5297	92	0.5142
18	0.6604	43	0.5601	68	0.5289	93	0.5137
19	0.6523	44	0.5582	69	0.5281	94	0.5133
20	0.6449	45	0.5564	70	0.5273	95	0.5129
21	0.6381	46	0.5547	71	0.5265	96	0.5124
22	0.6317	47	0.5530	72	0.5258	97	0.5120
23	0.6259	48	0.5515	73	0.5251	98	0.5116
24	0.6204	49	0.5499	74	0.5244	99	0.5112
25	0.6153	50	0.5485	75	0.5237	100	0.5108

Table 50. Distress Utility Factors for Longitudinal Cracking for Detailed Pavement Type: 05.

Alpha: **0.8700** **How Rated: Length per 100' station**

Beta: **1.0000**

Rho: **184.0000**

Length Per Station	UTILITY VALUE	Length Per Station	UTILITY VALUE	Length Per Station	UTILITY VALUE	Length Per Station	UTILITY VALUE
5	1.0000	130	0.7887	255	0.5772	380	0.0000
10	1.0000	135	0.7774	260	0.5713	385	0.4605
15	1.0000	140	0.7663	265	0.5655	390	0.4572
20	0.9999	145	0.7554	270	0.5599	395	0.4540
25	0.9994	150	0.7449	275	0.5544	400	0.4508
30	0.9981	155	0.7346	280	0.5491	405	0.4477
35	0.9955	160	0.7245	285	0.5438	410	0.4446
40	0.9913	165	0.7148	290	0.5387	415	0.4416
45	0.9854	170	0.7052	295	0.5337	420	0.4386
50	0.9781	175	0.6960	300	0.5289	425	0.4357
55	0.9693	180	0.6870	305	0.5241	430	0.4329
60	0.9595	185	0.6782	310	0.5194	435	0.4301
65	0.9487	190	0.6697	315	0.5149	440	0.4273
70	0.9372	195	0.6614	320	0.5104	445	0.4246
75	0.9252	200	0.6533	325	0.5061	450	0.4220
80	0.9128	205	0.6454	330	0.5018	455	0.4194
85	0.9001	210	0.6378	335	0.4977	460	0.4168
90	0.8874	215	0.6303	340	0.4936	465	0.4143
95	0.8746	220	0.6230	345	0.4896	470	0.4118
100	0.8618	225	0.6160	350	0.4857	475	0.4094
105	0.8492	230	0.6091	355	0.4819	480	0.4070
110	0.8367	235	0.6024	360	0.4781	485	0.4047
115	0.8244	240	0.5958	365	0.4745	490	0.4024
120	0.8122	245	0.5895	370	0.4709	495	0.4001
125	0.8004	250	0.5832	375	0.4674	500	0.3979

Table 51. Distress Utility Factors for Transverse Cracking for Detailed Pavement Type: 05.

Alpha: **0.6900** **How Rated: Number per 100' station**

Beta: **1.0000**

Rho: **10.3900**

Number Per Station	UTILITY VALUE	Number Per Station	UTILITY VALUE	Number Per Station	UTILITY VALUE	Number Per Station	UTILITY VALUE
1	1.0000	26	0.5373	51	0.4372	76	0.0000
2	0.9962	27	0.5304	52	0.4350	77	0.3971
3	0.9784	28	0.5239	53	0.4328	78	0.3961
4	0.9486	29	0.5178	54	0.4308	79	0.3950
5	0.9136	30	0.5120	55	0.4288	80	0.3940
6	0.8779	31	0.5065	56	0.4268	81	0.3931
7	0.8436	32	0.5013	57	0.4250	82	0.3921
8	0.8117	33	0.4964	58	0.4232	83	0.3912
9	0.7825	34	0.4917	59	0.4214	84	0.3903
10	0.7559	35	0.4872	60	0.4197	85	0.3894
11	0.7317	36	0.4830	61	0.4181	86	0.3885
12	0.7097	37	0.4789	62	0.4165	87	0.3877
13	0.6897	38	0.4751	63	0.4149	88	0.3868
14	0.6715	39	0.4714	64	0.4134	89	0.3860
15	0.6548	40	0.4678	65	0.4119	90	0.3852
16	0.6396	41	0.4645	66	0.4105	91	0.3845
17	0.6255	42	0.4612	67	0.4091	92	0.3837
18	0.6126	43	0.4581	68	0.4078	93	0.3829
19	0.6006	44	0.4551	69	0.4065	94	0.3822
20	0.5896	45	0.4523	70	0.4052	95	0.3815
21	0.5793	46	0.4495	71	0.4039	96	0.3808
22	0.5697	47	0.4469	72	0.4027	97	0.3801
23	0.5608	48	0.4443	73	0.4015	98	0.3794
24	0.5525	49	0.4418	74	0.4004	99	0.3787
25	0.5446	50	0.4395	75	0.3993	100	0.3781

Table 52. Distress Utility Factors for Shallow Rutting for Detailed Pavement Type: 06.

Alpha: **0.3100** **How Rated: Percent of wheelpath length**

Beta: **1.0000**

Rho: **19.7200**

Percent of Wheelpath Length	UTILITY VALUE	Percent of Wheelpath Length	UTILITY VALUE	Percent of Wheelpath Length	UTILITY VALUE	Percent of Wheelpath Length	UTILITY VALUE
1	1.0000	26	0.8548	51	0.7894	76	0.0000
2	1.0000	27	0.8507	52	0.7878	77	0.7600
3	0.9996	28	0.8467	53	0.7863	78	0.7593
4	0.9978	29	0.8429	54	0.7848	79	0.7585
5	0.9940	30	0.8393	55	0.7834	80	0.7577
6	0.9884	31	0.8359	56	0.7820	81	0.7570
7	0.9815	32	0.8326	57	0.7807	82	0.7563
8	0.9736	33	0.8295	58	0.7794	83	0.7556
9	0.9653	34	0.8264	59	0.7781	84	0.7549
10	0.9569	35	0.8235	60	0.7768	85	0.7542
11	0.9484	36	0.8207	61	0.7756	86	0.7535
12	0.9401	37	0.8181	62	0.7745	87	0.7529
13	0.9320	38	0.8155	63	0.7733	88	0.7522
14	0.9242	39	0.8130	64	0.7722	89	0.7516
15	0.9167	40	0.8107	65	0.7711	90	0.7510
16	0.9096	41	0.8084	66	0.7701	91	0.7504
17	0.9028	42	0.8062	67	0.7690	92	0.7498
18	0.8964	43	0.8040	68	0.7680	93	0.7492
19	0.8902	44	0.8020	69	0.7671	94	0.7487
20	0.8843	45	0.8000	70	0.7661	95	0.7481
21	0.8788	46	0.7981	71	0.7652	96	0.7476
22	0.8735	47	0.7962	72	0.7643	97	0.7470
23	0.8685	48	0.7944	73	0.7634	98	0.7465
24	0.8637	49	0.7927	74	0.7625	99	0.7460
25	0.8591	50	0.7910	75	0.7617	100	0.7455

Table 53. Distress Utility Factors for Deep Rutting for Detailed Pavement Type: 06.

Alpha: **0.6900** **How Rated: Percent of wheelpath length**

Beta: **1.0000**

Rho: **62.7000**

Percent of Wheelpath Length	UTILITY VALUE	Percent of Wheelpath Length	UTILITY VALUE	Percent of Wheelpath Length	UTILITY VALUE	Percent of Wheelpath Length	UTILITY VALUE
1	1.0000	26	0.6310	51	0.4985	76	0.0000
2	0.9998	27	0.6223	52	0.4954	77	0.4414
3	0.9970	28	0.6141	53	0.4924	78	0.4399
4	0.9882	29	0.6063	54	0.4895	79	0.4384
5	0.9734	30	0.5988	55	0.4867	80	0.4370
6	0.9542	31	0.5918	56	0.4840	81	0.4356
7	0.9325	32	0.5850	57	0.4813	82	0.4342
8	0.9097	33	0.5786	58	0.4788	83	0.4328
9	0.8868	34	0.5724	59	0.4763	84	0.4315
10	0.8644	35	0.5665	60	0.4739	85	0.4302
11	0.8428	36	0.5609	61	0.4715	86	0.4289
12	0.8222	37	0.5555	62	0.4693	87	0.4277
13	0.8026	38	0.5503	63	0.4670	88	0.4265
14	0.7842	39	0.5454	64	0.4649	89	0.4253
15	0.7668	40	0.5406	65	0.4628	90	0.4241
16	0.7504	41	0.5360	66	0.4608	91	0.4230
17	0.7350	42	0.5316	67	0.4588	92	0.4218
18	0.7206	43	0.5274	68	0.4568	93	0.4207
19	0.7069	44	0.5233	69	0.4549	94	0.4197
20	0.6941	45	0.5194	70	0.4531	95	0.4186
21	0.6820	46	0.5156	71	0.4513	96	0.4176
22	0.6706	47	0.5119	72	0.4496	97	0.4165
23	0.6599	48	0.5084	73	0.4479	98	0.4156
24	0.6497	49	0.5050	74	0.4462	99	0.4146
25	0.6401	50	0.5017	75	0.4446	100	0.4136

Table 54. Distress Utility Factors for Patching for Detailed Pavement Type: 06.

Alpha: 0.4500 **How Rated: Percent of lane area**

Beta: 1.0000

Rho: 10.1500

Percent of Lane Area	UTILITY VALUE	Percent of Lane Area	UTILITY VALUE	Percent of Lane Area	UTILITY VALUE	Percent of Lane Area	UTILITY VALUE
1	1.0000	26	0.6954	51	0.6312	76	0.0000
2	0.9972	27	0.6910	52	0.6298	77	0.6056
3	0.9847	28	0.6868	53	0.6284	78	0.6049
4	0.9644	29	0.6829	54	0.6271	79	0.6043
5	0.9409	30	0.6792	55	0.6258	80	0.6036
6	0.9171	31	0.6756	56	0.6246	81	0.6030
7	0.8944	32	0.6723	57	0.6234	82	0.6024
8	0.8735	33	0.6691	58	0.6222	83	0.6018
9	0.8543	34	0.6661	59	0.6211	84	0.6012
10	0.8369	35	0.6633	60	0.6200	85	0.6007
11	0.8212	36	0.6606	61	0.6190	86	0.6001
12	0.8069	37	0.6580	62	0.6180	87	0.5996
13	0.7939	38	0.6555	63	0.6170	88	0.5990
14	0.7821	39	0.6531	64	0.6160	89	0.5985
15	0.7713	40	0.6509	65	0.6151	90	0.5980
16	0.7614	41	0.6487	66	0.6141	91	0.5975
17	0.7523	42	0.6466	67	0.6133	92	0.5970
18	0.7440	43	0.6446	68	0.6124	93	0.5965
19	0.7362	44	0.6427	69	0.6116	94	0.5961
20	0.7291	45	0.6409	70	0.6107	95	0.5956
21	0.7225	46	0.6391	71	0.6099	96	0.5951
22	0.7163	47	0.6374	72	0.6092	97	0.5947
23	0.7106	48	0.6358	73	0.6084	98	0.5943
24	0.7052	49	0.6342	74	0.6077	99	0.5939
25	0.7002	50	0.6327	75	0.6070	100	0.5934

Table 55. Distress Utility Factors for Failures for Detailed Pavement Type: 06.

Alpha: 1.0000 **How Rated: Total Number**

Beta: 1.0000

Rho: 4.7000

Number Per Mile	UTILITY VALUE	Number Per Mile	UTILITY VALUE	Number Per Mile	UTILITY VALUE	Number Per Mile	UTILITY VALUE
1	0.9909	26	0.1654	51	0.0880	76	0.0000
2	0.9046	27	0.1598	52	0.0864	77	0.0592
3	0.7913	28	0.1545	53	0.0849	78	0.0585
4	0.6912	29	0.1496	54	0.0834	79	0.0578
5	0.6094	30	0.1450	55	0.0819	80	0.0571
6	0.5431	31	0.1407	56	0.0805	81	0.0564
7	0.4890	32	0.1366	57	0.0791	82	0.0557
8	0.4443	33	0.1327	58	0.0778	83	0.0551
9	0.4068	34	0.1291	59	0.0766	84	0.0544
10	0.3750	35	0.1257	60	0.0753	85	0.0538
11	0.3477	36	0.1224	61	0.0742	86	0.0532
12	0.3241	37	0.1193	62	0.0730	87	0.0526
13	0.3034	38	0.1163	63	0.0719	88	0.0520
14	0.2852	39	0.1135	64	0.0708	89	0.0514
15	0.2690	40	0.1109	65	0.0698	90	0.0509
16	0.2545	41	0.1083	66	0.0687	91	0.0503
17	0.2415	42	0.1059	67	0.0677	92	0.0498
18	0.2298	43	0.1035	68	0.0668	93	0.0493
19	0.2191	44	0.1013	69	0.0658	94	0.0488
20	0.2094	45	0.0992	70	0.0649	95	0.0483
21	0.2005	46	0.0971	71	0.0641	96	0.0478
22	0.1924	47	0.0952	72	0.0632	97	0.0473
23	0.1848	48	0.0933	73	0.0624	98	0.0468
24	0.1779	49	0.0915	74	0.0615	99	0.0464
25	0.1714	50	0.0897	75	0.0607	100	0.0459

Table 56. Distress Utility Factors for Block Cracking for Detailed Pavement Type: 06.

Alpha: 0.4900 **How Rated: Percent of lane area**

Beta: 1.0000

Rho: 9.7800

Percent of Lane Area	UTILITY VALUE	Percent of Lane Area	UTILITY VALUE	Percent of Lane Area	UTILITY VALUE	Percent of Lane Area	UTILITY VALUE
1	1.0000	26	0.6636	51	0.5955	76	0.0000
2	0.9963	27	0.6589	52	0.5940	77	0.5684
3	0.9812	28	0.6545	53	0.5926	78	0.5677
4	0.9575	29	0.6503	54	0.5912	79	0.5671
5	0.9307	30	0.6463	55	0.5898	80	0.5664
6	0.9040	31	0.6426	56	0.5885	81	0.5657
7	0.8788	32	0.6390	57	0.5873	82	0.5651
8	0.8557	33	0.6357	58	0.5860	83	0.5645
9	0.8347	34	0.6325	59	0.5848	84	0.5639
10	0.8157	35	0.6295	60	0.5837	85	0.5633
11	0.7986	36	0.6266	61	0.5826	86	0.5627
12	0.7831	37	0.6238	62	0.5815	87	0.5621
13	0.7691	38	0.6212	63	0.5805	88	0.5615
14	0.7563	39	0.6187	64	0.5794	89	0.5610
15	0.7447	40	0.6163	65	0.5784	90	0.5605
16	0.7341	41	0.6140	66	0.5775	91	0.5599
17	0.7244	42	0.6118	67	0.5766	92	0.5594
18	0.7154	43	0.6097	68	0.5756	93	0.5589
19	0.7071	44	0.6077	69	0.5748	94	0.5584
20	0.6995	45	0.6057	70	0.5739	95	0.5579
21	0.6924	46	0.6038	71	0.5731	96	0.5575
22	0.6859	47	0.6021	72	0.5722	97	0.5570
23	0.6797	48	0.6003	73	0.5714	98	0.5565
24	0.6740	49	0.5987	74	0.5707	99	0.5561
25	0.6686	50	0.5971	75	0.5699	100	0.5557

Table 57. Distress Utility Factors for Alligator Cracking for Detailed Pavement Type: 06.

Alpha: **0.5300** **How Rated: Percent of wheelpath length**

Beta: **1.0000**

Rho: **8.0100**

Percent of Wheelpath Length	UTILITY VALUE	Percent of Wheelpath Length	UTILITY VALUE	Percent of Wheelpath Length	UTILITY VALUE	Percent of Wheelpath Length	UTILITY VALUE
1	0.9998	26	0.6105	51	0.5470	76	0.0000
2	0.9903	27	0.6061	52	0.5457	77	0.5224
3	0.9633	28	0.6019	53	0.5443	78	0.5217
4	0.9285	29	0.5979	54	0.5431	79	0.5211
5	0.8932	30	0.5942	55	0.5418	80	0.5205
6	0.8605	31	0.5907	56	0.5406	81	0.5199
7	0.8312	32	0.5874	57	0.5395	82	0.5193
8	0.8053	33	0.5842	58	0.5384	83	0.5188
9	0.7824	34	0.5812	59	0.5373	84	0.5182
10	0.7621	35	0.5784	60	0.5362	85	0.5177
11	0.7441	36	0.5757	61	0.5352	86	0.5171
12	0.7281	37	0.5732	62	0.5342	87	0.5166
13	0.7138	38	0.5707	63	0.5333	88	0.5161
14	0.7009	39	0.5684	64	0.5323	89	0.5156
15	0.6893	40	0.5662	65	0.5314	90	0.5151
16	0.6787	41	0.5641	66	0.5306	91	0.5147
17	0.6691	42	0.5620	67	0.5297	92	0.5142
18	0.6604	43	0.5601	68	0.5289	93	0.5137
19	0.6523	44	0.5582	69	0.5281	94	0.5133
20	0.6449	45	0.5564	70	0.5273	95	0.5129
21	0.6381	46	0.5547	71	0.5265	96	0.5124
22	0.6317	47	0.5530	72	0.5258	97	0.5120
23	0.6259	48	0.5515	73	0.5251	98	0.5116
24	0.6204	49	0.5499	74	0.5244	99	0.5112
25	0.6153	50	0.5485	75	0.5237	100	0.5108

Table 58. Distress Utility Factors for Transverse Cracking for Detailed Pavement Type: 06.

Alpha: **0.6900** **How Rated: Number per 100' station**

Beta: **1.0000**

Rho: **10.3900**

Number Per Station	UTILITY VALUE	Number Per Station	UTILITY VALUE	Number Per Station	UTILITY VALUE	Number Per Station	UTILITY VALUE
1	1.0000	26	0.5373	51	0.4372	76	0.0000
2	0.9962	27	0.5304	52	0.4350	77	0.3971
3	0.9784	28	0.5239	53	0.4328	78	0.3961
4	0.9486	29	0.5178	54	0.4308	79	0.3950
5	0.9136	30	0.5120	55	0.4288	80	0.3940
6	0.8779	31	0.5065	56	0.4268	81	0.3931
7	0.8436	32	0.5013	57	0.4250	82	0.3921
8	0.8117	33	0.4964	58	0.4232	83	0.3912
9	0.7825	34	0.4917	59	0.4214	84	0.3903
10	0.7559	35	0.4872	60	0.4197	85	0.3894
11	0.7317	36	0.4830	61	0.4181	86	0.3885
12	0.7097	37	0.4789	62	0.4165	87	0.3877
13	0.6897	38	0.4751	63	0.4149	88	0.3868
14	0.6715	39	0.4714	64	0.4134	89	0.3860
15	0.6548	40	0.4678	65	0.4119	90	0.3852
16	0.6396	41	0.4645	66	0.4105	91	0.3845
17	0.6255	42	0.4612	67	0.4091	92	0.3837
18	0.6126	43	0.4581	68	0.4078	93	0.3829
19	0.6006	44	0.4551	69	0.4065	94	0.3822
20	0.5896	45	0.4523	70	0.4052	95	0.3815
21	0.5793	46	0.4495	71	0.4039	96	0.3808
22	0.5697	47	0.4469	72	0.4027	97	0.3801
23	0.5608	48	0.4443	73	0.4015	98	0.3794
24	0.5525	49	0.4418	74	0.4004	99	0.3787
25	0.5446	50	0.4395	75	0.3993	100	0.3781

Table 59. Distress Utility Factors for Longitudinal Cracking for Detailed Pavement Type: 06.

Alpha: 0.8700 **How Rated: Length per 100' station**

Beta: 1.0000

Rho: 184.0000

Length Per Station	UTILITY VALUE	Length Per Station	UTILITY VALUE	Length Per Station	UTILITY VALUE	Length Per Station	UTILITY VALUE
5	1.0000	130	0.7887	255	0.5772	380	0.0000
10	1.0000	135	0.7774	260	0.5713	385	0.4605
15	1.0000	140	0.7663	265	0.5655	390	0.4572
20	0.9999	145	0.7554	270	0.5599	395	0.4540
25	0.9994	150	0.7449	275	0.5544	400	0.4508
30	0.9981	155	0.7346	280	0.5491	405	0.4477
35	0.9955	160	0.7245	285	0.5438	410	0.4446
40	0.9913	165	0.7148	290	0.5387	415	0.4416
45	0.9854	170	0.7052	295	0.5337	420	0.4386
50	0.9781	175	0.6960	300	0.5289	425	0.4357
55	0.9693	180	0.6870	305	0.5241	430	0.4329
60	0.9595	185	0.6782	310	0.5194	435	0.4301
65	0.9487	190	0.6697	315	0.5149	440	0.4273
70	0.9372	195	0.6614	320	0.5104	445	0.4246
75	0.9252	200	0.6533	325	0.5061	450	0.4220
80	0.9128	205	0.6454	330	0.5018	455	0.4194
85	0.9001	210	0.6378	335	0.4977	460	0.4168
90	0.8874	215	0.6303	340	0.4936	465	0.4143
95	0.8746	220	0.6230	345	0.4896	470	0.4118
100	0.8618	225	0.6160	350	0.4857	475	0.4094
105	0.8492	230	0.6091	355	0.4819	480	0.4070
110	0.8367	235	0.6024	360	0.4781	485	0.4047
115	0.8244	240	0.5958	365	0.4745	490	0.4024
120	0.8122	245	0.5895	370	0.4709	495	0.4001
125	0.8004	250	0.5832	375	0.4674	500	0.3979

Table 60. Distress Utility Factors for Shallow Rutting for Detailed Pavement Type: 07.

Alpha: 0.2300 **How Rated: Percent of wheelpath length**

Beta: 1.0000

Rho: 17.5500

Percent of Wheelpath Length	UTILITY VALUE	Percent of Wheelpath Length	UTILITY VALUE	Percent of Wheelpath Length	UTILITY VALUE	Percent of Wheelpath Length	UTILITY VALUE
1	1.0000	26	0.8829	51	0.8370	76	0.0000
2	1.0000	27	0.8799	52	0.8359	77	0.8169
3	0.9993	28	0.8771	53	0.8348	78	0.8163
4	0.9971	29	0.8744	54	0.8338	79	0.8158
5	0.9931	30	0.8719	55	0.8328	80	0.8153
6	0.9877	31	0.8694	56	0.8319	81	0.8148
7	0.9813	32	0.8671	57	0.8310	82	0.8143
8	0.9744	33	0.8649	58	0.8301	83	0.8138
9	0.9673	34	0.8627	59	0.8292	84	0.8134
10	0.9602	35	0.8607	60	0.8283	85	0.8129
11	0.9534	36	0.8587	61	0.8275	86	0.8125
12	0.9467	37	0.8569	62	0.8267	87	0.8120
13	0.9404	38	0.8551	63	0.8259	88	0.8116
14	0.9343	39	0.8533	64	0.8252	89	0.8112
15	0.9286	40	0.8517	65	0.8244	90	0.8107
16	0.9232	41	0.8501	66	0.8237	91	0.8103
17	0.9181	42	0.8486	67	0.8230	92	0.8099
18	0.9132	43	0.8471	68	0.8223	93	0.8096
19	0.9087	44	0.8457	69	0.8217	94	0.8092
20	0.9044	45	0.8443	70	0.8210	95	0.8088
21	0.9003	46	0.8430	71	0.8204	96	0.8084
22	0.8964	47	0.8417	72	0.8198	97	0.8081
23	0.8928	48	0.8404	73	0.8191	98	0.8077
24	0.8893	49	0.8392	74	0.8186	99	0.8074
25	0.8860	50	0.8381	75	0.8180	100	0.8070

Table 61. Distress Utility Factors for Deep Rutting for Detailed Pavement Type: 07.

Alpha: 0.3200 **How Rated: Percent of wheelpath length**

Beta: 1.0000

Rho: 9.0400

Percent of Wheelpath Length	UTILITY VALUE	Percent of Wheelpath Length	UTILITY VALUE	Percent of Wheelpath Length	UTILITY VALUE	Percent of Wheelpath Length	UTILITY VALUE
1	1.0000	26	0.7740	51	0.7320	76	0.0000
2	0.9965	27	0.7710	52	0.7311	77	0.7154
3	0.9843	28	0.7683	53	0.7302	78	0.7150
4	0.9666	29	0.7657	54	0.7293	79	0.7146
5	0.9475	30	0.7633	55	0.7285	80	0.7142
6	0.9291	31	0.7609	56	0.7277	81	0.7138
7	0.9120	32	0.7588	57	0.7269	82	0.7134
8	0.8966	33	0.7567	58	0.7262	83	0.7130
9	0.8828	34	0.7547	59	0.7255	84	0.7126
10	0.8704	35	0.7528	60	0.7248	85	0.7123
11	0.8593	36	0.7511	61	0.7241	86	0.7119
12	0.8493	37	0.7494	62	0.7234	87	0.7116
13	0.8404	38	0.7477	63	0.7228	88	0.7112
14	0.8322	39	0.7462	64	0.7222	89	0.7109
15	0.8248	40	0.7447	65	0.7215	90	0.7106
16	0.8181	41	0.7433	66	0.7210	91	0.7103
17	0.8120	42	0.7420	67	0.7204	92	0.7099
18	0.8063	43	0.7407	68	0.7198	93	0.7096
19	0.8012	44	0.7394	69	0.7193	94	0.7093
20	0.7964	45	0.7382	70	0.7188	95	0.7090
21	0.7919	46	0.7371	71	0.7183	96	0.7088
22	0.7878	47	0.7360	72	0.7178	97	0.7085
23	0.7840	48	0.7349	73	0.7173	98	0.7082
24	0.7804	49	0.7339	74	0.7168	99	0.7079
25	0.7771	50	0.7329	75	0.7163	100	0.7077

Table 62. Distress Utility Factors for Patching for Detailed Pavement Type: 07.

Alpha: 0.3200 **How Rated: Percent of lane area**

Beta: 1.0000

Rho: 17.2800

Percent of Lane Area	UTILITY VALUE	Percent of Lane Area	UTILITY VALUE	Percent of Lane Area	UTILITY VALUE	Percent of Lane Area	UTILITY VALUE
1	1.0000	26	0.8354	51	0.7720	76	0.0000
2	0.9999	27	0.8313	52	0.7705	77	0.7443
3	0.9990	28	0.8274	53	0.7690	78	0.7436
4	0.9957	29	0.8237	54	0.7676	79	0.7429
5	0.9899	30	0.8201	55	0.7663	80	0.7422
6	0.9820	31	0.8167	56	0.7650	81	0.7415
7	0.9729	32	0.8135	57	0.7637	82	0.7408
8	0.9631	33	0.8104	58	0.7624	83	0.7401
9	0.9531	34	0.8075	59	0.7612	84	0.7395
10	0.9432	35	0.8047	60	0.7601	85	0.7389
11	0.9335	36	0.8020	61	0.7589	86	0.7382
12	0.9242	37	0.7994	62	0.7578	87	0.7376
13	0.9153	38	0.7969	63	0.7568	88	0.7371
14	0.9069	39	0.7945	64	0.7557	89	0.7365
15	0.8989	40	0.7923	65	0.7547	90	0.7359
16	0.8913	41	0.7901	66	0.7537	91	0.7353
17	0.8842	42	0.7879	67	0.7527	92	0.7348
18	0.8775	43	0.7859	68	0.7518	93	0.7343
19	0.8711	44	0.7839	69	0.7509	94	0.7337
20	0.8651	45	0.7820	70	0.7500	95	0.7332
21	0.8595	46	0.7802	71	0.7491	96	0.7327
22	0.8541	47	0.7784	72	0.7483	97	0.7322
23	0.8490	48	0.7767	73	0.7475	98	0.7317
24	0.8442	49	0.7751	74	0.7466	99	0.7313
25	0.8397	50	0.7735	75	0.7459	100	0.7308

Table 63. Distress Utility Factors for Failures for Detailed Pavement Type: 07.

Alpha: 1.0000 **How Rated: Total Number**

Beta: 1.0000

Rho: 4.7000

Number Per Mile	UTILITY VALUE	Number Per Mile	UTILITY VALUE	Number Per Mile	UTILITY VALUE	Number Per Mile	UTILITY VALUE
1	0.9909	26	0.1654	51	0.0880	76	0.0000
2	0.9046	27	0.1598	52	0.0864	77	0.0592
3	0.7913	28	0.1545	53	0.0849	78	0.0585
4	0.6912	29	0.1496	54	0.0834	79	0.0578
5	0.6094	30	0.1450	55	0.0819	80	0.0571
6	0.5431	31	0.1407	56	0.0805	81	0.0564
7	0.4890	32	0.1366	57	0.0791	82	0.0557
8	0.4443	33	0.1327	58	0.0778	83	0.0551
9	0.4068	34	0.1291	59	0.0766	84	0.0544
10	0.3750	35	0.1257	60	0.0753	85	0.0538
11	0.3477	36	0.1224	61	0.0742	86	0.0532
12	0.3241	37	0.1193	62	0.0730	87	0.0526
13	0.3034	38	0.1163	63	0.0719	88	0.0520
14	0.2852	39	0.1135	64	0.0708	89	0.0514
15	0.2690	40	0.1109	65	0.0698	90	0.0509
16	0.2545	41	0.1083	66	0.0687	91	0.0503
17	0.2415	42	0.1059	67	0.0677	92	0.0498
18	0.2298	43	0.1035	68	0.0668	93	0.0493
19	0.2191	44	0.1013	69	0.0658	94	0.0488
20	0.2094	45	0.0992	70	0.0649	95	0.0483
21	0.2005	46	0.0971	71	0.0641	96	0.0478
22	0.1924	47	0.0952	72	0.0632	97	0.0473
23	0.1848	48	0.0933	73	0.0624	98	0.0468
24	0.1779	49	0.0915	74	0.0615	99	0.0464
25	0.1714	50	0.0897	75	0.0607	100	0.0459

Table 64. Distress Utility Factors for Block Cracking for Detailed Pavement Type: 07.

Alpha: **0.3100** **How Rated: Percent of lane area**

Beta: **1.0000**

Rho: **13.7900**

Percent of Lane Area	UTILITY VALUE	Percent of Lane Area	UTILITY VALUE	Percent of Lane Area	UTILITY VALUE	Percent of Lane Area	UTILITY VALUE
1	1.0000	26	0.8176	51	0.7634	76	0.0000
2	0.9997	27	0.8140	52	0.7622	77	0.7408
3	0.9969	28	0.8106	53	0.7610	78	0.7402
4	0.9901	29	0.8073	54	0.7599	79	0.7397
5	0.9803	30	0.8042	55	0.7587	80	0.7391
6	0.9689	31	0.8013	56	0.7577	81	0.7385
7	0.9568	32	0.7985	57	0.7566	82	0.7380
8	0.9447	33	0.7959	58	0.7556	83	0.7375
9	0.9330	34	0.7934	59	0.7546	84	0.7369
10	0.9219	35	0.7910	60	0.7537	85	0.7364
11	0.9115	36	0.7886	61	0.7527	86	0.7359
12	0.9018	37	0.7865	62	0.7518	87	0.7354
13	0.8927	38	0.7843	63	0.7509	88	0.7350
14	0.8842	39	0.7823	64	0.7501	89	0.7345
15	0.8764	40	0.7804	65	0.7493	90	0.7340
16	0.8691	41	0.7785	66	0.7485	91	0.7336
17	0.8623	42	0.7768	67	0.7477	92	0.7332
18	0.8559	43	0.7751	68	0.7469	93	0.7327
19	0.8500	44	0.7734	69	0.7462	94	0.7323
20	0.8444	45	0.7718	70	0.7454	95	0.7319
21	0.8392	46	0.7703	71	0.7447	96	0.7315
22	0.8344	47	0.7688	72	0.7440	97	0.7311
23	0.8298	48	0.7674	73	0.7434	98	0.7307
24	0.8255	49	0.7660	74	0.7427	99	0.7303
25	0.8214	50	0.7647	75	0.7421	100	0.7299

Table 65. Distress Utility Factors for Alligator Cracking for Detailed Pavement Type: 07.

Alpha: 0.4200 **How Rated: Percent of wheelpath length**

Beta: 1.0000

Rho: 18.7700

Percent of Wheelpath Length	UTILITY VALUE	Percent of Wheelpath Length	UTILITY VALUE	Percent of Wheelpath Length	UTILITY VALUE	Percent of Wheelpath Length	UTILITY VALUE
1	1.0000	26	0.7960	51	0.7093	76	0.0000
2	1.0000	27	0.7904	52	0.7073	77	0.6709
3	0.9992	28	0.7852	53	0.7053	78	0.6698
4	0.9962	29	0.7801	54	0.7033	79	0.6688
5	0.9902	30	0.7753	55	0.7014	80	0.6678
6	0.9816	31	0.7708	56	0.6996	81	0.6669
7	0.9712	32	0.7664	57	0.6978	82	0.6659
8	0.9598	33	0.7622	58	0.6961	83	0.6650
9	0.9478	34	0.7582	59	0.6944	84	0.6641
10	0.9357	35	0.7543	60	0.6928	85	0.6632
11	0.9238	36	0.7506	61	0.6912	86	0.6624
12	0.9121	37	0.7471	62	0.6897	87	0.6615
13	0.9009	38	0.7437	63	0.6882	88	0.6607
14	0.8901	39	0.7404	64	0.6868	89	0.6599
15	0.8798	40	0.7373	65	0.6853	90	0.6591
16	0.8701	41	0.7343	66	0.6840	91	0.6583
17	0.8608	42	0.7314	67	0.6826	92	0.6575
18	0.8520	43	0.7286	68	0.6813	93	0.6568
19	0.8436	44	0.7259	69	0.6800	94	0.6560
20	0.8357	45	0.7232	70	0.6788	95	0.6553
21	0.8282	46	0.7207	71	0.6776	96	0.6546
22	0.8211	47	0.7183	72	0.6764	97	0.6539
23	0.8143	48	0.7159	73	0.6752	98	0.6532
24	0.8079	49	0.7137	74	0.6741	99	0.6525
25	0.8018	50	0.7115	75	0.6730	100	0.6519

Table 66. Distress Utility Factors for Longitudinal Cracking for Detailed Pavement Type: 07.

Alpha: 0.3700 **How Rated: Length per 100' station**

Beta: 1.0000

Rho: 136.9000

Length Per Station	UTILITY VALUE	Length Per Station	UTILITY VALUE	Length Per Station	UTILITY VALUE	Length Per Station	UTILITY VALUE
5	1.0000	130	0.8709	255	0.7837	380	0.0000
10	1.0000	135	0.8658	260	0.7815	385	0.7407
15	1.0000	140	0.8608	265	0.7793	390	0.7395
20	0.9996	145	0.8561	270	0.7772	395	0.7384
25	0.9985	150	0.8515	275	0.7751	400	0.7372
30	0.9961	155	0.8470	280	0.7731	405	0.7361
35	0.9926	160	0.8427	285	0.7711	410	0.7350
40	0.9879	165	0.8386	290	0.7692	415	0.7340
45	0.9823	170	0.8346	295	0.7674	420	0.7329
50	0.9761	175	0.8308	300	0.7656	425	0.7319
55	0.9693	180	0.8271	305	0.7638	430	0.7309
60	0.9622	185	0.8235	310	0.7621	435	0.7299
65	0.9550	190	0.8200	315	0.7604	440	0.7289
70	0.9477	195	0.8166	320	0.7588	445	0.7280
75	0.9404	200	0.8134	325	0.7572	450	0.7271
80	0.9332	205	0.8103	330	0.7556	455	0.7261
85	0.9261	210	0.8072	335	0.7541	460	0.7252
90	0.9192	215	0.8043	340	0.7526	465	0.7244
95	0.9124	220	0.8014	345	0.7512	470	0.7235
100	0.9059	225	0.7986	350	0.7498	475	0.7226
105	0.8995	230	0.7960	355	0.7484	480	0.7218
110	0.8934	235	0.7934	360	0.7470	485	0.7210
115	0.8875	240	0.7908	365	0.7457	490	0.7202
120	0.8818	245	0.7884	370	0.7444	495	0.7194
125	0.8762	250	0.7860	375	0.7432	500	0.7186

Table 67. Distress Utility Factors for Transverse Cracking for Detailed Pavement Type: 07.

Alpha: **0.4300** **How Rated: Number per 100' station**

Beta: **1.0000**

Rho: **9.5600**

Number Per Station	UTILITY VALUE	Number Per Station	UTILITY VALUE	Number Per Station	UTILITY VALUE	Number Per Station	UTILITY VALUE
1	1.0000	26	0.7023	51	0.6435	76	0.0000
2	0.9964	27	0.6982	52	0.6422	77	0.6202
3	0.9822	28	0.6944	53	0.6410	78	0.6196
4	0.9606	29	0.6908	54	0.6398	79	0.6190
5	0.9365	30	0.6873	55	0.6386	80	0.6184
6	0.9126	31	0.6841	56	0.6375	81	0.6179
7	0.8903	32	0.6810	57	0.6364	82	0.6173
8	0.8698	33	0.6781	58	0.6353	83	0.6168
9	0.8514	34	0.6754	59	0.6343	84	0.6163
10	0.8347	35	0.6728	60	0.6333	85	0.6157
11	0.8197	36	0.6703	61	0.6324	86	0.6152
12	0.8061	37	0.6679	62	0.6314	87	0.6147
13	0.7939	38	0.6656	63	0.6305	88	0.6143
14	0.7828	39	0.6635	64	0.6297	89	0.6138
15	0.7727	40	0.6614	65	0.6288	90	0.6133
16	0.7634	41	0.6594	66	0.6280	91	0.6129
17	0.7550	42	0.6575	67	0.6272	92	0.6124
18	0.7472	43	0.6557	68	0.6264	93	0.6120
19	0.7400	44	0.6540	69	0.6256	94	0.6116
20	0.7334	45	0.6523	70	0.6249	95	0.6112
21	0.7273	46	0.6507	71	0.6242	96	0.6108
22	0.7215	47	0.6491	72	0.6235	97	0.6104
23	0.7162	48	0.6477	73	0.6228	98	0.6100
24	0.7113	49	0.6462	74	0.6221	99	0.6096
25	0.7066	50	0.6448	75	0.6215	100	0.6092

Table 68. Distress Utility Factors for Shallow Rutting for Detailed Pavement Type: 08.

Alpha: 0.2300 **How Rated: Percent of wheelpath length**

Beta: 1.0000

Rho: 17.5500

Percent of Wheelpath Length	UTILITY VALUE	Percent of Wheelpath Length	UTILITY VALUE	Percent of Wheelpath Length	UTILITY VALUE	Percent of Wheelpath Length	UTILITY VALUE
1	1.0000	26	0.8829	51	0.8370	76	0.0000
2	1.0000	27	0.8799	52	0.8359	77	0.8169
3	0.9993	28	0.8771	53	0.8348	78	0.8163
4	0.9971	29	0.8744	54	0.8338	79	0.8158
5	0.9931	30	0.8719	55	0.8328	80	0.8153
6	0.9877	31	0.8694	56	0.8319	81	0.8148
7	0.9813	32	0.8671	57	0.8310	82	0.8143
8	0.9744	33	0.8649	58	0.8301	83	0.8138
9	0.9673	34	0.8627	59	0.8292	84	0.8134
10	0.9602	35	0.8607	60	0.8283	85	0.8129
11	0.9534	36	0.8587	61	0.8275	86	0.8125
12	0.9467	37	0.8569	62	0.8267	87	0.8120
13	0.9404	38	0.8551	63	0.8259	88	0.8116
14	0.9343	39	0.8533	64	0.8252	89	0.8112
15	0.9286	40	0.8517	65	0.8244	90	0.8107
16	0.9232	41	0.8501	66	0.8237	91	0.8103
17	0.9181	42	0.8486	67	0.8230	92	0.8099
18	0.9132	43	0.8471	68	0.8223	93	0.8096
19	0.9087	44	0.8457	69	0.8217	94	0.8092
20	0.9044	45	0.8443	70	0.8210	95	0.8088
21	0.9003	46	0.8430	71	0.8204	96	0.8084
22	0.8964	47	0.8417	72	0.8198	97	0.8081
23	0.8928	48	0.8404	73	0.8191	98	0.8077
24	0.8893	49	0.8392	74	0.8186	99	0.8074
25	0.8860	50	0.8381	75	0.8180	100	0.8070

Table 69. Distress Utility Factors for Deep Rutting for Detailed Pavement Type: 08.

Alpha: 0.3200 **How Rated: Percentage of wheelpath length**

Beta: 1.0000

Rho: 9.0400

Percent of Wheelpath Length	UTILITY VALUE	Percent of Wheelpath Length	UTILITY VALUE	Percent of Wheelpath Length	UTILITY VALUE	Percent of Wheelpath Length	UTILITY VALUE
1	1.0000	26	0.7740	51	0.7320	76	0.0000
2	0.9965	27	0.7710	52	0.7311	77	0.7154
3	0.9843	28	0.7683	53	0.7302	78	0.7150
4	0.9666	29	0.7657	54	0.7293	79	0.7146
5	0.9475	30	0.7633	55	0.7285	80	0.7142
6	0.9291	31	0.7609	56	0.7277	81	0.7138
7	0.9120	32	0.7588	57	0.7269	82	0.7134
8	0.8966	33	0.7567	58	0.7262	83	0.7130
9	0.8828	34	0.7547	59	0.7255	84	0.7126
10	0.8704	35	0.7528	60	0.7248	85	0.7123
11	0.8593	36	0.7511	61	0.7241	86	0.7119
12	0.8493	37	0.7494	62	0.7234	87	0.7116
13	0.8404	38	0.7477	63	0.7228	88	0.7112
14	0.8322	39	0.7462	64	0.7222	89	0.7109
15	0.8248	40	0.7447	65	0.7215	90	0.7106
16	0.8181	41	0.7433	66	0.7210	91	0.7103
17	0.8120	42	0.7420	67	0.7204	92	0.7099
18	0.8063	43	0.7407	68	0.7198	93	0.7096
19	0.8012	44	0.7394	69	0.7193	94	0.7093
20	0.7964	45	0.7382	70	0.7188	95	0.7090
21	0.7919	46	0.7371	71	0.7183	96	0.7088
22	0.7878	47	0.7360	72	0.7178	97	0.7085
23	0.7840	48	0.7349	73	0.7173	98	0.7082
24	0.7804	49	0.7339	74	0.7168	99	0.7079
25	0.7771	50	0.7329	75	0.7163	100	0.7077

Table 70. Distress Utility Factors for Patching for Detailed Pavement Type: 08.

Alpha: 0.3200 **How Rated: Percent of lane area**

Beta: 1.0000

Rho: 17.2800

Percent of Lane Area	UTILITY VALUE	Percent of Lane Area	UTILITY VALUE	Percent of Lane Area	UTILITY VALUE	Percent of Lane Area	UTILITY VALUE
1	1.0000	26	0.8354	51	0.7720	76	0.0000
2	0.9999	27	0.8313	52	0.7705	77	0.7443
3	0.9990	28	0.8274	53	0.7690	78	0.7436
4	0.9957	29	0.8237	54	0.7676	79	0.7429
5	0.9899	30	0.8201	55	0.7663	80	0.7422
6	0.9820	31	0.8167	56	0.7650	81	0.7415
7	0.9729	32	0.8135	57	0.7637	82	0.7408
8	0.9631	33	0.8104	58	0.7624	83	0.7401
9	0.9531	34	0.8075	59	0.7612	84	0.7395
10	0.9432	35	0.8047	60	0.7601	85	0.7389
11	0.9335	36	0.8020	61	0.7589	86	0.7382
12	0.9242	37	0.7994	62	0.7578	87	0.7376
13	0.9153	38	0.7969	63	0.7568	88	0.7371
14	0.9069	39	0.7945	64	0.7557	89	0.7365
15	0.8989	40	0.7923	65	0.7547	90	0.7359
16	0.8913	41	0.7901	66	0.7537	91	0.7353
17	0.8842	42	0.7879	67	0.7527	92	0.7348
18	0.8775	43	0.7859	68	0.7518	93	0.7343
19	0.8711	44	0.7839	69	0.7509	94	0.7337
20	0.8651	45	0.7820	70	0.7500	95	0.7332
21	0.8595	46	0.7802	71	0.7491	96	0.7327
22	0.8541	47	0.7784	72	0.7483	97	0.7322
23	0.8490	48	0.7767	73	0.7475	98	0.7317
24	0.8442	49	0.7751	74	0.7466	99	0.7313
25	0.8397	50	0.7735	75	0.7459	100	0.7308

Table 71. Distress Utility Factors for Failures for Detailed Pavement Type: 08.

Alpha: 1.0000 **How Rated: Total Number**

Beta: 1.0000

Rho: 4.7000

Number Per Mile	UTILITY VALUE	Number Per Mile	UTILITY VALUE	Number Per Mile	UTILITY VALUE	Number Per Mile	UTILITY VALUE
1	0.9909	26	0.1654	51	0.0880	76	0.0000
2	0.9046	27	0.1598	52	0.0864	77	0.0592
3	0.7913	28	0.1545	53	0.0849	78	0.0585
4	0.6912	29	0.1496	54	0.0834	79	0.0578
5	0.6094	30	0.1450	55	0.0819	80	0.0571
6	0.5431	31	0.1407	56	0.0805	81	0.0564
7	0.4890	32	0.1366	57	0.0791	82	0.0557
8	0.4443	33	0.1327	58	0.0778	83	0.0551
9	0.4068	34	0.1291	59	0.0766	84	0.0544
10	0.3750	35	0.1257	60	0.0753	85	0.0538
11	0.3477	36	0.1224	61	0.0742	86	0.0532
12	0.3241	37	0.1193	62	0.0730	87	0.0526
13	0.3034	38	0.1163	63	0.0719	88	0.0520
14	0.2852	39	0.1135	64	0.0708	89	0.0514
15	0.2690	40	0.1109	65	0.0698	90	0.0509
16	0.2545	41	0.1083	66	0.0687	91	0.0503
17	0.2415	42	0.1059	67	0.0677	92	0.0498
18	0.2298	43	0.1035	68	0.0668	93	0.0493
19	0.2191	44	0.1013	69	0.0658	94	0.0488
20	0.2094	45	0.0992	70	0.0649	95	0.0483
21	0.2005	46	0.0971	71	0.0641	96	0.0478
22	0.1924	47	0.0952	72	0.0632	97	0.0473
23	0.1848	48	0.0933	73	0.0624	98	0.0468
24	0.1779	49	0.0915	74	0.0615	99	0.0464
25	0.1714	50	0.0897	75	0.0607	100	0.0459

Table 72. Distress Utility Factors for Block Cracking for Detailed Pavement Type: 08.

Alpha: 0.3100 **How Rated: Percent of lane area**

Beta: 1.0000

Rho: 13.7900

Percent of Lane Area	UTILITY VALUE	Percent of Lane Area	UTILITY VALUE	Percent of Lane Area	UTILITY VALUE	Percent of Lane Area	UTILITY VALUE
1	1.0000	26	0.8176	51	0.7634	76	0.0000
2	0.9997	27	0.8140	52	0.7622	77	0.7408
3	0.9969	28	0.8106	53	0.7610	78	0.7402
4	0.9901	29	0.8073	54	0.7599	79	0.7397
5	0.9803	30	0.8042	55	0.7587	80	0.7391
6	0.9689	31	0.8013	56	0.7577	81	0.7385
7	0.9568	32	0.7985	57	0.7566	82	0.7380
8	0.9447	33	0.7959	58	0.7556	83	0.7375
9	0.9330	34	0.7934	59	0.7546	84	0.7369
10	0.9219	35	0.7910	60	0.7537	85	0.7364
11	0.9115	36	0.7886	61	0.7527	86	0.7359
12	0.9018	37	0.7865	62	0.7518	87	0.7354
13	0.8927	38	0.7843	63	0.7509	88	0.7350
14	0.8842	39	0.7823	64	0.7501	89	0.7345
15	0.8764	40	0.7804	65	0.7493	90	0.7340
16	0.8691	41	0.7785	66	0.7485	91	0.7336
17	0.8623	42	0.7768	67	0.7477	92	0.7332
18	0.8559	43	0.7751	68	0.7469	93	0.7327
19	0.8500	44	0.7734	69	0.7462	94	0.7323
20	0.8444	45	0.7718	70	0.7454	95	0.7319
21	0.8392	46	0.7703	71	0.7447	96	0.7315
22	0.8344	47	0.7688	72	0.7440	97	0.7311
23	0.8298	48	0.7674	73	0.7434	98	0.7307
24	0.8255	49	0.7660	74	0.7427	99	0.7303
25	0.8214	50	0.7647	75	0.7421	100	0.7299

Table 73. Distress Utility Factors for Alligator Cracking for Detailed Pavement Type: 08.

Alpha: **0.4200** **How Rated: Percent of wheelpath length**

Beta: **1.0000**

Rho: **18.7700**

Percent of Wheelpath Length	UTILITY VALUE	Percent of Wheelpath Length	UTILITY VALUE	Percent of Wheelpath Length	UTILITY VALUE	Percent of Wheelpath Length	UTILITY VALUE
1	1.0000	26	0.7960	51	0.7093	76	0.0000
2	1.0000	27	0.7904	52	0.7073	77	0.6709
3	0.9992	28	0.7852	53	0.7053	78	0.6698
4	0.9962	29	0.7801	54	0.7033	79	0.6688
5	0.9902	30	0.7753	55	0.7014	80	0.6678
6	0.9816	31	0.7708	56	0.6996	81	0.6669
7	0.9712	32	0.7664	57	0.6978	82	0.6659
8	0.9598	33	0.7622	58	0.6961	83	0.6650
9	0.9478	34	0.7582	59	0.6944	84	0.6641
10	0.9357	35	0.7543	60	0.6928	85	0.6632
11	0.9238	36	0.7506	61	0.6912	86	0.6624
12	0.9121	37	0.7471	62	0.6897	87	0.6615
13	0.9009	38	0.7437	63	0.6882	88	0.6607
14	0.8901	39	0.7404	64	0.6868	89	0.6599
15	0.8798	40	0.7373	65	0.6853	90	0.6591
16	0.8701	41	0.7343	66	0.6840	91	0.6583
17	0.8608	42	0.7314	67	0.6826	92	0.6575
18	0.8520	43	0.7286	68	0.6813	93	0.6568
19	0.8436	44	0.7259	69	0.6800	94	0.6560
20	0.8357	45	0.7232	70	0.6788	95	0.6553
21	0.8282	46	0.7207	71	0.6776	96	0.6546
22	0.8211	47	0.7183	72	0.6764	97	0.6539
23	0.8143	48	0.7159	73	0.6752	98	0.6532
24	0.8079	49	0.7137	74	0.6741	99	0.6525
25	0.8018	50	0.7115	75	0.6730	100	0.6519

Table 74. Distress Utility Factors for Longitudinal Cracking for Detailed Pavement Type: 08.

Alpha: 0.3700 **How Rated: Length per 100' station**

Beta: 1.0000

Rho: 136.9000

Length Per Station	UTILITY VALUE	Length Per Station	UTILITY VALUE	Length Per Station	UTILITY VALUE	Length Per Station	UTILITY VALUE
5	1.0000	130	0.8709	255	0.7837	380	0.0000
10	1.0000	135	0.8658	260	0.7815	385	0.7407
15	1.0000	140	0.8608	265	0.7793	390	0.7395
20	0.9996	145	0.8561	270	0.7772	395	0.7384
25	0.9985	150	0.8515	275	0.7751	400	0.7372
30	0.9961	155	0.8470	280	0.7731	405	0.7361
35	0.9926	160	0.8427	285	0.7711	410	0.7350
40	0.9879	165	0.8386	290	0.7692	415	0.7340
45	0.9823	170	0.8346	295	0.7674	420	0.7329
50	0.9761	175	0.8308	300	0.7656	425	0.7319
55	0.9693	180	0.8271	305	0.7638	430	0.7309
60	0.9622	185	0.8235	310	0.7621	435	0.7299
65	0.9550	190	0.8200	315	0.7604	440	0.7289
70	0.9477	195	0.8166	320	0.7588	445	0.7280
75	0.9404	200	0.8134	325	0.7572	450	0.7271
80	0.9332	205	0.8103	330	0.7556	455	0.7261
85	0.9261	210	0.8072	335	0.7541	460	0.7252
90	0.9192	215	0.8043	340	0.7526	465	0.7244
95	0.9124	220	0.8014	345	0.7512	470	0.7235
100	0.9059	225	0.7986	350	0.7498	475	0.7226
105	0.8995	230	0.7960	355	0.7484	480	0.7218
110	0.8934	235	0.7934	360	0.7470	485	0.7210
115	0.8875	240	0.7908	365	0.7457	490	0.7202
120	0.8818	245	0.7884	370	0.7444	495	0.7194
125	0.8762	250	0.7860	375	0.7432	500	0.7186

Table 75. Distress Utility Factors for Transverse Cracking for Detailed Pavement Type: 08.

Alpha: 0.4300 **How Rated: Number per 100' station**

Beta: 1.0000

Rho: 9.5600

Number Per Station	UTILITY VALUE	Number Per Station	UTILITY VALUE	Number Per Station	UTILITY VALUE	Number Per Station	UTILITY VALUE
1	1.0000	26	0.7023	51	0.6435	76	0.0000
2	0.9964	27	0.6982	52	0.6422	77	0.6202
3	0.9822	28	0.6944	53	0.6410	78	0.6196
4	0.9606	29	0.6908	54	0.6398	79	0.6190
5	0.9365	30	0.6873	55	0.6386	80	0.6184
6	0.9126	31	0.6841	56	0.6375	81	0.6179
7	0.8903	32	0.6810	57	0.6364	82	0.6173
8	0.8698	33	0.6781	58	0.6353	83	0.6168
9	0.8514	34	0.6754	59	0.6343	84	0.6163
10	0.8347	35	0.6728	60	0.6333	85	0.6157
11	0.8197	36	0.6703	61	0.6324	86	0.6152
12	0.8061	37	0.6679	62	0.6314	87	0.6147
13	0.7939	38	0.6656	63	0.6305	88	0.6143
14	0.7828	39	0.6635	64	0.6297	89	0.6138
15	0.7727	40	0.6614	65	0.6288	90	0.6133
16	0.7634	41	0.6594	66	0.6280	91	0.6129
17	0.7550	42	0.6575	67	0.6272	92	0.6124
18	0.7472	43	0.6557	68	0.6264	93	0.6120
19	0.7400	44	0.6540	69	0.6256	94	0.6116
20	0.7334	45	0.6523	70	0.6249	95	0.6112
21	0.7273	46	0.6507	71	0.6242	96	0.6108
22	0.7215	47	0.6491	72	0.6235	97	0.6104
23	0.7162	48	0.6477	73	0.6228	98	0.6100
24	0.7113	49	0.6462	74	0.6221	99	0.6096
25	0.7066	50	0.6448	75	0.6215	100	0.6092

Table 76. Distress Utility Factors for Shallow Rutting for Detailed Pavement Type: 09.

Alpha: 0.3100 **How Rated: Percentage of wheelpath length**

Beta: 1.0000

Rho: 19.7200

Percent of Wheelpath Length	UTILITY VALUE	Percent of Wheelpath Length	UTILITY VALUE	Percent of Wheelpath Length	UTILITY VALUE	Percent of Wheelpath Length	UTILITY VALUE
1	1.0000	26	0.8548	51	0.7894	76	0.0000
2	1.0000	27	0.8507	52	0.7878	77	0.7600
3	0.9996	28	0.8467	53	0.7863	78	0.7593
4	0.9978	29	0.8429	54	0.7848	79	0.7585
5	0.9940	30	0.8393	55	0.7834	80	0.7577
6	0.9884	31	0.8359	56	0.7820	81	0.7570
7	0.9815	32	0.8326	57	0.7807	82	0.7563
8	0.9736	33	0.8295	58	0.7794	83	0.7556
9	0.9653	34	0.8264	59	0.7781	84	0.7549
10	0.9569	35	0.8235	60	0.7768	85	0.7542
11	0.9484	36	0.8207	61	0.7756	86	0.7535
12	0.9401	37	0.8181	62	0.7745	87	0.7529
13	0.9320	38	0.8155	63	0.7733	88	0.7522
14	0.9242	39	0.8130	64	0.7722	89	0.7516
15	0.9167	40	0.8107	65	0.7711	90	0.7510
16	0.9096	41	0.8084	66	0.7701	91	0.7504
17	0.9028	42	0.8062	67	0.7690	92	0.7498
18	0.8964	43	0.8040	68	0.7680	93	0.7492
19	0.8902	44	0.8020	69	0.7671	94	0.7487
20	0.8843	45	0.8000	70	0.7661	95	0.7481
21	0.8788	46	0.7981	71	0.7652	96	0.7476
22	0.8735	47	0.7962	72	0.7643	97	0.7470
23	0.8685	48	0.7944	73	0.7634	98	0.7465
24	0.8637	49	0.7927	74	0.7625	99	0.7460
25	0.8591	50	0.7910	75	0.7617	100	0.7455

Table 77. Distress Utility Factors for Deep Rutting for Detailed Pavement Type: 09.

Alpha: 0.6900 **How Rated: Percent of wheelpath length**

Beta: 1.0000

Rho: 16.2700

Percent of Wheelpath Length	UTILITY VALUE	Percent of Wheelpath Length	UTILITY VALUE	Percent of Wheelpath Length	UTILITY VALUE	Percent of Wheelpath Length	UTILITY VALUE
1	1.0000	26	0.6310	51	0.4985	76	0.0000
2	0.9998	27	0.6223	52	0.4954	77	0.4414
3	0.9970	28	0.6141	53	0.4924	78	0.4399
4	0.9882	29	0.6063	54	0.4895	79	0.4384
5	0.9734	30	0.5988	55	0.4867	80	0.4370
6	0.9542	31	0.5918	56	0.4840	81	0.4356
7	0.9325	32	0.5850	57	0.4813	82	0.4342
8	0.9097	33	0.5786	58	0.4788	83	0.4328
9	0.8868	34	0.5724	59	0.4763	84	0.4315
10	0.8644	35	0.5665	60	0.4739	85	0.4302
11	0.8428	36	0.5609	61	0.4715	86	0.4289
12	0.8222	37	0.5555	62	0.4693	87	0.4277
13	0.8026	38	0.5503	63	0.4670	88	0.4265
14	0.7842	39	0.5454	64	0.4649	89	0.4253
15	0.7668	40	0.5406	65	0.4628	90	0.4241
16	0.7504	41	0.5360	66	0.4608	91	0.4230
17	0.7350	42	0.5316	67	0.4588	92	0.4218
18	0.7206	43	0.5274	68	0.4568	93	0.4207
19	0.7069	44	0.5233	69	0.4549	94	0.4197
20	0.6941	45	0.5194	70	0.4531	95	0.4186
21	0.6820	46	0.5156	71	0.4513	96	0.4176
22	0.6706	47	0.5119	72	0.4496	97	0.4165
23	0.6599	48	0.5084	73	0.4479	98	0.4156
24	0.6497	49	0.5050	74	0.4462	99	0.4146
25	0.6401	50	0.5017	75	0.4446	100	0.4136

Table 78. Distress Utility Factors for Patching for Detailed Pavement Type: 09.

Alpha: **0.4500** **How Rated: Percent of lane area**

Beta: **1.0000**

Rho: **10.1500**

Percent of Lane Area	UTILITY VALUE	Percent of Lane Area	UTILITY VALUE	Percent of Lane Area	UTILITY VALUE	Percent of Lane Area	UTILITY VALUE
1	1.0000	26	0.6954	51	0.6312	76	0.0000
2	0.9972	27	0.6910	52	0.6298	77	0.6056
3	0.9847	28	0.6868	53	0.6284	78	0.6049
4	0.9644	29	0.6829	54	0.6271	79	0.6043
5	0.9409	30	0.6792	55	0.6258	80	0.6036
6	0.9171	31	0.6756	56	0.6246	81	0.6030
7	0.8944	32	0.6723	57	0.6234	82	0.6024
8	0.8735	33	0.6691	58	0.6222	83	0.6018
9	0.8543	34	0.6661	59	0.6211	84	0.6012
10	0.8369	35	0.6633	60	0.6200	85	0.6007
11	0.8212	36	0.6606	61	0.6190	86	0.6001
12	0.8069	37	0.6580	62	0.6180	87	0.5996
13	0.7939	38	0.6555	63	0.6170	88	0.5990
14	0.7821	39	0.6531	64	0.6160	89	0.5985
15	0.7713	40	0.6509	65	0.6151	90	0.5980
16	0.7614	41	0.6487	66	0.6141	91	0.5975
17	0.7523	42	0.6466	67	0.6133	92	0.5970
18	0.7440	43	0.6446	68	0.6124	93	0.5965
19	0.7362	44	0.6427	69	0.6116	94	0.5961
20	0.7291	45	0.6409	70	0.6107	95	0.5956
21	0.7225	46	0.6391	71	0.6099	96	0.5951
22	0.7163	47	0.6374	72	0.6092	97	0.5947
23	0.7106	48	0.6358	73	0.6084	98	0.5943
24	0.7052	49	0.6342	74	0.6077	99	0.5939
25	0.7002	50	0.6327	75	0.6070	100	0.5934

Table 79. Distress Utility Factors for Failures for Detailed Pavement Type: 09.

Alpha: 1.0000 **How Rated: Total Number**

Beta: 1.0000

Rho: 4.7000

Number Per Mile	UTILITY VALUE	Number Per Mile	UTILITY VALUE	Number Per Mile	UTILITY VALUE	Number Per Mile	UTILITY VALUE
1	0.9909	26	0.1654	51	0.0880	76	0.0000
2	0.9046	27	0.1598	52	0.0864	77	0.0592
3	0.7913	28	0.1545	53	0.0849	78	0.0585
4	0.6912	29	0.1496	54	0.0834	79	0.0578
5	0.6094	30	0.1450	55	0.0819	80	0.0571
6	0.5431	31	0.1407	56	0.0805	81	0.0564
7	0.4890	32	0.1366	57	0.0791	82	0.0557
8	0.4443	33	0.1327	58	0.0778	83	0.0551
9	0.4068	34	0.1291	59	0.0766	84	0.0544
10	0.3750	35	0.1257	60	0.0753	85	0.0538
11	0.3477	36	0.1224	61	0.0742	86	0.0532
12	0.3241	37	0.1193	62	0.0730	87	0.0526
13	0.3034	38	0.1163	63	0.0719	88	0.0520
14	0.2852	39	0.1135	64	0.0708	89	0.0514
15	0.2690	40	0.1109	65	0.0698	90	0.0509
16	0.2545	41	0.1083	66	0.0687	91	0.0503
17	0.2415	42	0.1059	67	0.0677	92	0.0498
18	0.2298	43	0.1035	68	0.0668	93	0.0493
19	0.2191	44	0.1013	69	0.0658	94	0.0488
20	0.2094	45	0.0992	70	0.0649	95	0.0483
21	0.2005	46	0.0971	71	0.0641	96	0.0478
22	0.1924	47	0.0952	72	0.0632	97	0.0473
23	0.1848	48	0.0933	73	0.0624	98	0.0468
24	0.1779	49	0.0915	74	0.0615	99	0.0464
25	0.1714	50	0.0897	75	0.0607	100	0.0459

Table 80. Distress Utility Factors for Block Cracking for Detailed Pavement Type: 09.

Alpha: 0.4900 **How Rated: Percent of lane area**

Beta: 1.0000

Rho: 9.7800

Percent of Lane Area	UTILITY VALUE	Percent of Lane Area	UTILITY VALUE	Percent of Lane Area	UTILITY VALUE	Percent of Lane Area	UTILITY VALUE
1	1.0000	26	0.6636	51	0.5955	76	0.0000
2	0.9963	27	0.6589	52	0.5940	77	0.5684
3	0.9812	28	0.6545	53	0.5926	78	0.5677
4	0.9575	29	0.6503	54	0.5912	79	0.5671
5	0.9307	30	0.6463	55	0.5898	80	0.5664
6	0.9040	31	0.6426	56	0.5885	81	0.5657
7	0.8788	32	0.6390	57	0.5873	82	0.5651
8	0.8557	33	0.6357	58	0.5860	83	0.5645
9	0.8347	34	0.6325	59	0.5848	84	0.5639
10	0.8157	35	0.6295	60	0.5837	85	0.5633
11	0.7986	36	0.6266	61	0.5826	86	0.5627
12	0.7831	37	0.6238	62	0.5815	87	0.5621
13	0.7691	38	0.6212	63	0.5805	88	0.5615
14	0.7563	39	0.6187	64	0.5794	89	0.5610
15	0.7447	40	0.6163	65	0.5784	90	0.5605
16	0.7341	41	0.6140	66	0.5775	91	0.5599
17	0.7244	42	0.6118	67	0.5766	92	0.5594
18	0.7154	43	0.6097	68	0.5756	93	0.5589
19	0.7071	44	0.6077	69	0.5748	94	0.5584
20	0.6995	45	0.6057	70	0.5739	95	0.5579
21	0.6924	46	0.6038	71	0.5731	96	0.5575
22	0.6859	47	0.6021	72	0.5722	97	0.5570
23	0.6797	48	0.6003	73	0.5714	98	0.5565
24	0.6740	49	0.5987	74	0.5707	99	0.5561
25	0.6686	50	0.5971	75	0.5699	100	0.5557

Table 81. Distress Utility Factors for Alligator Cracking for Detailed Pavement Type: 09.

Alpha: **0.5300** **How Rated: Percentage of wheelpath length**

Beta: **1.0000**

Rho: **8.0100**

Percent of Wheelpath Length	UTILITY VALUE	Percent of Wheelpath Length	UTILITY VALUE	Percent of Wheelpath Length	UTILITY VALUE	Percent of Wheelpath Length	UTILITY VALUE
1	0.9998	26	0.6105	51	0.5470	76	0.0000
2	0.9903	27	0.6061	52	0.5457	77	0.5224
3	0.9633	28	0.6019	53	0.5443	78	0.5217
4	0.9285	29	0.5979	54	0.5431	79	0.5211
5	0.8932	30	0.5942	55	0.5418	80	0.5205
6	0.8605	31	0.5907	56	0.5406	81	0.5199
7	0.8312	32	0.5874	57	0.5395	82	0.5193
8	0.8053	33	0.5842	58	0.5384	83	0.5188
9	0.7824	34	0.5812	59	0.5373	84	0.5182
10	0.7621	35	0.5784	60	0.5362	85	0.5177
11	0.7441	36	0.5757	61	0.5352	86	0.5171
12	0.7281	37	0.5732	62	0.5342	87	0.5166
13	0.7138	38	0.5707	63	0.5333	88	0.5161
14	0.7009	39	0.5684	64	0.5323	89	0.5156
15	0.6893	40	0.5662	65	0.5314	90	0.5151
16	0.6787	41	0.5641	66	0.5306	91	0.5147
17	0.6691	42	0.5620	67	0.5297	92	0.5142
18	0.6604	43	0.5601	68	0.5289	93	0.5137
19	0.6523	44	0.5582	69	0.5281	94	0.5133
20	0.6449	45	0.5564	70	0.5273	95	0.5129
21	0.6381	46	0.5547	71	0.5265	96	0.5124
22	0.6317	47	0.5530	72	0.5258	97	0.5120
23	0.6259	48	0.5515	73	0.5251	98	0.5116
24	0.6204	49	0.5499	74	0.5244	99	0.5112
25	0.6153	50	0.5485	75	0.5237	100	0.5108

Table 82. Distress Utility Factors for Longitudinal Cracking for Detailed Pavement Type: 09.

Alpha: 0.8700 **How Rated: Length per 100' station**

Beta: 1.0000

Rho: 184.0000

Length Per Station	UTILITY VALUE	Length Per Station	UTILITY VALUE	Length Per Station	UTILITY VALUE	Length Per Station	UTILITY VALUE
5	1.0000	130	0.7887	255	0.5772	380	0.0000
10	1.0000	135	0.7774	260	0.5713	385	0.4605
15	1.0000	140	0.7663	265	0.5655	390	0.4572
20	0.9999	145	0.7554	270	0.5599	395	0.4540
25	0.9994	150	0.7449	275	0.5544	400	0.4508
30	0.9981	155	0.7346	280	0.5491	405	0.4477
35	0.9955	160	0.7245	285	0.5438	410	0.4446
40	0.9913	165	0.7148	290	0.5387	415	0.4416
45	0.9854	170	0.7052	295	0.5337	420	0.4386
50	0.9781	175	0.6960	300	0.5289	425	0.4357
55	0.9693	180	0.6870	305	0.5241	430	0.4329
60	0.9595	185	0.6782	310	0.5194	435	0.4301
65	0.9487	190	0.6697	315	0.5149	440	0.4273
70	0.9372	195	0.6614	320	0.5104	445	0.4246
75	0.9252	200	0.6533	325	0.5061	450	0.4220
80	0.9128	205	0.6454	330	0.5018	455	0.4194
85	0.9001	210	0.6378	335	0.4977	460	0.4168
90	0.8874	215	0.6303	340	0.4936	465	0.4143
95	0.8746	220	0.6230	345	0.4896	470	0.4118
100	0.8618	225	0.6160	350	0.4857	475	0.4094
105	0.8492	230	0.6091	355	0.4819	480	0.4070
110	0.8367	235	0.6024	360	0.4781	485	0.4047
115	0.8244	240	0.5958	365	0.4745	490	0.4024
120	0.8122	245	0.5895	370	0.4709	495	0.4001
125	0.8004	250	0.5832	375	0.4674	500	0.3979

Table 83. Distress Utility Factors for Transverse Cracking for Detailed Pavement Type: 09.

Alpha: 0.6900 **How Rated: Number per 100' station**

Beta: 1.0000

Rho: 10.3900

Number Per Station	UTILITY VALUE	Number Per Station	UTILITY VALUE	Number Per Station	UTILITY VALUE	Number Per Station	UTILITY VALUE
1	1.0000	26	0.5373	51	0.4372	76	0.0000
2	0.9962	27	0.5304	52	0.4350	77	0.3971
3	0.9784	28	0.5239	53	0.4328	78	0.3961
4	0.9486	29	0.5178	54	0.4308	79	0.3950
5	0.9136	30	0.5120	55	0.4288	80	0.3940
6	0.8779	31	0.5065	56	0.4268	81	0.3931
7	0.8436	32	0.5013	57	0.4250	82	0.3921
8	0.8117	33	0.4964	58	0.4232	83	0.3912
9	0.7825	34	0.4917	59	0.4214	84	0.3903
10	0.7559	35	0.4872	60	0.4197	85	0.3894
11	0.7317	36	0.4830	61	0.4181	86	0.3885
12	0.7097	37	0.4789	62	0.4165	87	0.3877
13	0.6897	38	0.4751	63	0.4149	88	0.3868
14	0.6715	39	0.4714	64	0.4134	89	0.3860
15	0.6548	40	0.4678	65	0.4119	90	0.3852
16	0.6396	41	0.4645	66	0.4105	91	0.3845
17	0.6255	42	0.4612	67	0.4091	92	0.3837
18	0.6126	43	0.4581	68	0.4078	93	0.3829
19	0.6006	44	0.4551	69	0.4065	94	0.3822
20	0.5896	45	0.4523	70	0.4052	95	0.3815
21	0.5793	46	0.4495	71	0.4039	96	0.3808
22	0.5697	47	0.4469	72	0.4027	97	0.3801
23	0.5608	48	0.4443	73	0.4015	98	0.3794
24	0.5525	49	0.4418	74	0.4004	99	0.3787
25	0.5446	50	0.4395	75	0.3993	100	0.3781

Table 84. Distress Utility Factors for Shallow Rutting for Detailed Pavement Type: 10.

Alpha: 0.3100 How Rated: Percent of wheelpath length

Beta: 1.0000

Rho: 19.7200

Percent of Wheelpath Length	UTILITY VALUE	Percent of Wheelpath Length	UTILITY VALUE	Percent of Wheelpath Length	UTILITY VALUE	Percent of Wheelpath Length	UTILITY VALUE
1	1.0000	26	0.8548	51	0.7894	76	0.0000
2	1.0000	27	0.8507	52	0.7878	77	0.7600
3	0.9996	28	0.8467	53	0.7863	78	0.7593
4	0.9978	29	0.8429	54	0.7848	79	0.7585
5	0.9940	30	0.8393	55	0.7834	80	0.7577
6	0.9884	31	0.8359	56	0.7820	81	0.7570
7	0.9815	32	0.8326	57	0.7807	82	0.7563
8	0.9736	33	0.8295	58	0.7794	83	0.7556
9	0.9653	34	0.8264	59	0.7781	84	0.7549
10	0.9569	35	0.8235	60	0.7768	85	0.7542
11	0.9484	36	0.8207	61	0.7756	86	0.7535
12	0.9401	37	0.8181	62	0.7745	87	0.7529
13	0.9320	38	0.8155	63	0.7733	88	0.7522
14	0.9242	39	0.8130	64	0.7722	89	0.7516
15	0.9167	40	0.8107	65	0.7711	90	0.7510
16	0.9096	41	0.8084	66	0.7701	91	0.7504
17	0.9028	42	0.8062	67	0.7690	92	0.7498
18	0.8964	43	0.8040	68	0.7680	93	0.7492
19	0.8902	44	0.8020	69	0.7671	94	0.7487
20	0.8843	45	0.8000	70	0.7661	95	0.7481
21	0.8788	46	0.7981	71	0.7652	96	0.7476
22	0.8735	47	0.7962	72	0.7643	97	0.7470
23	0.8685	48	0.7944	73	0.7634	98	0.7465
24	0.8637	49	0.7927	74	0.7625	99	0.7460
25	0.8591	50	0.7910	75	0.7617	100	0.7455

Table 85. Distress Utility Factors for Deep Rutting for Detailed Pavement Type: 10.

Alpha: **0.6900** **How Rated: Percentage of wheelpath length**

Beta: **1.0000**

Rho: **16.2700**

Percent of Wheelpath Length	UTILITY VALUE	Percent of Wheelpath Length	UTILITY VALUE	Percent of Wheelpath Length	UTILITY VALUE	Percent of Wheelpath Length	UTILITY VALUE
1	1.0000	26	0.6310	51	0.4985	76	0.0000
2	0.9998	27	0.6223	52	0.4954	77	0.4414
3	0.9970	28	0.6141	53	0.4924	78	0.4399
4	0.9882	29	0.6063	54	0.4895	79	0.4384
5	0.9734	30	0.5988	55	0.4867	80	0.4370
6	0.9542	31	0.5918	56	0.4840	81	0.4356
7	0.9325	32	0.5850	57	0.4813	82	0.4342
8	0.9097	33	0.5786	58	0.4788	83	0.4328
9	0.8868	34	0.5724	59	0.4763	84	0.4315
10	0.8644	35	0.5665	60	0.4739	85	0.4302
11	0.8428	36	0.5609	61	0.4715	86	0.4289
12	0.8222	37	0.5555	62	0.4693	87	0.4277
13	0.8026	38	0.5503	63	0.4670	88	0.4265
14	0.7842	39	0.5454	64	0.4649	89	0.4253
15	0.7668	40	0.5406	65	0.4628	90	0.4241
16	0.7504	41	0.5360	66	0.4608	91	0.4230
17	0.7350	42	0.5316	67	0.4588	92	0.4218
18	0.7206	43	0.5274	68	0.4568	93	0.4207
19	0.7069	44	0.5233	69	0.4549	94	0.4197
20	0.6941	45	0.5194	70	0.4531	95	0.4186
21	0.6820	46	0.5156	71	0.4513	96	0.4176
22	0.6706	47	0.5119	72	0.4496	97	0.4165
23	0.6599	48	0.5084	73	0.4479	98	0.4156
24	0.6497	49	0.5050	74	0.4462	99	0.4146
25	0.6401	50	0.5017	75	0.4446	100	0.4136

Table 86. Distress Utility Factors for Patching for Detailed Pavement Type: 10.

Alpha: **0.4500** **How Rated: Percent of lane area**

Beta: **1.0000**

Rho: **10.1500**

Percent of Lane Area	UTILITY VALUE	Percent of Lane Area	UTILITY VALUE	Percent of Lane Area	UTILITY VALUE	Percent of Lane Area	UTILITY VALUE
1	1.0000	26	0.6954	51	0.6312	76	0.0000
2	0.9972	27	0.6910	52	0.6298	77	0.6056
3	0.9847	28	0.6868	53	0.6284	78	0.6049
4	0.9644	29	0.6829	54	0.6271	79	0.6043
5	0.9409	30	0.6792	55	0.6258	80	0.6036
6	0.9171	31	0.6756	56	0.6246	81	0.6030
7	0.8944	32	0.6723	57	0.6234	82	0.6024
8	0.8735	33	0.6691	58	0.6222	83	0.6018
9	0.8543	34	0.6661	59	0.6211	84	0.6012
10	0.8369	35	0.6633	60	0.6200	85	0.6007
11	0.8212	36	0.6606	61	0.6190	86	0.6001
12	0.8069	37	0.6580	62	0.6180	87	0.5996
13	0.7939	38	0.6555	63	0.6170	88	0.5990
14	0.7821	39	0.6531	64	0.6160	89	0.5985
15	0.7713	40	0.6509	65	0.6151	90	0.5980
16	0.7614	41	0.6487	66	0.6141	91	0.5975
17	0.7523	42	0.6466	67	0.6133	92	0.5970
18	0.7440	43	0.6446	68	0.6124	93	0.5965
19	0.7362	44	0.6427	69	0.6116	94	0.5961
20	0.7291	45	0.6409	70	0.6107	95	0.5956
21	0.7225	46	0.6391	71	0.6099	96	0.5951
22	0.7163	47	0.6374	72	0.6092	97	0.5947
23	0.7106	48	0.6358	73	0.6084	98	0.5943
24	0.7052	49	0.6342	74	0.6077	99	0.5939
25	0.7002	50	0.6327	75	0.6070	100	0.5934

Table 87. Distress Utility Factors for Failures for Detailed Pavement Type: 10.

Alpha: 1.0000 **How Rated: Total Number**

Beta: 1.0000

Rho: 4.7000

Number Per Mile	UTILITY VALUE	Number Per Mile	UTILITY VALUE	Number Per Mile	UTILITY VALUE	Number Per Mile	UTILITY VALUE
1	0.9909	26	0.1654	51	0.0880	76	0.0000
2	0.9046	27	0.1598	52	0.0864	77	0.0592
3	0.7913	28	0.1545	53	0.0849	78	0.0585
4	0.6912	29	0.1496	54	0.0834	79	0.0578
5	0.6094	30	0.1450	55	0.0819	80	0.0571
6	0.5431	31	0.1407	56	0.0805	81	0.0564
7	0.4890	32	0.1366	57	0.0791	82	0.0557
8	0.4443	33	0.1327	58	0.0778	83	0.0551
9	0.4068	34	0.1291	59	0.0766	84	0.0544
10	0.3750	35	0.1257	60	0.0753	85	0.0538
11	0.3477	36	0.1224	61	0.0742	86	0.0532
12	0.3241	37	0.1193	62	0.0730	87	0.0526
13	0.3034	38	0.1163	63	0.0719	88	0.0520
14	0.2852	39	0.1135	64	0.0708	89	0.0514
15	0.2690	40	0.1109	65	0.0698	90	0.0509
16	0.2545	41	0.1083	66	0.0687	91	0.0503
17	0.2415	42	0.1059	67	0.0677	92	0.0498
18	0.2298	43	0.1035	68	0.0668	93	0.0493
19	0.2191	44	0.1013	69	0.0658	94	0.0488
20	0.2094	45	0.0992	70	0.0649	95	0.0483
21	0.2005	46	0.0971	71	0.0641	96	0.0478
22	0.1924	47	0.0952	72	0.0632	97	0.0473
23	0.1848	48	0.0933	73	0.0624	98	0.0468
24	0.1779	49	0.0915	74	0.0615	99	0.0464
25	0.1714	50	0.0897	75	0.0607	100	0.0459

Table 88. Distress Utility Factors for Block Cracking for Detailed Pavement Type: 10.

Alpha: 0.4900 **How Rated: Percent of lane area**

Beta: 1.0000

Rho: 9.7800

Percent of Lane Area	UTILITY VALUE	Percent of Lane Area	UTILITY VALUE	Percent of Lane Area	UTILITY VALUE	Percent of Lane Area	UTILITY VALUE
1	1.0000	26	0.6636	51	0.5955	76	0.0000
2	0.9963	27	0.6589	52	0.5940	77	0.5684
3	0.9812	28	0.6545	53	0.5926	78	0.5677
4	0.9575	29	0.6503	54	0.5912	79	0.5671
5	0.9307	30	0.6463	55	0.5898	80	0.5664
6	0.9040	31	0.6426	56	0.5885	81	0.5657
7	0.8788	32	0.6390	57	0.5873	82	0.5651
8	0.8557	33	0.6357	58	0.5860	83	0.5645
9	0.8347	34	0.6325	59	0.5848	84	0.5639
10	0.8157	35	0.6295	60	0.5837	85	0.5633
11	0.7986	36	0.6266	61	0.5826	86	0.5627
12	0.7831	37	0.6238	62	0.5815	87	0.5621
13	0.7691	38	0.6212	63	0.5805	88	0.5615
14	0.7563	39	0.6187	64	0.5794	89	0.5610
15	0.7447	40	0.6163	65	0.5784	90	0.5605
16	0.7341	41	0.6140	66	0.5775	91	0.5599
17	0.7244	42	0.6118	67	0.5766	92	0.5594
18	0.7154	43	0.6097	68	0.5756	93	0.5589
19	0.7071	44	0.6077	69	0.5748	94	0.5584
20	0.6995	45	0.6057	70	0.5739	95	0.5579
21	0.6924	46	0.6038	71	0.5731	96	0.5575
22	0.6859	47	0.6021	72	0.5722	97	0.5570
23	0.6797	48	0.6003	73	0.5714	98	0.5565
24	0.6740	49	0.5987	74	0.5707	99	0.5561
25	0.6686	50	0.5971	75	0.5699	100	0.5557

Table 89. Distress Utility Factors for Alligator Cracking for Detailed Pavement Type: 10.

Alpha: 0.5300 **How Rated: Percent of wheelpath length**

Beta: 1.0000

Rho: 8.0100

Percent of Wheelpath Length	UTILITY VALUE	Percent of Wheelpath Length	UTILITY VALUE	Percent of Wheelpath Length	UTILITY VALUE	Percent of Wheelpath Length	UTILITY VALUE
1	0.9998	26	0.6105	51	0.5470	76	0.0000
2	0.9903	27	0.6061	52	0.5457	77	0.5224
3	0.9633	28	0.6019	53	0.5443	78	0.5217
4	0.9285	29	0.5979	54	0.5431	79	0.5211
5	0.8932	30	0.5942	55	0.5418	80	0.5205
6	0.8605	31	0.5907	56	0.5406	81	0.5199
7	0.8312	32	0.5874	57	0.5395	82	0.5193
8	0.8053	33	0.5842	58	0.5384	83	0.5188
9	0.7824	34	0.5812	59	0.5373	84	0.5182
10	0.7621	35	0.5784	60	0.5362	85	0.5177
11	0.7441	36	0.5757	61	0.5352	86	0.5171
12	0.7281	37	0.5732	62	0.5342	87	0.5166
13	0.7138	38	0.5707	63	0.5333	88	0.5161
14	0.7009	39	0.5684	64	0.5323	89	0.5156
15	0.6893	40	0.5662	65	0.5314	90	0.5151
16	0.6787	41	0.5641	66	0.5306	91	0.5147
17	0.6691	42	0.5620	67	0.5297	92	0.5142
18	0.6604	43	0.5601	68	0.5289	93	0.5137
19	0.6523	44	0.5582	69	0.5281	94	0.5133
20	0.6449	45	0.5564	70	0.5273	95	0.5129
21	0.6381	46	0.5547	71	0.5265	96	0.5124
22	0.6317	47	0.5530	72	0.5258	97	0.5120
23	0.6259	48	0.5515	73	0.5251	98	0.5116
24	0.6204	49	0.5499	74	0.5244	99	0.5112
25	0.6153	50	0.5485	75	0.5237	100	0.5108

Table 90. Distress Utility Factors for Transverse Cracking for Detailed Pavement Type: 10.

Alpha: 0.6900 **How Rated: Number per 100' station**

Beta: 1.0000

Rho: 10.3900

Number Per Station	UTILITY VALUE	Number Per Station	UTILITY VALUE	Number Per Station	UTILITY VALUE	Number Per Station	UTILITY VALUE
1	1.0000	26	0.5373	51	0.4372	76	0.0000
2	0.9962	27	0.5304	52	0.4350	77	0.3971
3	0.9784	28	0.5239	53	0.4328	78	0.3961
4	0.9486	29	0.5178	54	0.4308	79	0.3950
5	0.9136	30	0.5120	55	0.4288	80	0.3940
6	0.8779	31	0.5065	56	0.4268	81	0.3931
7	0.8436	32	0.5013	57	0.4250	82	0.3921
8	0.8117	33	0.4964	58	0.4232	83	0.3912
9	0.7825	34	0.4917	59	0.4214	84	0.3903
10	0.7559	35	0.4872	60	0.4197	85	0.3894
11	0.7317	36	0.4830	61	0.4181	86	0.3885
12	0.7097	37	0.4789	62	0.4165	87	0.3877
13	0.6897	38	0.4751	63	0.4149	88	0.3868
14	0.6715	39	0.4714	64	0.4134	89	0.3860
15	0.6548	40	0.4678	65	0.4119	90	0.3852
16	0.6396	41	0.4645	66	0.4105	91	0.3845
17	0.6255	42	0.4612	67	0.4091	92	0.3837
18	0.6126	43	0.4581	68	0.4078	93	0.3829
19	0.6006	44	0.4551	69	0.4065	94	0.3822
20	0.5896	45	0.4523	70	0.4052	95	0.3815
21	0.5793	46	0.4495	71	0.4039	96	0.3808
22	0.5697	47	0.4469	72	0.4027	97	0.3801
23	0.5608	48	0.4443	73	0.4015	98	0.3794
24	0.5525	49	0.4418	74	0.4004	99	0.3787
25	0.5446	50	0.4395	75	0.3993	100	0.3781

Table 91. Distress Utility Factors for Longitudinal Cracking for Detailed Pavement Type: 10.

Alpha: **0.8700** **How Rated: Length per 100' station**

Beta: **1.0000**

Rho: **184.0000**

Length Per Station	UTILITY VALUE	Length Per Station	UTILITY VALUE	Length Per Station	UTILITY VALUE	Length Per Station	UTILITY VALUE
5	1.0000	130	0.7887	255	0.5772	380	0.0000
10	1.0000	135	0.7774	260	0.5713	385	0.4605
15	1.0000	140	0.7663	265	0.5655	390	0.4572
20	0.9999	145	0.7554	270	0.5599	395	0.4540
25	0.9994	150	0.7449	275	0.5544	400	0.4508
30	0.9981	155	0.7346	280	0.5491	405	0.4477
35	0.9955	160	0.7245	285	0.5438	410	0.4446
40	0.9913	165	0.7148	290	0.5387	415	0.4416
45	0.9854	170	0.7052	295	0.5337	420	0.4386
50	0.9781	175	0.6960	300	0.5289	425	0.4357
55	0.9693	180	0.6870	305	0.5241	430	0.4329
60	0.9595	185	0.6782	310	0.5194	435	0.4301
65	0.9487	190	0.6697	315	0.5149	440	0.4273
70	0.9372	195	0.6614	320	0.5104	445	0.4246
75	0.9252	200	0.6533	325	0.5061	450	0.4220
80	0.9128	205	0.6454	330	0.5018	455	0.4194
85	0.9001	210	0.6378	335	0.4977	460	0.4168
90	0.8874	215	0.6303	340	0.4936	465	0.4143
95	0.8746	220	0.6230	345	0.4896	470	0.4118
100	0.8618	225	0.6160	350	0.4857	475	0.4094
105	0.8492	230	0.6091	355	0.4819	480	0.4070
110	0.8367	235	0.6024	360	0.4781	485	0.4047
115	0.8244	240	0.5958	365	0.4745	490	0.4024
120	0.8122	245	0.5895	370	0.4709	495	0.4001
125	0.8004	250	0.5832	375	0.4674	500	0.3979

For the ACP section, assume that Pavement Type = 4. The rating for Shallow Rutting (25 percent) is the L value. Thus, use Table 36 to find a utility value of 0.8591.

Assuming that there are no other distress types (i.e., all other utility values = 1.0000), the Distress Score for the ACP section is 86 (rounded up from 85.91).

For the CRCP section, assume that the length of the section is 0.5 miles. Pavement Type is 1. The ratings for Punchouts and Concrete Patches must be converted to L values, using the equations shown below:

$$L_{Punch} = \frac{5}{0.5} \qquad L_{PCPat} = \frac{3}{0.5}$$

The L values are thus 10 per mile for Punchouts and 6 per mile for Concrete Patches. Then use Tables 23 and 25 to find a utility value of 0.4109 for Punchouts and 0.7795 for Concrete Patches.

Assuming that there are no other distress types (i.e., all other utility values = 1.0000), the Distress Score for the CRCP section is 32 (rounded down from 32.03), as shown in the equation below:

Answer #1: The CRCP section is worse, by 54 points.

$$DS = 100 \times [0.4109 * 0.7795]$$

Question #2: Is a JCP section with 38 Failed Joints and Cracks in worse condition than an ACP section with 10 percent Alligator Cracking? And if so, then by how much?

For the JCP section, assume that Pavement Type = 2, and that Section Length = 0.5 miles. The rating for Failed Joints and Cracks must be converted to an L value, using the equation shown below:

$$L = 100 \times \left[\frac{38}{\left(\frac{5280 \times 0.5}{60} \right)} \right]$$

The L value is thus 86.36 percent. Use 86 percent in Table 31 to find a utility value of 0.5869.

Assuming that there are no other distress types (i.e., all other utility values = 1.0000), the Distress Score for the JCP section is 59 (rounded up from 58.69).

For the ACP section, assume that Pavement Type = 6, and that Section Length is also 0.5 miles. The rating for Alligator Cracking (10 percent) is the L value. Thus, use Table 57 to find a utility value of 0.7621.

Assuming that there are no other distress types (i.e., all other utility values = 1.0000), the Distress Score for the ACP section is 76 (rounded down from 76.21).

Answer #2: The JCP section is in worse condition, by 17 points.

CALCULATING THE DISTRESS SCORE

As mentioned in Chapter 1, the PMIS Distress Score is calculated from the pavement utility curves. We propose that PMIS use the equations listed below, one for each Broad Pavement Type (CRCP, JCP, and ACP), to calculate the Distress Score. These equations are similar to the Unadjusted Visual Utility (UVU) equations, which were used in PES.

Equation for CRCP (Pavement Type = 1)

For CRCP sections, use the following equation:

$$DS = 100 \times \left[U_{Spall} * U_{Punch} * U_{ACPat} * U_{PCPat} \right]$$

where:

DS	=	Distress Score,
U	=	Utility value,
Spall	=	Spalled Cracks,
Punch	=	Punchouts,
ACPat	=	Asphalt Patches, and
PCPat	=	Concrete Patches.

Equation for JCP (Pavement Type = 2-3)

For JCP sections, use the following equation:

$$DS = 100 \times \left[U_{Flj} * U_{Fail} * U_{SS} * U_{Lng} * U_{PCPat}\right]$$

where:

DS	=	Distress Score,
U	=	Utility value,
Flj	=	Failed Joints and Cracks,
Fail	=	Failures,
SS	=	Shattered (Failed) Slabs,
Lng	=	Slabs With Longitudinal Cracking, and
PCPat	=	Concrete Patches.

Equation for ACP (Pavement Type = 4-10)

For ACP sections, use the following equation:

$$DS = 100 \times \left[U_{SRut} * U_{DRut} * U_{Patch} * U_{Fail} * U_{Blk} * U_{Alg} * U_{Lng} * U_{Trn}\right]$$

where:

DS	=	Distress Score,
U	=	Utility value,
SRut	=	Shallow Rutting,
DRut	=	Deep Rutting,
Pat	=	Patching,
Fail	=	Failures,
Blk	=	Block Cracking,
Alg	=	Alligator Cracking,
Lng	=	Longitudinal Cracking, and
Trn	=	Transverse Cracking.

CALCULATING THE CONDITION SCORE

As mentioned in Chapter 1, the PMIS Condition Score is also calculated from the pavement utility curves. We propose that PMIS use the equation shown below to calculate the Condition Score:

$$CS = 100 \times DS \times U_{RS}$$

where:

CS	=	Condition Score,
DS	=	Distress Score,
U	=	Utility value, and
RS	=	Ride Score.

This equation is similar to the Unadjusted Pavement Score (UPS) equation, which was used in PES.

SUMMARY

The PMIS utility values will give pavement managers a consistent way to compare different pavement sections in different conditions in different places. By serving as inputs to the PMIS Distress and Condition Score equations, they will also provide a way for TxDOT to describe the overall condition of its pavements.

For all of their applications, the utility values by themselves are not enough to describe the future condition of any pavement section. However, they can support this process, as will be described in Chapter 3.

III — PAVEMENT PERFORMANCE CURVES

Although comparing the current condition of different pavement sections is important, one of the most important benefits of a pavement management system comes from its ability to predict future pavement condition. This ability allows the pavement manager to "plan ahead," and fix a "problem" section before it becomes a problem. By "heading off" these problem sections, the pavement manager can use less-expensive treatments, and thus treat more pavements with the same amount of money. As more pavements are improved, the overall network condition should rise.

To provide this ability for TxDOT pavement managers, we propose that PMIS use a set of pavement performance curves to predict the future condition of Texas highways.

DESCRIPTION

As mentioned in Chapter 2, it is possible to relate increasing pavement distress to decreasing pavement utility (as was shown in Figure 1). Of course, increasing pavement distress is also related to increasing pavement age. Thus, pavement age, pavement distress, and pavement utility are all related to each other. As the pavement gets older, the amount of pavement distress increases (as described by the performance curve), and the pavement's utility drops.

Actually, it would be better to replace "pavement age" with a measure of accumulated traffic load (e.g., accumulated 18-k ESAL), but the performance curve concepts are the same. In the absence of consistent accumulated traffic load data on Texas highways, we propose that PMIS use "pavement age" in its pavement performance curves.

The pavement performance curve gives a way to estimate a pavement section's theoretical "age," based upon the amount of distress observed, as shown in Figure 5. When compared to the expected "design life," this age can be used to determine the section's remaining life, using the equation shown below:

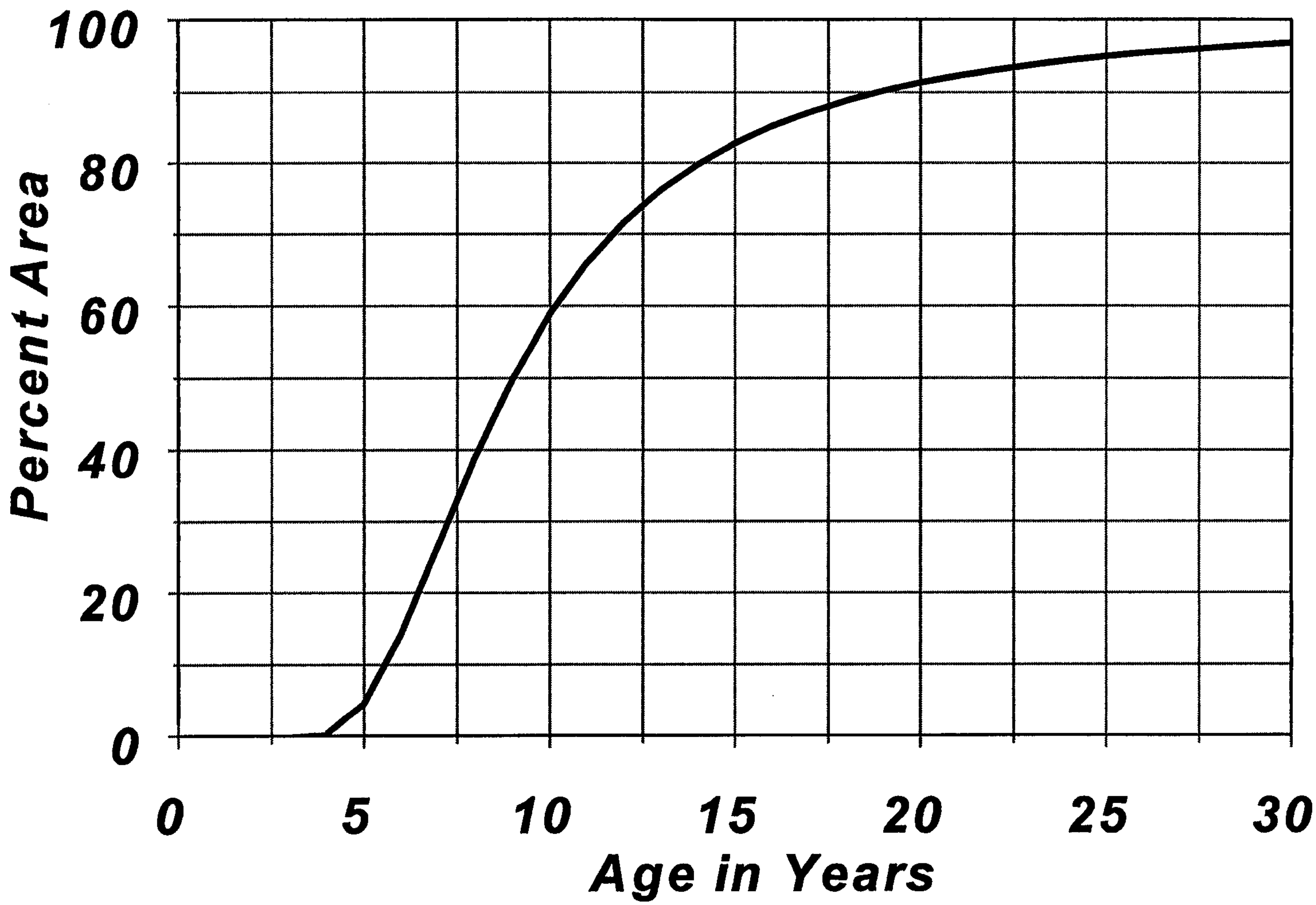

Figure 5. Performance Curve for Shallow Rutting.

$$RL = DL - AGE$$

where:

RL	=	Remaining Life, in years;
DL	=	Design Life, in years; and
AGE	=	Pavement section age, in years (from the performance curve).

"Design life" can be defined in terms of what was used in the original pavement design (e.g., 20 years), or it can be defined in terms of a pre-defined "Failure Criterion." We propose that PMIS define design life in terms of a "Failure Criterion" for Distress Score and Ride Score. The "Failure Criterion" concept will be described in more detail in Chapter 5.

Because each distress type has its own performance curve, each distress type can cause the pavement section to have a different theoretical "age," and thus, a different remaining life. For example, a pavement section may appear to be "2 years old" in terms of Alligator Cracking and Shallow Rutting, but may be "5 years old" in terms of Deep Rutting — and the section may actually have been built only one year ago!

When TxDOT completes its automated enhancements to the Road Life logs, pavement managers will be able to compare "actual" pavement age (from the Road Life system) with "theoretical" pavement age (computed from the PMIS performance curves). These comparisons will help TxDOT describe the overall amount of life remaining in its highway network.

Until the Road Life enhancements are completed, we propose that PMIS use the "theoretical" ages computed from its performance curve equations to describe pavement section ages.

EFFECT OF TREATMENTS ON PAVEMENT PERFORMANCE

With all of its pavement condition data, PMIS should be able to identify when a particular section will need to be treated, and what type of treatment will be required. If all goes well, the treatment will restore the pavement to its original condition — thus goes well, the treatment will restore the pavement to its original condition — thus restoring its utility (functional and structural) value to 1.0000.

Some treatments, of course, will not completely restore the pavement's original condition. For example, a crack seal treatment will eliminate the cracks, but will not do anything about rutting or ride quality.

There is also a link between the treatment type and how long the "improved" condition will last. Distress types on pavements repaired with some lighter treatments reappear in just a few years. Of course, a reconstruction treatment will restore original condition for the longest possible time — but it is not feasible to reconstruct every pavement section which needs to be treated.

Because of the relationship between treatment type and pavement performance, we propose that PMIS establish broad categories of treatment types, as shown in Table 92.

Table 92. Proposed PMIS Treatment Types.

PMIS Treatment Type		Used in...		
Abbreviation	Description	Needs Estimate?	Optimization?	Impact Analysis?
NN	Needs Nothing	Yes	Yes	Yes
SGap	Stopgap	No	Yes	Yes
PM	Preventive Maintenance	Yes	Yes	Yes
LRhb	Light Rehab	Yes	Yes	Yes
MRhb	Medium Rehab	Yes	Yes	Yes
HRhb	Heavy Rehab or Reconstruction	Yes	Yes	Yes

These treatment types are not meant to be specific because PMIS will not have enough detailed information to give a specific pavement design. Development of a pavement design will require detailed pavement data collection and testing above and beyond the network-level PMIS effort.

For more information about these treatment types, please refer to Chapter 4.

DEFINING PERFORMANCE CURVES

The performance curves are a foundation of the PMIS analysis procedures (Needs Estimate, Optimization, and Impact Analysis). As will be described in later Chapters, the performance curves project distress ratings and Ride Scores into the future for use in predicting future pavement condition, treatments, and costs. Because of their importance to the overall PMIS effort, we propose that TxDOT continually evaluate and improve the PMIS performance curves, to give the most reliable results possible.

Distress Types

The performance curves should determine how much distress will be observed at any time during the pavement's life. Thus, the performance curve will be able to give a PMIS rating for each distress type.

As with the utility curve equations described in Chapter 2, some of the distress ratings will have to be "normalized" to a percentage or other similar value. Thus, we propose that the PMIS performance curves for pavement distress compute the L value (level of distress) as a function of pavement age. The "predicted" PMIS distress rating can then be back-calculated from the L value. One advantage of this feature is that the pavement manager will be able to "calibrate" the performance curve equations by comparing a section's current PMIS distress ratings with those predicted from previous years' data.

As in Chapter 2, we propose that PMIS not define performance curves for its optional distress types (currently, Raveling and Flushing) or for those distress types that are used to normalize other distress ratings (currently, Average Crack Spacing and Apparent Joint Spacing). We also propose that PMIS not define a performance curve for Patching on ACP sections, as described below.

Patching on ACP Sections

Research study personnel had often observed a relationship between Patching on ACP sections and the number of Failures. The immediate problem, of course, was to develop a performance curve that TxDOT could use to predict Failures before they occurred.

It was originally expected that data from the Flexible Pavement Database and PES would define a performance curve for Failures on ACP sections. However, the data indicated that very few pavement sections ever developed more than two Failures per mile (i.e., had a PES rating of "010" or "001"). Discussion with TxDOT Districts revealed that they were patching the Failures as quickly as possible.

Research study personnel reviewed the data again and defined a relationship between Failures and Patching: every time the number of Failures rose above two per mile, the amount of Patching increased (and the number of Failures went back down below two per mile again). It was difficult to determine an exact percentage increase in Patching when Failures were repaired, because the broad PES rating categories (i.e., "000," "100," "010," and "001") did not identify the actual percent of Patching. Research study personnel tried many different combinations; the one that worked the best was to use a 5 percent increase in Patching for every 2 Failures per mile repaired.

Because of this relationship, we propose that PMIS define performance curves for Failures, but not for Patching, on ACP. To "age" the amount of Patching over time, we propose that PMIS increase the rating for Patching by 5 percent (up to a maximum of 100, of course) for every 2 Failures per mile — stopping only when the Failures rating drops below 2 (per mile). The Failures should then be "aged" according to the appropriate treatment-based performance curve each year and more Patching added only when the Failures rating exceeds 2 (per mile). An example of this process is shown below in Table 93.

Table 93. Example of Aging Patching and Failures for ACP.

Fiscal Year	PMIS Ratings		Description of Aging Process
	Patching	Failures	
1995 (current)	3	11	current ratings (no aging)
1996	28	1	failures were above 2 per mile: reduce failures to 9, 7, 5, 3, and then to 1; increase patching by 5 percent each time to 8, 13, 18, 23, and finally to 28, respectively
1997	28	1.7587	failures were below 2 per mile: age failures according to performance curve to get 1.7587; no change in patching
1998	28	2.3934	failures were below 2 per mile: age failures according to performance curve to get 2.3934; no change in patching
1999	33	0.3934	failures were above 2 per mile; reduce failures to 0.3934; increase patching by 5 percent

This proposal has not been used in the current version of PMIS. PMIS ages Failures and lets those values trigger Preventive Maintenance treatments, as needed.

Ride Quality

The performance curves should also be able to track the expected decrease in ride quality as a pavement ages. However, this approach would contradict the "shape" of the performance curve used for distress: the ride curve would have a negative slope (i.e., ride quality goes down as the pavement ages), while the distress curve would have a positive slope (i.e., the level of distress increases as the pavement ages). The performance curves would be more difficult to understand if one group of curves went up with time and the other group of curves went down with time.

To ensure that the ride quality performance curves have the same positive slope as the distress performance curves, we propose that PMIS compute the L value (percent of ride quality lost) as a function of pavement age. The "predicted" PMIS Ride Score can then be back-calculated from the L value. One advantage of this feature is that the pavement manager will be able to "calibrate" the performance curve equations by comparing a section's current PMIS Ride Score with that predicted from previous year's data.

BASIC PERFORMANCE CURVE EQUATION

As with the utility curves, the basic shape of a pavement's performance curve is sigmoidal (S-shaped). Most of the PMIS distress types have a performance curve (Patching, Raveling, Flushing, Average Crack Spacing, and Apparent Joint Spacing do not). This curve may be represented by the following equation:

$$L_i = \alpha e^{-\left(\frac{\chi \epsilon \sigma \rho}{AGE_i}\right)^{\beta}}$$

where:

L	=	level of distress (for distress types) or ride quality lost (for ride quality);
i	=	a PMIS distress type (e.g., Deep Rutting or Punchouts) or Ride Score;
α	=	alpha, a horizontal asymptote factor that controls the maximum range of percentage distress growth or ride loss;
e	=	base of the natural logarithms (e ≈ 2.71828...);
χ	=	chi, a traffic weighting factor that controls the effect of 18-k ESAL on performance;
ϵ	=	epsilon, a climate weighting factor that controls the effect of rainfall and freeze-thaw cycles on performance;
σ	=	sigma, a subgrade weighting support factor that controls the effect of subgrade strength on performance;
ρ	=	rho, a prolongation factor, in years, that controls "how long" the pavement will "last" before significant increases in distress occur;
AGE	=	pavement section age, in years; and
β	=	beta, a slope factor that controls how steeply condition is lost in the middle of the curve.

The χ, ϵ, and σ factors are curve modifiers used only in the performance curve equations.

These factors are described in the next three sections. The α, β, and ρ factors are described in Chapter 2. Please refer to Chapter 2 for information about the L value.

Traffic Factor (Chi)

Chi (χ) controls the effect of traffic on pavement performance. We propose that PMIS define Chi in terms of a section's 20-year projected 18-k ESAL, as shown in the equation below:

$$\chi_i = \chi_{\max} - \chi_\beta e^{-\left(\frac{\chi_\rho}{ESAL}\right)}$$

where:

χ	=	traffic weighting factor;
i	=	a PMIS distress type (e.g., Deep Rutting or Punchouts);
χ_{max}	=	the maximum value of Chi;
e	=	base of the natural logarithms (e ≈ 2.71828...);
χ_β	=	ChiBeta, a slope factor that controls how steeply utility is lost in the middle of the curve;
χ_ρ	=	ChiRho, a prolongation factor, in 18 kips (millions), that controls the shape of the traffic factor curve; and
ESAL	=	the pavement section's 20-year projected 18-k ESAL (Equivalent Single Axle Load) value, in millions.

We propose that PMIS define the coefficients of the Chi equation, as shown in Tables 94-96. The tables contain minimum values for Chi (χ_{min}). These values ensure that PMIS will not "fail" a pavement section immediately under very high traffic loads (which would happen as χ approaches zero).

Because Chi is related to traffic load, we propose that Chi be computed only for the load-associated ACP distress types (i.e., Shallow Rutting, Deep Rutting, Alligator Cracking), and for ACP ride quality. For all other ACP distress types, we propose that Chi should be defined equal to 1.0000. We also propose that a Chi value of 1.0000 be used for rigid pavements (CRCP and

JCP), as suggested by Research Study 1908 ("*Texas Pavement Management System*"), conducted by the Center for Transportation Research — University of Texas at Austin.

Table 94. Proposed χ_{max}, χ_{β}, and χ_{ρ} Coefficients for Computing Chi Factor for Pavement Distress (PMIS Pavement Types 4-8).

PMIS Pavement Type	Distress Type	χ_{max}	χ_{β}	χ_{ρ}	χ_{min}
4	Shallow Rutting	1.1800	1.4800	33.2800	0.8300
	Deep Rutting	1.1800	1.4800	33.2800	0.8300
	Alligator Cracking	1.3000	3.1600	37.3500	0.7000
5	Shallow Rutting	1.1800	1.1400	13.5600	0.8300
	Deep Rutting	1.1800	1.1400	13.5600	0.8300
	Alligator Cracking	1.3000	2.3400	15.3700	0.7000
6	Shallow Rutting	1.1800	1.1300	5.1300	0.8300
	Deep Rutting	1.1800	1.1300	5.1300	0.8300
	Alligator Cracking	1.3000	2.3100	5.8100	0.7000
7	Shallow Rutting	1.1800	1.3400	33.9700	0.8300
	Deep Rutting	1.1800	1.3400	33.9700	0.8300
	Alligator Cracking	1.3000	2.8400	38.5300	0.7000
8	Shallow Rutting	1.1800	1.1800	24.1800	0.8300
	Deep Rutting	1.1800	1.1800	24.1800	0.8300
	Alligator Cracking	1.3000	2.4300	27.4100	0.7000

Table 95. Proposed χ_{max}, χ_{β}, and χ_{ρ} Coefficients for Computing Chi Factor for Pavement Distress (PMIS Pavement Types 9-10).

PMIS Pavement Type	Distress Type	χ_{max}	χ_{β}	χ_{ρ}	χ_{min}
9	Shallow Rutting	1.1800	1.0900	10.1300	0.8300
	Deep Rutting	1.1800	1.0900	10.1300	0.8300
	Alligator Cracking	1.3000	2.2400	11.4800	0.7000
10	Shallow Rutting	1.1800	0.9600	1.6500	0.8300
	Deep Rutting	1.1800	0.9600	1.6500	0.8300
	Alligator Cracking	1.3000	1.9200	1.8700	0.7000

Table 96. Proposed χ_{max}, χ_{β}, and χ_{ρ} Coefficients for Computing Chi Factor for Ride Quality (PMIS Pavement Types 4-10).

PMIS Pavement Type	χ_{max}	χ_{β}	χ_{ρ}	χ_{min}
4	1.1200	0.6300	27.5800	0.9400
5	1.1200	0.5000	11.2000	0.9400
6	1.1200	0.5000	4.2400	0.9400
7	1.1200	0.5800	28.1400	0.9400
8	1.1200	0.5200	19.9900	0.9400
9	1.1200	0.4900	8.3600	0.9400
10	1.1200	0.4400	1.3600	0.9400

For reference purposes, we have enclosed Tables 97-124, which list the proposed Chi factors for "typical" 18-k ESAL values from 1 million to 100 million repetitions in 20 years. Tables 97-124 only cover the proposed Chi factors for load-associated distress types and ride quality on ACP (Pavement Types = 4-10).

Table 97. Traffic Factors (CHI) for Shallow Rutting for Detailed Pavement Type 04.

Chi Maximum: 1.1800 **Chi Minimum:** 0.8300

Chi Beta: 1.4800 **Chi Rho:** 33.2800

ESALs in Millions	CHI Factor	ESALs in Millions	CHI Factor	ESALs in Millions	CHI Factor	ESALs in Millions	CHI Factor
1	1.18	26	0.83	51	0.83	76	0.83
2	1.18	27	0.83	52	0.83	77	0.83
3	1.179977	28	0.83	53	0.83	78	0.83
4	1.179639	29	0.83	54	0.83	79	0.83
5	1.178096	30	0.83	55	0.83	80	0.83
6	1.174227	31	0.83	56	0.83	81	0.83
7	1.16725	32	0.83	57	0.83	82	0.83
8	1.156901	33	0.83	58	0.83	83	0.83
9	1.143328	34	0.83	59	0.83	84	0.83
10	1.12692	35	0.83	60	0.83	85	0.83
11	1.108167	36	0.83	61	0.83	86	0.83
12	1.087569	37	0.83	62	0.83	87	0.83
13	1.065589	38	0.83	63	0.83	88	0.83
14	1.042633	39	0.83	64	0.83	89	0.83
15	1.019044	40	0.83	65	0.83	90	0.83
16	0.995103	41	0.83	66	0.83	91	0.83
17	0.971038	42	0.83	67	0.83	92	0.83
18	0.94703	43	0.83	68	0.83	93	0.83
19	0.92322	44	0.83	69	0.83	94	0.83
20	0.899718	45	0.83	70	0.83	95	0.83
21	0.876605	46	0.83	71	0.83	96	0.83
22	0.853944	47	0.83	72	0.83	97	0.83
23	0.831778	48	0.83	73	0.83	98	0.83
24	0.83	49	0.83	74	0.83	99	0.83
25	0.83	50	0.83	75	0.83	100	0.83

Table 98. Traffic Factors (CHI) for Deep Rutting for Detailed Pavement Type 04.

Chi Maximum: **1.1800** **Chi Minimum:** **0.8300**

Chi Beta: **1.4800** **Chi Rho:** **33.2800**

ESALs in Millions	CHI Factor	ESALs in Millions	CHI Factor	ESALs in Millions	CHI Factor	ESALs in Millions	CHI Factor
1	1.18	26	0.83	51	0.83	76	0.83
2	1.18	27	0.83	52	0.83	77	0.83
3	1.179977	28	0.83	53	0.83	78	0.83
4	1.179639	29	0.83	54	0.83	79	0.83
5	1.178096	30	0.83	55	0.83	80	0.83
6	1.174227	31	0.83	56	0.83	81	0.83
7	1.16725	32	0.83	57	0.83	82	0.83
8	1.156901	33	0.83	58	0.83	83	0.83
9	1.143328	34	0.83	59	0.83	84	0.83
10	1.12692	35	0.83	60	0.83	85	0.83
11	1.108167	36	0.83	61	0.83	86	0.83
12	1.087569	37	0.83	62	0.83	87	0.83
13	1.065589	38	0.83	63	0.83	88	0.83
14	1.042633	39	0.83	64	0.83	89	0.83
15	1.019044	40	0.83	65	0.83	90	0.83
16	0.995103	41	0.83	66	0.83	91	0.83
17	0.971038	42	0.83	67	0.83	92	0.83
18	0.94703	43	0.83	68	0.83	93	0.83
19	0.92322	44	0.83	69	0.83	94	0.83
20	0.899718	45	0.83	70	0.83	95	0.83
21	0.876605	46	0.83	71	0.83	96	0.83
22	0.853944	47	0.83	72	0.83	97	0.83
23	0.831778	48	0.83	73	0.83	98	0.83
24	0.83	49	0.83	74	0.83	99	0.83
25	0.83	50	0.83	75	0.83	100	0.83

Table 99. Traffic Factors (CHI) for Alligator Cracking for Detailed Pavement Type 04.

Chi Maximum: 1.3000 **Chi Minimum:** 0.7000

Chi Beta: 3.1600 **Chi Rho:** 37.3500

ESALs in Millions	CHI Factor	ESALs in Millions	CHI Factor	ESALs in Millions	CHI Factor	ESALs in Millions	CHI Factor
1	1.3	26	0.7	51	0.7	76	0.7
2	1.3	27	0.7	52	0.7	77	0.7
3	1.299988	28	0.7	53	0.7	78	0.7
4	1.299722	29	0.7	54	0.7	79	0.7
5	1.298199	30	0.7	55	0.7	80	0.7
6	1.293745	31	0.7	56	0.7	81	0.7
7	1.28478	32	0.7	57	0.7	82	0.7
8	1.270347	33	0.7	58	0.7	83	0.7
9	1.250184	34	0.7	59	0.7	84	0.7
10	1.224561	35	0.7	60	0.7	85	0.7
11	1.19406	36	0.7	61	0.7	86	0.7
12	1.159413	37	0.7	62	0.7	87	0.7
13	1.121382	38	0.7	63	0.7	88	0.7
14	1.080694	39	0.7	64	0.7	89	0.7
15	1.038005	40	0.7	65	0.7	90	0.7
16	0.993888	41	0.7	66	0.7	91	0.7
17	0.948831	42	0.7	67	0.7	92	0.7
18	0.903242	43	0.7	68	0.7	93	0.7
19	0.857457	44	0.7	69	0.7	94	0.7
20	0.81175	45	0.7	70	0.7	95	0.7
21	0.766342	46	0.7	71	0.7	96	0.7
22	0.721407	47	0.7	72	0.7	97	0.7
23	0.7	48	0.7	73	0.7	98	0.7
24	0.7	49	0.7	74	0.7	99	0.7
25	0.7	50	0.7	75	0.7	100	0.7

Table 100. Traffic Factors (CHI) for Ride Score for Detailed Pavement Type 04.

Chi Maximum: 1.1200 **Chi Minimum:** 0.9400

Chi Beta: 0.6300 **Chi Rho:** 27.5800

ESALs in Millions	CHI Factor	ESALs in Millions	CHI Factor	ESALs in Millions	CHI Factor	ESALs in Millions	CHI Factor
1	1.12	26	0.94	51	0.94	76	0.94
2	1.119999	27	0.94	52	0.94	77	0.94
3	1.119936	28	0.94	53	0.94	78	0.94
4	1.119362	29	0.94	54	0.94	79	0.94
5	1.117466	30	0.94	55	0.94	80	0.94
6	1.113646	31	0.94	56	0.94	81	0.94
7	1.107748	32	0.94	57	0.94	82	0.94
8	1.09995	33	0.94	58	0.94	83	0.94
9	1.090592	34	0.94	59	0.94	84	0.94
10	1.080046	35	0.94	60	0.94	85	0.94
11	1.068661	36	0.94	61	0.94	86	0.94
12	1.056732	37	0.94	62	0.94	87	0.94
13	1.044496	38	0.94	63	0.94	88	0.94
14	1.032142	39	0.94	64	0.94	89	0.94
15	1.019812	40	0.94	65	0.94	90	0.94
16	1.007611	41	0.94	66	0.94	91	0.94
17	0.995617	42	0.94	67	0.94	92	0.94
18	0.983885	43	0.94	68	0.94	93	0.94
19	0.972454	44	0.94	69	0.94	94	0.94
20	0.961347	45	0.94	70	0.94	95	0.94
21	0.950579	46	0.94	71	0.94	96	0.94
22	0.940157	47	0.94	72	0.94	97	0.94
23	0.94	48	0.94	73	0.94	98	0.94
24	0.94	49	0.94	74	0.94	99	0.94
25	0.94	50	0.94	75	0.94	100	0.94

Table 101. Traffic Factors (CHI) for Shallow Rutting for Detailed Pavement Type 05.

Chi Maximum: 1.1800 **Chi Minimum:** 0.8300

Chi Beta: 1.1400 **Chi Rho:** 13.5600

ESALs in Millions	CHI Factor	ESALs in Millions	CHI Factor	ESALs in Millions	CHI Factor	ESALs in Millions	CHI Factor
1	1.179999	26	0.83	51	0.83	76	0.83
2	1.178705	27	0.83	52	0.83	77	0.83
3	1.167587	28	0.83	53	0.83	78	0.83
4	1.141572	29	0.83	54	0.83	79	0.83
5	1.1043	30	0.83	55	0.83	80	0.83
6	1.06104	31	0.83	56	0.83	81	0.83
7	1.015709	32	0.83	57	0.83	82	0.83
8	0.970697	33	0.83	58	0.83	83	0.83
9	0.927322	34	0.83	59	0.83	84	0.83
10	0.886234	35	0.83	60	0.83	85	0.83
11	0.847694	36	0.83	61	0.83	86	0.83
12	0.83	37	0.83	62	0.83	87	0.83
13	0.83	38	0.83	63	0.83	88	0.83
14	0.83	39	0.83	64	0.83	89	0.83
15	0.83	40	0.83	65	0.83	90	0.83
16	0.83	41	0.83	66	0.83	91	0.83
17	0.83	42	0.83	67	0.83	92	0.83
18	0.83	43	0.83	68	0.83	93	0.83
19	0.83	44	0.83	69	0.83	94	0.83
20	0.83	45	0.83	70	0.83	95	0.83
21	0.83	46	0.83	71	0.83	96	0.83
22	0.83	47	0.83	72	0.83	97	0.83
23	0.83	48	0.83	73	0.83	98	0.83
24	0.83	49	0.83	74	0.83	99	0.83
25	0.83	50	0.83	75	0.83	100	0.83

Table 102. Traffic Factors (CHI) for Deep Rutting for Detailed Pavement Type 05.

Chi Maximum: 1.1800 **Chi Minimum:** 0.8300

Chi Beta: 1.1400 **Chi Rho:** 13.5600

ESALs in Millions	CHI Factor	ESALs in Millions	CHI Factor	ESALs in Millions	CHI Factor	ESALs in Millions	CHI Factor
1	1.179999	26	0.83	51	0.83	76	0.83
2	1.178705	27	0.83	52	0.83	77	0.83
3	1.167587	28	0.83	53	0.83	78	0.83
4	1.141572	29	0.83	54	0.83	79	0.83
5	1.1043	30	0.83	55	0.83	80	0.83
6	1.06104	31	0.83	56	0.83	81	0.83
7	1.015709	32	0.83	57	0.83	82	0.83
8	0.970697	33	0.83	58	0.83	83	0.83
9	0.927322	34	0.83	59	0.83	84	0.83
10	0.886234	35	0.83	60	0.83	85	0.83
11	0.847694	36	0.83	61	0.83	86	0.83
12	0.83	37	0.83	62	0.83	87	0.83
13	0.83	38	0.83	63	0.83	88	0.83
14	0.83	39	0.83	64	0.83	89	0.83
15	0.83	40	0.83	65	0.83	90	0.83
16	0.83	41	0.83	66	0.83	91	0.83
17	0.83	42	0.83	67	0.83	92	0.83
18	0.83	43	0.83	68	0.83	93	0.83
19	0.83	44	0.83	69	0.83	94	0.83
20	0.83	45	0.83	70	0.83	95	0.83
21	0.83	46	0.83	71	0.83	96	0.83
22	0.83	47	0.83	72	0.83	97	0.83
23	0.83	48	0.83	73	0.83	98	0.83
24	0.83	49	0.83	74	0.83	99	0.83
25	0.83	50	0.83	75	0.83	100	0.83

Table 103. Traffic Factors (CHI) for Alligator Cracking for Detailed Pavement Type 05.

Chi Maximum: 1.3000 **Chi Minimum:** 0.7000

Chi Beta: 2.3400 **Chi Rho:** 15.3700

ESALs in Millions	CHI Factor	ESALs in Millions	CHI Factor	ESALs in Millions	CHI Factor	ESALs in Millions	CHI Factor
1	1.3	26	0.7	51	0.7	76	0.7
2	1.298924	27	0.7	52	0.7	77	0.7
3	1.286063	28	0.7	53	0.7	78	0.7
4	1.249831	29	0.7	54	0.7	79	0.7
5	1.191808	30	0.7	55	0.7	80	0.7
6	1.119408	31	0.7	56	0.7	81	0.7
7	1.039607	32	0.7	57	0.7	82	0.7
8	0.957368	33	0.7	58	0.7	83	0.7
9	0.875832	34	0.7	59	0.7	84	0.7
10	0.796841	35	0.7	60	0.7	85	0.7
11	0.721387	36	0.7	61	0.7	86	0.7
12	0.7	37	0.7	62	0.7	87	0.7
13	0.7	38	0.7	63	0.7	88	0.7
14	0.7	39	0.7	64	0.7	89	0.7
15	0.7	40	0.7	65	0.7	90	0.7
16	0.7	41	0.7	66	0.7	91	0.7
17	0.7	42	0.7	67	0.7	92	0.7
18	0.7	43	0.7	68	0.7	93	0.7
19	0.7	44	0.7	69	0.7	94	0.7
20	0.7	45	0.7	70	0.7	95	0.7
21	0.7	46	0.7	71	0.7	96	0.7
22	0.7	47	0.7	72	0.7	97	0.7
23	0.7	48	0.7	73	0.7	98	0.7
24	0.7	49	0.7	74	0.7	99	0.7
25	0.7	50	0.7	75	0.7	100	0.7

Table 104. Traffic Factors (CHI) for Ride Score for Detailed Pavement Type 05.

Chi Maximum: 1.1200 **Chi Minimum:** 0.9400

Chi Beta: 0.5000 **Chi Rho:** 11.2000

ESALs in Millions	CHI Factor	ESALs in Millions	CHI Factor	ESALs in Millions	CHI Factor	ESALs in Millions	CHI Factor
1	1.119993	26	0.94	51	0.94	76	0.94
2	1.118151	27	0.94	52	0.94	77	0.94
3	1.108044	28	0.94	53	0.94	78	0.94
4	1.089595	29	0.94	54	0.94	79	0.94
5	1.066771	30	0.94	55	0.94	80	0.94
6	1.042681	31	0.94	56	0.94	81	0.94
7	1.019052	32	0.94	57	0.94	82	0.94
8	0.996702	33	0.94	58	0.94	83	0.94
9	0.97595	34	0.94	59	0.94	84	0.94
10	0.95686	35	0.94	60	0.94	85	0.94
11	0.94	36	0.94	61	0.94	86	0.94
12	0.94	37	0.94	62	0.94	87	0.94
13	0.94	38	0.94	63	0.94	88	0.94
14	0.94	39	0.94	64	0.94	89	0.94
15	0.94	40	0.94	65	0.94	90	0.94
16	0.94	41	0.94	66	0.94	91	0.94
17	0.94	42	0.94	67	0.94	92	0.94
18	0.94	43	0.94	68	0.94	93	0.94
19	0.94	44	0.94	69	0.94	94	0.94
20	0.94	45	0.94	70	0.94	95	0.94
21	0.94	46	0.94	71	0.94	96	0.94
22	0.94	47	0.94	72	0.94	97	0.94
23	0.94	48	0.94	73	0.94	98	0.94
24	0.94	49	0.94	74	0.94	99	0.94
25	0.94	50	0.94	75	0.94	100	0.94

Table 105. Traffic Factors (CHI) for Shallow Rutting for Detailed Pavement Type 06.

Chi Maximum: 1.1800 **Chi Minimum:** 0.8300

Chi Beta: 1.1300 **Chi Rho:** 5.1300

ESALs in Millions	CHI Factor	ESALs in Millions	CHI Factor	ESALs in Millions	CHI Factor	ESALs in Millions	CHI Factor
1	1.173314	26	0.83	51	0.83	76	0.83
2	1.093081	27	0.83	52	0.83	77	0.83
3	0.975622	28	0.83	53	0.83	78	0.83
4	0.866602	29	0.83	54	0.83	79	0.83
5	0.83	30	0.83	55	0.83	80	0.83
6	0.83	31	0.83	56	0.83	81	0.83
7	0.83	32	0.83	57	0.83	82	0.83
8	0.83	33	0.83	58	0.83	83	0.83
9	0.83	34	0.83	59	0.83	84	0.83
10	0.83	35	0.83	60	0.83	85	0.83
11	0.83	36	0.83	61	0.83	86	0.83
12	0.83	37	0.83	62	0.83	87	0.83
13	0.83	38	0.83	63	0.83	88	0.83
14	0.83	39	0.83	64	0.83	89	0.83
15	0.83	40	0.83	65	0.83	90	0.83
16	0.83	41	0.83	66	0.83	91	0.83
17	0.83	42	0.83	67	0.83	92	0.83
18	0.83	43	0.83	68	0.83	93	0.83
19	0.83	44	0.83	69	0.83	94	0.83
20	0.83	45	0.83	70	0.83	95	0.83
21	0.83	46	0.83	71	0.83	96	0.83
22	0.83	47	0.83	72	0.83	97	0.83
23	0.83	48	0.83	73	0.83	98	0.83
24	0.83	49	0.83	74	0.83	99	0.83
25	0.83	50	0.83	75	0.83	100	0.83

Table 106. Traffic Factors (CHI) for Deep Rutting for Detailed Pavement Type 06.

Chi Maximum: 1.1800 **Chi Minimum:** 0.8300

Chi Beta: 1.1300 **Chi Rho:** 5.1300

ESALs in Millions	CHI Factor	ESALs in Millions	CHI Factor	ESALs in Millions	CHI Factor	ESALs in Millions	CHI Factor
1	1.173314	26	0.83	51	0.83	76	0.83
2	1.093081	27	0.83	52	0.83	77	0.83
3	0.975622	28	0.83	53	0.83	78	0.83
4	0.866602	29	0.83	54	0.83	79	0.83
5	0.83	30	0.83	55	0.83	80	0.83
6	0.83	31	0.83	56	0.83	81	0.83
7	0.83	32	0.83	57	0.83	82	0.83
8	0.83	33	0.83	58	0.83	83	0.83
9	0.83	34	0.83	59	0.83	84	0.83
10	0.83	35	0.83	60	0.83	85	0.83
11	0.83	36	0.83	61	0.83	86	0.83
12	0.83	37	0.83	62	0.83	87	0.83
13	0.83	38	0.83	63	0.83	88	0.83
14	0.83	39	0.83	64	0.83	89	0.83
15	0.83	40	0.83	65	0.83	90	0.83
16	0.83	41	0.83	66	0.83	91	0.83
17	0.83	42	0.83	67	0.83	92	0.83
18	0.83	43	0.83	68	0.83	93	0.83
19	0.83	44	0.83	69	0.83	94	0.83
20	0.83	45	0.83	70	0.83	95	0.83
21	0.83	46	0.83	71	0.83	96	0.83
22	0.83	47	0.83	72	0.83	97	0.83
23	0.83	48	0.83	73	0.83	98	0.83
24	0.83	49	0.83	74	0.83	99	0.83
25	0.83	50	0.83	75	0.83	100	0.83

Table 107. Traffic Factors (CHI) for Alligator Cracking for Detailed Pavement Type 06.

Chi Maximum: 1.3000 **Chi Minimum:** 0.7000

Chi Beta: 2.3100 **Chi Rho:** 5.8100

ESALs in Millions	CHI Factor	ESALs in Millions	CHI Factor	ESALs in Millions	CHI Factor	ESALs in Millions	CHI Factor
1	1.293076	26	0.7	51	0.7	76	0.7
2	1.17353	27	0.7	52	0.7	77	0.7
3	0.966936	28	0.7	53	0.7	78	0.7
4	0.759496	29	0.7	54	0.7	79	0.7
5	0.7	30	0.7	55	0.7	80	0.7
6	0.7	31	0.7	56	0.7	81	0.7
7	0.7	32	0.7	57	0.7	82	0.7
8	0.7	33	0.7	58	0.7	83	0.7
9	0.7	34	0.7	59	0.7	84	0.7
10	0.7	35	0.7	60	0.7	85	0.7
11	0.7	36	0.7	61	0.7	86	0.7
12	0.7	37	0.7	62	0.7	87	0.7
13	0.7	38	0.7	63	0.7	88	0.7
14	0.7	39	0.7	64	0.7	89	0.7
15	0.7	40	0.7	65	0.7	90	0.7
16	0.7	41	0.7	66	0.7	91	0.7
17	0.7	42	0.7	67	0.7	92	0.7
18	0.7	43	0.7	68	0.7	93	0.7
19	0.7	44	0.7	69	0.7	94	0.7
20	0.7	45	0.7	70	0.7	95	0.7
21	0.7	46	0.7	71	0.7	96	0.7
22	0.7	47	0.7	72	0.7	97	0.7
23	0.7	48	0.7	73	0.7	98	0.7
24	0.7	49	0.7	74	0.7	99	0.7
25	0.7	50	0.7	75	0.7	100	0.7

Table 108. Traffic Factors (CHI) for Ride Score for Detailed Pavement Type 06.

Chi Maximum: 1.1200 **Chi Minimum:** 0.9400

Chi Beta: 0.5000 **Chi Rho:** 4.2400

ESALs in Millions	CHI Factor	ESALs in Millions	CHI Factor	ESALs in Millions	CHI Factor	ESALs in Millions	CHI Factor
1	1.112796	26	0.94	51	0.94	76	0.94
2	1.059984	27	0.94	52	0.94	77	0.94
3	0.998335	28	0.94	53	0.94	78	0.94
4	0.946772	29	0.94	54	0.94	79	0.94
5	0.94	30	0.94	55	0.94	80	0.94
6	0.94	31	0.94	56	0.94	81	0.94
7	0.94	32	0.94	57	0.94	82	0.94
8	0.94	33	0.94	58	0.94	83	0.94
9	0.94	34	0.94	59	0.94	84	0.94
10	0.94	35	0.94	60	0.94	85	0.94
11	0.94	36	0.94	61	0.94	86	0.94
12	0.94	37	0.94	62	0.94	87	0.94
13	0.94	38	0.94	63	0.94	88	0.94
14	0.94	39	0.94	64	0.94	89	0.94
15	0.94	40	0.94	65	0.94	90	0.94
16	0.94	41	0.94	66	0.94	91	0.94
17	0.94	42	0.94	67	0.94	92	0.94
18	0.94	43	0.94	68	0.94	93	0.94
19	0.94	44	0.94	69	0.94	94	0.94
20	0.94	45	0.94	70	0.94	95	0.94
21	0.94	46	0.94	71	0.94	96	0.94
22	0.94	47	0.94	72	0.94	97	0.94
23	0.94	48	0.94	73	0.94	98	0.94
24	0.94	49	0.94	74	0.94	99	0.94
25	0.94	50	0.94	75	0.94	100	0.94

Table 109. Traffic Factors (CHI) for Shallow Rutting for Detailed Pavement Type 07.

Chi Maximum: 1.1800 **Chi Minimum:** 0.8300

Chi Beta: 1.3400 **Chi Rho:** 33.9700

ESALs in Millions	CHI Factor	ESALs in Millions	CHI Factor	ESALs in Millions	CHI Factor	ESALs in Millions	CHI Factor
1	1.18	26	0.83	51	0.83	76	0.83
2	1.18	27	0.83	52	0.83	77	0.83
3	1.179984	28	0.83	53	0.83	78	0.83
4	1.179725	29	0.83	54	0.83	79	0.83
5	1.178499	30	0.83	55	0.83	80	0.83
6	1.175341	31	0.83	56	0.83	81	0.83
7	1.16954	32	0.83	57	0.83	82	0.83
8	1.160814	33	0.83	58	0.83	83	0.83
9	1.149247	34	0.83	59	0.83	84	0.83
10	1.135145	35	0.83	60	0.83	85	0.83
11	1.118916	36	0.83	61	0.83	86	0.83
12	1.100989	37	0.83	62	0.83	87	0.83
13	1.081766	38	0.83	63	0.83	88	0.83
14	1.061609	39	0.83	64	0.83	89	0.83
15	1.040821	40	0.83	65	0.83	90	0.83
16	1.019659	41	0.83	66	0.83	91	0.83
17	0.99833	42	0.83	67	0.83	92	0.83
18	0.977001	43	0.83	68	0.83	93	0.83
19	0.955802	44	0.83	69	0.83	94	0.83
20	0.934837	45	0.83	70	0.83	95	0.83
21	0.914184	46	0.83	71	0.83	96	0.83
22	0.893902	47	0.83	72	0.83	97	0.83
23	0.874036	48	0.83	73	0.83	98	0.83
24	0.854615	49	0.83	74	0.83	99	0.83
25	0.835662	50	0.83	75	0.83	100	0.83

Table 110. Traffic Factors (CHI) for Alligator Cracking for Detailed Pavement Type 07.

Chi Maximum: 1.3000 **Chi Minimum:** 0.7000

Chi Beta: 2.8400 **Chi Rho:** 38.5300

ESALs in Millions	CHI Factor	ESALs in Millions	CHI Factor	ESALs in Millions	CHI Factor	ESALs in Millions	CHI Factor
1	1.3	26	0.7	51	0.7	76	0.7
2	1.3	27	0.7	52	0.7	77	0.7
3	1.299992	28	0.7	53	0.7	78	0.7
4	1.299814	29	0.7	54	0.7	79	0.7
5	1.298722	30	0.7	55	0.7	80	0.7
6	1.295382	31	0.7	56	0.7	81	0.7
7	1.288443	32	0.7	57	0.7	82	0.7
8	1.277004	33	0.7	58	0.7	83	0.7
9	1.26073	34	0.7	59	0.7	84	0.7
10	1.239747	35	0.7	60	0.7	85	0.7
11	1.214473	36	0.7	61	0.7	86	0.7
12	1.185483	37	0.7	62	0.7	87	0.7
13	1.153399	38	0.7	63	0.7	88	0.7
14	1.118834	39	0.7	64	0.7	89	0.7
15	1.082349	40	0.7	65	0.7	90	0.7
16	1.044446	41	0.7	66	0.7	91	0.7
17	1.005556	42	0.7	67	0.7	92	0.7
18	0.966046	43	0.7	68	0.7	93	0.7
19	0.926221	44	0.7	69	0.7	94	0.7
20	0.886334	45	0.7	70	0.7	95	0.7
21	0.84659	46	0.7	71	0.7	96	0.7
22	0.807155	47	0.7	72	0.7	97	0.7
23	0.76816	48	0.7	73	0.7	98	0.7
24	0.729711	49	0.7	74	0.7	99	0.7
25	0.7	50	0.7	75	0.7	100	0.7

Table 111. Traffic Factors (CHI) for Deep Rutting for Detailed Pavement Type 07.

Chi Maximum: 1.1800 **Chi Minimum:** 0.8300

Chi Beta: 1.3400 **Chi Rho:** 33.9700

ESALs in Millions	CHI Factor	ESALs in Millions	CHI Factor	ESALs in Millions	CHI Factor	ESALs in Millions	CHI Factor
1	1.18	26	0.83	51	0.83	76	0.83
2	1.18	27	0.83	52	0.83	77	0.83
3	1.179984	28	0.83	53	0.83	78	0.83
4	1.179725	29	0.83	54	0.83	79	0.83
5	1.178499	30	0.83	55	0.83	80	0.83
6	1.175341	31	0.83	56	0.83	81	0.83
7	1.16954	32	0.83	57	0.83	82	0.83
8	1.160814	33	0.83	58	0.83	83	0.83
9	1.149247	34	0.83	59	0.83	84	0.83
10	1.135145	35	0.83	60	0.83	85	0.83
11	1.118916	36	0.83	61	0.83	86	0.83
12	1.100989	37	0.83	62	0.83	87	0.83
13	1.081766	38	0.83	63	0.83	88	0.83
14	1.061609	39	0.83	64	0.83	89	0.83
15	1.040821	40	0.83	65	0.83	90	0.83
16	1.019659	41	0.83	66	0.83	91	0.83
17	0.99833	42	0.83	67	0.83	92	0.83
18	0.977001	43	0.83	68	0.83	93	0.83
19	0.955802	44	0.83	69	0.83	94	0.83
20	0.934837	45	0.83	70	0.83	95	0.83
21	0.914184	46	0.83	71	0.83	96	0.83
22	0.893902	47	0.83	72	0.83	97	0.83
23	0.874036	48	0.83	73	0.83	98	0.83
24	0.854615	49	0.83	74	0.83	99	0.83
25	0.835662	50	0.83	75	0.83	100	0.83

Table 112. Traffic Factors (CHI) for Shallow Rutting for Detailed Pavement Type 08.

Chi Maximum: 1.1800 **Chi Minimum:** 0.8300

Chi Beta: 1.1800 **Chi Rho:** 24.1800

ESALs in Millions	CHI Factor	ESALs in Millions	CHI Factor	ESALs in Millions	CHI Factor	ESALs in Millions	CHI Factor
1	1.18	26	0.83	51	0.83	76	0.83
2	1.179993	27	0.83	52	0.83	77	0.83
3	1.179627	28	0.83	53	0.83	78	0.83
4	1.177204	29	0.83	54	0.83	79	0.83
5	1.170632	30	0.83	55	0.83	80	0.83
6	1.159026	31	0.83	56	0.83	81	0.83
7	1.1427	32	0.83	57	0.83	82	0.83
8	1.122558	33	0.83	58	0.83	83	0.83
9	1.099633	34	0.83	59	0.83	84	0.83
10	1.074862	35	0.83	60	0.83	85	0.83
11	1.049014	36	0.83	61	0.83	86	0.83
12	1.022682	37	0.83	62	0.83	87	0.83
13	0.996306	38	0.83	63	0.83	88	0.83
14	0.970206	39	0.83	64	0.83	89	0.83
15	0.944604	40	0.83	65	0.83	90	0.83
16	0.919652	41	0.83	66	0.83	91	0.83
17	0.895448	42	0.83	67	0.83	92	0.83
18	0.87205	43	0.83	68	0.83	93	0.83
19	0.84949	44	0.83	69	0.83	94	0.83
20	0.83	45	0.83	70	0.83	95	0.83
21	0.83	46	0.83	71	0.83	96	0.83
22	0.83	47	0.83	72	0.83	97	0.83
23	0.83	48	0.83	73	0.83	98	0.83
24	0.83	49	0.83	74	0.83	99	0.83
25	0.83	50	0.83	75	0.83	100	0.83

Table 113. Traffic Factors (CHI) for Ride Score for Detailed Pavement Type 07.

Chi Maximum: 1.1200 **Chi Minimum:** 0.9400

Chi Beta: 0.5800 **Chi Rho:** 28.1400

ESALs in Millions	CHI Factor	ESALs in Millions	CHI Factor	ESALs in Millions	CHI Factor	ESALs in Millions	CHI Factor
1	1.12	26	0.94	51	0.94	76	0.94
2	1.12	27	0.94	52	0.94	77	0.94
3	1.119951	28	0.94	53	0.94	78	0.94
4	1.119489	29	0.94	54	0.94	79	0.94
5	1.117914	30	0.94	55	0.94	80	0.94
6	1.114672	31	0.94	56	0.94	81	0.94
7	1.109587	32	0.94	57	0.94	82	0.94
8	1.102789	33	0.94	58	0.94	83	0.94
9	1.094559	34	0.94	59	0.94	84	0.94
10	1.085221	35	0.94	60	0.94	85	0.94
11	1.075082	36	0.94	61	0.94	86	0.94
12	1.064409	37	0.94	62	0.94	87	0.94
13	1.053419	38	0.94	63	0.94	88	0.94
14	1.042287	39	0.94	64	0.94	89	0.94
15	1.031143	40	0.94	65	0.94	90	0.94
16	1.020089	41	0.94	66	0.94	91	0.94
17	1.009199	42	0.94	67	0.94	92	0.94
18	0.998527	43	0.94	68	0.94	93	0.94
19	0.988109	44	0.94	69	0.94	94	0.94
20	0.977971	45	0.94	70	0.94	95	0.94
21	0.96813	46	0.94	71	0.94	96	0.94
22	0.958592	47	0.94	72	0.94	97	0.94
23	0.949361	48	0.94	73	0.94	98	0.94
24	0.940437	49	0.94	74	0.94	99	0.94
25	0.94	50	0.94	75	0.94	100	0.94

Table 114. Traffic Factors (CHI) for Alligator Cracking for Detailed Pavement Type 08.

Chi Maximum: 1.3000 **Chi Minimum:** 0.7000

Chi Beta: 2.4300 **Chi Rho:** 27.4100

ESALs in Millions	CHI Factor	ESALs in Millions	CHI Factor	ESALs in Millions	CHI Factor	ESALs in Millions	CHI Factor
1	1.3	26	0.7	51	0.7	76	0.7
2	1.299997	27	0.7	52	0.7	77	0.7
3	1.299738	28	0.7	53	0.7	78	0.7
4	1.297432	29	0.7	54	0.7	79	0.7
5	1.289889	30	0.7	55	0.7	80	0.7
6	1.274788	31	0.7	56	0.7	81	0.7
7	1.251579	32	0.7	57	0.7	82	0.7
8	1.221004	33	0.7	58	0.7	83	0.7
9	1.184405	34	0.7	59	0.7	84	0.7
10	1.143251	35	0.7	60	0.7	85	0.7
11	1.098895	36	0.7	61	0.7	86	0.7
12	1.052483	37	0.7	62	0.7	87	0.7
13	1.004938	38	0.7	63	0.7	88	0.7
14	0.95698	39	0.7	64	0.7	89	0.7
15	0.909154	40	0.7	65	0.7	90	0.7
16	0.861867	41	0.7	66	0.7	91	0.7
17	0.815415	42	0.7	67	0.7	92	0.7
18	0.770004	43	0.7	68	0.7	93	0.7
19	0.725779	44	0.7	69	0.7	94	0.7
20	0.7	45	0.7	70	0.7	95	0.7
21	0.7	46	0.7	71	0.7	96	0.7
22	0.7	47	0.7	72	0.7	97	0.7
23	0.7	48	0.7	73	0.7	98	0.7
24	0.7	49	0.7	74	0.7	99	0.7
25	0.7	50	0.7	75	0.7	100	0.7

Table 115. Traffic Factors (CHI) for Deep Rutting for Detailed Pavement Type 08.

Chi Maximum: 1.1800 **Chi Minimum:** 0.8300

Chi Beta: 1.1800 **Chi Rho:** 24.1800

ESALs in Millions	CHI Factor	ESALs in Millions	CHI Factor	ESALs in Millions	CHI Factor	ESALs in Millions	CHI Factor
1	1.18	26	0.83	51	0.83	76	0.83
2	1.179993	27	0.83	52	0.83	77	0.83
3	1.179627	28	0.83	53	0.83	78	0.83
4	1.177204	29	0.83	54	0.83	79	0.83
5	1.170632	30	0.83	55	0.83	80	0.83
6	1.159026	31	0.83	56	0.83	81	0.83
7	1.1427	32	0.83	57	0.83	82	0.83
8	1.122558	33	0.83	58	0.83	83	0.83
9	1.099633	34	0.83	59	0.83	84	0.83
10	1.074862	35	0.83	60	0.83	85	0.83
11	1.049014	36	0.83	61	0.83	86	0.83
12	1.022682	37	0.83	62	0.83	87	0.83
13	0.996306	38	0.83	63	0.83	88	0.83
14	0.970206	39	0.83	64	0.83	89	0.83
15	0.944604	40	0.83	65	0.83	90	0.83
16	0.919652	41	0.83	66	0.83	91	0.83
17	0.895448	42	0.83	67	0.83	92	0.83
18	0.87205	43	0.83	68	0.83	93	0.83
19	0.84949	44	0.83	69	0.83	94	0.83
20	0.83	45	0.83	70	0.83	95	0.83
21	0.83	46	0.83	71	0.83	96	0.83
22	0.83	47	0.83	72	0.83	97	0.83
23	0.83	48	0.83	73	0.83	98	0.83
24	0.83	49	0.83	74	0.83	99	0.83
25	0.83	50	0.83	75	0.83	100	0.83

Table 116. Traffic Factors (CHI) for Shallow Rutting for Detailed Pavement Type 09.

Chi Maximum: 1.1800 **Chi Minimum:** 0.8300

Chi Beta: 1.0900 **Chi Rho:** 10.1300

ESALs in Millions	CHI Factor	ESALs in Millions	CHI Factor	ESALs in Millions	CHI Factor	ESALs in Millions	CHI Factor
1	1.179957	26	0.83	51	0.83	76	0.83
2	1.173118	27	0.83	52	0.83	77	0.83
3	1.142764	28	0.83	53	0.83	78	0.83
4	1.093388	29	0.83	54	0.83	79	0.83
5	1.036271	30	0.83	55	0.83	80	0.83
6	0.978538	31	0.83	56	0.83	81	0.83
7	0.923587	32	0.83	57	0.83	82	0.83
8	0.872743	33	0.83	58	0.83	83	0.83
9	0.83	34	0.83	59	0.83	84	0.83
10	0.83	35	0.83	60	0.83	85	0.83
11	0.83	36	0.83	61	0.83	86	0.83
12	0.83	37	0.83	62	0.83	87	0.83
13	0.83	38	0.83	63	0.83	88	0.83
14	0.83	39	0.83	64	0.83	89	0.83
15	0.83	40	0.83	65	0.83	90	0.83
16	0.83	41	0.83	66	0.83	91	0.83
17	0.83	42	0.83	67	0.83	92	0.83
18	0.83	43	0.83	68	0.83	93	0.83
19	0.83	44	0.83	69	0.83	94	0.83
20	0.83	45	0.83	70	0.83	95	0.83
21	0.83	46	0.83	71	0.83	96	0.83
22	0.83	47	0.83	72	0.83	97	0.83
23	0.83	48	0.83	73	0.83	98	0.83
24	0.83	49	0.83	74	0.83	99	0.83
25	0.83	50	0.83	75	0.83	100	0.83

Table 117. Traffic Factors (CHI) for Ride Score for Detailed Pavement Type 08.

Chi Maximum: **1.1200** **Chi Minimum:** **0.9400**

Chi Beta: **0.5200** **Chi Rho:** **19.9900**

ESALs in Millions	CHI Factor	ESALs in Millions	CHI Factor	ESALs in Millions	CHI Factor	ESALs in Millions	CHI Factor
1	1.12	26	0.94	51	0.94	76	0.94
2	1.119976	27	0.94	52	0.94	77	0.94
3	1.119336	28	0.94	53	0.94	78	0.94
4	1.116487	29	0.94	54	0.94	79	0.94
5	1.110457	30	0.94	55	0.94	80	0.94
6	1.101419	31	0.94	56	0.94	81	0.94
7	1.090092	32	0.94	57	0.94	82	0.94
8	1.077262	33	0.94	58	0.94	83	0.94
9	1.063586	34	0.94	59	0.94	84	0.94
10	1.049555	35	0.94	60	0.94	85	0.94
11	1.035517	36	0.94	61	0.94	86	0.94
12	1.021703	37	0.94	62	0.94	87	0.94
13	1.008264	38	0.94	63	0.94	88	0.94
14	0.995292	39	0.94	64	0.94	89	0.94
15	0.982838	40	0.94	65	0.94	90	0.94
16	0.970924	41	0.94	66	0.94	91	0.94
17	0.959556	42	0.94	67	0.94	92	0.94
18	0.948725	43	0.94	68	0.94	93	0.94
19	0.94	44	0.94	69	0.94	94	0.94
20	0.94	45	0.94	70	0.94	95	0.94
21	0.94	46	0.94	71	0.94	96	0.94
22	0.94	47	0.94	72	0.94	97	0.94
23	0.94	48	0.94	73	0.94	98	0.94
24	0.94	49	0.94	74	0.94	99	0.94
25	0.94	50	0.94	75	0.94	100	0.94

Table 118. Traffic Factors (CHI) for Alligator Cracking for Detailed Pavement Type 09.

Chi Maximum: **1.3000** **Chi Minimum:** **0.7000**

Chi Beta: **2.2400** **Chi Rho:** **11.4800**

ESALs in Millions	CHI Factor	ESALs in Millions	CHI Factor	ESALs in Millions	CHI Factor	ESALs in Millions	CHI Factor
1	1.299977	26	0.7	51	0.7	76	0.7
2	1.292799	27	0.7	52	0.7	77	0.7
3	1.251208	28	0.7	53	0.7	78	0.7
4	1.172994	29	0.7	54	0.7	79	0.7
5	1.07452	30	0.7	55	0.7	80	0.7
6	0.969404	31	0.7	56	0.7	81	0.7
7	0.865485	32	0.7	57	0.7	82	0.7
8	0.766622	33	0.7	58	0.7	83	0.7
9	0.7	34	0.7	59	0.7	84	0.7
10	0.7	35	0.7	60	0.7	85	0.7
11	0.7	36	0.7	61	0.7	86	0.7
12	0.7	37	0.7	62	0.7	87	0.7
13	0.7	38	0.7	63	0.7	88	0.7
14	0.7	39	0.7	64	0.7	89	0.7
15	0.7	40	0.7	65	0.7	90	0.7
16	0.7	41	0.7	66	0.7	91	0.7
17	0.7	42	0.7	67	0.7	92	0.7
18	0.7	43	0.7	68	0.7	93	0.7
19	0.7	44	0.7	69	0.7	94	0.7
20	0.7	45	0.7	70	0.7	95	0.7
21	0.7	46	0.7	71	0.7	96	0.7
22	0.7	47	0.7	72	0.7	97	0.7
23	0.7	48	0.7	73	0.7	98	0.7
24	0.7	49	0.7	74	0.7	99	0.7
25	0.7	50	0.7	75	0.7	100	0.7

Table 119. Traffic Factors (CHI) for Deep Rutting for Detailed Pavement Type 09.

Chi Maximum: 1.1800 **Chi Minimum:** 0.8300

Chi Beta: 1.0900 **Chi Rho:** 10.1300

ESALs in Millions	CHI Factor	ESALs in Millions	CHI Factor	ESALs in Millions	CHI Factor	ESALs in Millions	CHI Factor
1	1.179957	26	0.83	51	0.83	76	0.83
2	1.173118	27	0.83	52	0.83	77	0.83
3	1.142764	28	0.83	53	0.83	78	0.83
4	1.093388	29	0.83	54	0.83	79	0.83
5	1.036271	30	0.83	55	0.83	80	0.83
6	0.978538	31	0.83	56	0.83	81	0.83
7	0.923587	32	0.83	57	0.83	82	0.83
8	0.872743	33	0.83	58	0.83	83	0.83
9	0.83	34	0.83	59	0.83	84	0.83
10	0.83	35	0.83	60	0.83	85	0.83
11	0.83	36	0.83	61	0.83	86	0.83
12	0.83	37	0.83	62	0.83	87	0.83
13	0.83	38	0.83	63	0.83	88	0.83
14	0.83	39	0.83	64	0.83	89	0.83
15	0.83	40	0.83	65	0.83	90	0.83
16	0.83	41	0.83	66	0.83	91	0.83
17	0.83	42	0.83	67	0.83	92	0.83
18	0.83	43	0.83	68	0.83	93	0.83
19	0.83	44	0.83	69	0.83	94	0.83
20	0.83	45	0.83	70	0.83	95	0.83
21	0.83	46	0.83	71	0.83	96	0.83
22	0.83	47	0.83	72	0.83	97	0.83
23	0.83	48	0.83	73	0.83	98	0.83
24	0.83	49	0.83	74	0.83	99	0.83
25	0.83	50	0.83	75	0.83	100	0.83

Table 120. Traffic Factors (CHI) for Shallow Rutting for Detailed Pavement Type 10.

Chi Maximum: 1.1800 **Chi Minimum:** 0.8300

Chi Beta: 0.9600 **Chi Rho:** 1.6500

ESALs in Millions	CHI Factor	ESALs in Millions	CHI Factor	ESALs in Millions	CHI Factor	ESALs in Millions	CHI Factor
1	0.995632	26	0.83	51	0.83	76	0.83
2	0.83	27	0.83	52	0.83	77	0.83
3	0.83	28	0.83	53	0.83	78	0.83
4	0.83	29	0.83	54	0.83	79	0.83
5	0.83	30	0.83	55	0.83	80	0.83
6	0.83	31	0.83	56	0.83	81	0.83
7	0.83	32	0.83	57	0.83	82	0.83
8	0.83	33	0.83	58	0.83	83	0.83
9	0.83	34	0.83	59	0.83	84	0.83
10	0.83	35	0.83	60	0.83	85	0.83
11	0.83	36	0.83	61	0.83	86	0.83
12	0.83	37	0.83	62	0.83	87	0.83
13	0.83	38	0.83	63	0.83	88	0.83
14	0.83	39	0.83	64	0.83	89	0.83
15	0.83	40	0.83	65	0.83	90	0.83
16	0.83	41	0.83	66	0.83	91	0.83
17	0.83	42	0.83	67	0.83	92	0.83
18	0.83	43	0.83	68	0.83	93	0.83
19	0.83	44	0.83	69	0.83	94	0.83
20	0.83	45	0.83	70	0.83	95	0.83
21	0.83	46	0.83	71	0.83	96	0.83
22	0.83	47	0.83	72	0.83	97	0.83
23	0.83	48	0.83	73	0.83	98	0.83
24	0.83	49	0.83	74	0.83	99	0.83
25	0.83	50	0.83	75	0.83	100	0.83

Table 121. Traffic Factors (CHI) for Shallow Rutting for Detailed Pavement Type 09.

Chi Maximum: 1.1200 **Chi Minimum:** 0.9400

Chi Beta: 0.4900 **Chi Rho:** 8.3600

ESALs in Millions	CHI Factor	ESALs in Millions	CHI Factor	ESALs in Millions	CHI Factor	ESALs in Millions	CHI Factor
1	1.119885	26	0.94	51	0.94	76	0.94
2	1.112504	27	0.94	52	0.94	77	0.94
3	1.089803	28	0.94	53	0.94	78	0.94
4	1.059393	29	0.94	54	0.94	79	0.94
5	1.027943	30	0.94	55	0.94	80	0.94
6	0.998359	31	0.94	56	0.94	81	0.94
7	0.971569	32	0.94	57	0.94	82	0.94
8	0.947671	33	0.94	58	0.94	83	0.94
9	0.94	34	0.94	59	0.94	84	0.94
10	0.94	35	0.94	60	0.94	85	0.94
11	0.94	36	0.94	61	0.94	86	0.94
12	0.94	37	0.94	62	0.94	87	0.94
13	0.94	38	0.94	63	0.94	88	0.94
14	0.94	39	0.94	64	0.94	89	0.94
15	0.94	40	0.94	65	0.94	90	0.94
16	0.94	41	0.94	66	0.94	91	0.94
17	0.94	42	0.94	67	0.94	92	0.94
18	0.94	43	0.94	68	0.94	93	0.94
19	0.94	44	0.94	69	0.94	94	0.94
20	0.94	45	0.94	70	0.94	95	0.94
21	0.94	46	0.94	71	0.94	96	0.94
22	0.94	47	0.94	72	0.94	97	0.94
23	0.94	48	0.94	73	0.94	98	0.94
24	0.94	49	0.94	74	0.94	99	0.94
25	0.94	50	0.94	75	0.94	100	0.94

Table 122. Traffic Factors (CHI) for Alligator Cracking for Detailed Pavement Type 10.

Chi Maximum: 1.3000 **Chi Minimum:** 0.7000

Chi Beta: 1.9200 **Chi Rho:** 1.8700

ESALs in Millions	CHI Factor	ESALs in Millions	CHI Factor	ESALs in Millions	CHI Factor	ESALs in Millions	CHI Factor
1	1.004083	26	0.7	51	0.7	76	0.7
2	0.7	27	0.7	52	0.7	77	0.7
3	0.7	28	0.7	53	0.7	78	0.7
4	0.7	29	0.7	54	0.7	79	0.7
5	0.7	30	0.7	55	0.7	80	0.7
6	0.7	31	0.7	56	0.7	81	0.7
7	0.7	32	0.7	57	0.7	82	0.7
8	0.7	33	0.7	58	0.7	83	0.7
9	0.7	34	0.7	59	0.7	84	0.7
10	0.7	35	0.7	60	0.7	85	0.7
11	0.7	36	0.7	61	0.7	86	0.7
12	0.7	37	0.7	62	0.7	87	0.7
13	0.7	38	0.7	63	0.7	88	0.7
14	0.7	39	0.7	64	0.7	89	0.7
15	0.7	40	0.7	65	0.7	90	0.7
16	0.7	41	0.7	66	0.7	91	0.7
17	0.7	42	0.7	67	0.7	92	0.7
18	0.7	43	0.7	68	0.7	93	0.7
19	0.7	44	0.7	69	0.7	94	0.7
20	0.7	45	0.7	70	0.7	95	0.7
21	0.7	46	0.7	71	0.7	96	0.7
22	0.7	47	0.7	72	0.7	97	0.7
23	0.7	48	0.7	73	0.7	98	0.7
24	0.7	49	0.7	74	0.7	99	0.7
25	0.7	50	0.7	75	0.7	100	0.7

Table 123. Traffic Factors (CHI) for Deep Rutting for Detailed Pavement Type 10.

Chi Maximum: 1.1800 **Chi Minimum:** 0.8300

Chi Beta: 0.9600 **Chi Rho:** 1.6500

ESALs in Millions	CHI Factor	ESALs in Millions	CHI Factor	ESALs in Millions	CHI Factor	ESALs in Millions	CHI Factor
1	0.995632	26	0.83	51	0.83	76	0.83
2	0.83	27	0.83	52	0.83	77	0.83
3	0.83	28	0.83	53	0.83	78	0.83
4	0.83	29	0.83	54	0.83	79	0.83
5	0.83	30	0.83	55	0.83	80	0.83
6	0.83	31	0.83	56	0.83	81	0.83
7	0.83	32	0.83	57	0.83	82	0.83
8	0.83	33	0.83	58	0.83	83	0.83
9	0.83	34	0.83	59	0.83	84	0.83
10	0.83	35	0.83	60	0.83	85	0.83
11	0.83	36	0.83	61	0.83	86	0.83
12	0.83	37	0.83	62	0.83	87	0.83
13	0.83	38	0.83	63	0.83	88	0.83
14	0.83	39	0.83	64	0.83	89	0.83
15	0.83	40	0.83	65	0.83	90	0.83
16	0.83	41	0.83	66	0.83	91	0.83
17	0.83	42	0.83	67	0.83	92	0.83
18	0.83	43	0.83	68	0.83	93	0.83
19	0.83	44	0.83	69	0.83	94	0.83
20	0.83	45	0.83	70	0.83	95	0.83
21	0.83	46	0.83	71	0.83	96	0.83
22	0.83	47	0.83	72	0.83	97	0.83
23	0.83	48	0.83	73	0.83	98	0.83
24	0.83	49	0.83	74	0.83	99	0.83
25	0.83	50	0.83	75	0.83	100	0.83

Table 124. Traffic Factors (CHI) for Ride Score for Detailed Pavement Type 10.

Chi Maximum: 1.1200 **Chi Minimum:** 0.9400

Chi Beta: 0.4400 **Chi Rho:** 1.3600

ESALs in Millions	CHI Factor	ESALs in Millions	CHI Factor	ESALs in Millions	CHI Factor	ESALs in Millions	CHI Factor
1	1.007069	26	0.94	51	0.94	76	0.94
2	0.94	27	0.94	52	0.94	77	0.94
3	0.94	28	0.94	53	0.94	78	0.94
4	0.94	29	0.94	54	0.94	79	0.94
5	0.94	30	0.94	55	0.94	80	0.94
6	0.94	31	0.94	56	0.94	81	0.94
7	0.94	32	0.94	57	0.94	82	0.94
8	0.94	33	0.94	58	0.94	83	0.94
9	0.94	34	0.94	59	0.94	84	0.94
10	0.94	35	0.94	60	0.94	85	0.94
11	0.94	36	0.94	61	0.94	86	0.94
12	0.94	37	0.94	62	0.94	87	0.94
13	0.94	38	0.94	63	0.94	88	0.94
14	0.94	39	0.94	64	0.94	89	0.94
15	0.94	40	0.94	65	0.94	90	0.94
16	0.94	41	0.94	66	0.94	91	0.94
17	0.94	42	0.94	67	0.94	92	0.94
18	0.94	43	0.94	68	0.94	93	0.94
19	0.94	44	0.94	69	0.94	94	0.94
20	0.94	45	0.94	70	0.94	95	0.94
21	0.94	46	0.94	71	0.94	96	0.94
22	0.94	47	0.94	72	0.94	97	0.94
23	0.94	48	0.94	73	0.94	98	0.94
24	0.94	49	0.94	74	0.94	99	0.94
25	0.94	50	0.94	75	0.94	100	0.94

Climate Factor (Epsilon)

Epsilon (ϵ) controls the effect of climate on pavement performance. PES used average county rainfall and average county freeze-thaw cycles to account for climatic effects when computing its Adjusted Visual Utility (AVU) score, but this did nothing to "age" pavement sections solely under the effects of climate.

Although climate is an important factor to consider when predicting future pavement condition, most TxDOT-sponsored research studies have focused on the effects of traffic on performance. Several important climatic factors have been identified in the research, but many questions still remain to be answered in this area.

We propose that PMIS use an Epsilon value of 1.0000 for all ACP distress types and ride quality until more is learned about the effects of climate on pavement performance. For rigid pavements (CRCP and JCP) we propose that PMIS use an Epsilon value of 1.0000, as suggested by Research Study 1908 ("*Texas Pavement Management System*"), conducted by the Center for Transportation Research — University of Texas at Austin.

Subgrade Support Factor (Sigma)

Sigma (σ) controls the effect of subgrade support on pavement performance. Although the man-made upper pavement layers may be carefully designed and constructed, the final pavement performance will still be affected by the quality of the underlying subgrade material. Obviously, there are many factors which will effect subgrade quality — not all of which are within the pavement manager's control. Because of the complex interaction of the factors that affect subgrade quality, TxDOT has taken an empirical approach to subgrade support by describing it in terms of the W7 geophone readings taken from Falling Weight Deflectometer (FWD) tests. The W7 sensor measures surface deflection at a distance of 1.82 m (72 ins) from the center of the FWD's loadplate. TxDOT has computed average W7 values for each County.

We propose that PMIS use these average County W7 values to compute the Sigma factor, by County, for each TxDOT District, as shown in Table 125. Obviously this is not an exact approach to estimating the support offered by subgrade at any one location, however it does give acceptable results for network-level studies. For rigid pavements (CRCP and JCP) we propose that PMIS use a Sigma value of 1.0000, as suggested by Research Study 1908 ("*Texas Pavement*

Management System"), conducted by the Center for Transportation Research — University of Texas at Austin.

Table 125. Sigma Values, by County, for Each TxDOT District.

District 1 (Paris)

County Number and Name	Subgrade Support	Sigma Values for...				
		Shallow Rutting	Deep Rutting	Alligator Cracking	Block Cracking	Ride Quality
60 Delta	5 Very Poor	1.00	1.00	1.00	1.00	1.00
75 Fannin	3 Fair	1.42	1.42	1.42	1.42	1.08
81 Franklin	4 Poor	1.21	1.21	1.21	1.21	1.04
92 Grayson	1 Very Good	1.80	1.80	1.80	1.80	1.19
113 Hopkins	4 Poor	1.21	1.21	1.21	1.21	1.04
117 Hunt	1 Very Good	1.80	1.80	1.80	1.80	1.19
139 Lamar	4 Poor	1.21	1.21	1.21	1.21	1.04
190 Rains	4 Poor	1.21	1.21	1.21	1.21	1.04
194 Red River	4 Poor	1.21	1.21	1.21	1.21	1.04

District 2 (Fort Worth)

County Number and Name	Subgrade Support	Sigma Values for...				
		Shallow Rutting	Deep Rutting	Alligator Cracking	Block Cracking	Ride Quality
73 Erath	2 Good	1.61	1.61	1.61	1.61	1.14
112 Hood	1 Very Good	1.80	1.80	1.80	1.80	1.19
120 Jack	1 Very Good	1.80	1.80	1.80	1.80	1.19
127 Johnson	3 Fair	1.42	1.42	1.42	1.42	1.08
182 Palo Pinto	1 Very Good	1.80	1.80	1.80	1.80	1.19
184 Parker	1 Very Good	1.80	1.80	1.80	1.80	1.19
213 Somervell	1 Very Good	1.80	1.80	1.80	1.80	1.19
220 Tarrant	1 Very Good	1.80	1.80	1.80	1.80	1.19
249 Wise	2 Good	1.42	1.42	1.42	1.42	1.08

Table 125 (Continued). Sigma Values, by County, for Each TxDOT District.

District 3 (Wichita Falls)

County Number and Name	Subgrade Support	Sigma Values for...				
		Shallow Rutting	Deep Rutting	Alligator Cracking	Block Cracking	Ride Quality
5 Archer	4 Poor	1.21	1.21	1.21	1.21	1.04
12 Baylor	4 Poor	1.21	1.21	1.21	1.21	1.04
39 Clay	3 Fair	1.42	1.42	1.42	1.42	1.08
49 Cooke	1 Very Good	1.80	1.80	1.80	1.80	1.19
169 Montague	1 Very Good	1.80	1.80	1.80	1.80	1.19
224 Throckmorton	4 Poor	1.21	1.21	1.21	1.21	1.04
243 Wichita	4 Poor	1.21	1.21	1.21	1.21	1.04
244 Wilbarger	4 Poor	1.21	1.21	1.21	1.21	1.04
252 Young	3 Fair	1.42	1.42	1.42	1.42	1.08

District 4 (Amarillo)

County Number and Name	Subgrade Support	Sigma Values for...				
		Shallow Rutting	Deep Rutting	Alligator Cracking	Block Cracking	Ride Quality
6 Armstrong	4 Poor	1.21	1.21	1.21	1.21	1.04
33 Carson	4 Poor	1.21	1.21	1.21	1.21	1.04
56 Dallam	4 Poor	1.21	1.21	1.21	1.21	1.04
59 Deaf Smith	4 Poor	1.21	1.21	1.21	1.21	1.04
91 Gray	4 Poor	1.21	1.21	1.21	1.21	1.04
99 Hansford	4 Poor	1.21	1.21	1.21	1.21	1.04
104 Hartley	4 Poor	1.21	1.21	1.21	1.21	1.04
107 Hemphill	4 Poor	1.21	1.21	1.21	1.21	1.04
118 Hutchinson	4 Poor	1.21	1.21	1.21	1.21	1.04
148 Lipscomb	4 Poor	1.21	1.21	1.21	1.21	1.04
171 Moore	4 Poor	1.21	1.21	1.21	1.21	1.04
179 Ochiltree	4 Poor	1.21	1.21	1.21	1.21	1.04
180 Oldham	4 Poor	1.21	1.21	1.21	1.21	1.04
188 Potter	4 Poor	1.21	1.21	1.21	1.21	1.04
191 Randall	4 Poor	1.21	1.21	1.21	1.21	1.04
197 Roberts	5 Very Poor	1.00	1.00	1.00	1.00	1.00
211 Sherman	4 Poor	1.21	1.21	1.21	1.21	1.04

Table 125 (Continued). Sigma Values, by County, for Each TxDOT District.

District 5 (Lubbock)

County Number and Name	Subgrade Support	Sigma Values for...				
		Shallow Rutting	Deep Rutting	Alligator Cracking	Block Cracking	Ride Quality
9 Bailey	4 Poor	1.21	1.21	1.21	1.21	1.04
35 Castro	4 Poor	1.21	1.21	1.21	1.21	1.04
40 Cochran	3 Fair	1.42	1.42	1.42	1.42	1.08
54 Crosby	4 Poor	1.21	1.21	1.21	1.21	1.04
58 Dawson	4 Poor	1.21	1.21	1.21	1.21	1.04
78 Floyd	4 Poor	1.21	1.21	1.21	1.21	1.04
84 Gaines	3 Fair	1.42	1.42	1.42	1.42	1.08
86 Garza	4 Poor	1.21	1.21	1.21	1.21	1.04
96 Hale	4 Poor	1.21	1.21	1.21	1.21	1.04
111 Hockley	4 Poor	1.21	1.21	1.21	1.21	1.04
140 Lamb	4 Poor	1.21	1.21	1.21	1.21	1.04
152 Lubbock	4 Poor	1.21	1.21	1.21	1.21	1.04
153 Lynn	4 Poor	1.21	1.21	1.21	1.21	1.04
185 Parmer	4 Poor	1.21	1.21	1.21	1.21	1.04
219 Swisher	4 Poor	1.21	1.21	1.21	1.21	1.04
223 Terry	3 Fair	1.42	1.42	1.42	1.42	1.08
251 Yoakum	3 Fair	1.42	1.42	1.42	1.42	1.08

District 6 (Odessa)

County Number and Name	Subgrade Support	Sigma Values for...				
		Shallow Rutting	Deep Rutting	Alligator Cracking	Block Cracking	Ride Quality
2 Andrews	2 Good	1.61	1.61	1.61	1.61	1.14
52 Crane	1 Very Good	1.80	1.80	1.80	1.80	1.19
69 Ector	1 Very Good	1.80	1.80	1.80	1.80	1.19
151 Loving	1 Very Good	1.80	1.80	1.80	1.80	1.19
156 Martin	3 Fair	1.42	1.42	1.42	1.42	1.08
165 Midland	2 Good	1.61	1.61	1.61	1.61	1.14
186 Pecos	1 Very Good	1.80	1.80	1.80	1.80	1.19
192 Reeves	1 Very Good	1.80	1.80	1.80	1.80	1.19
222 Terrell	1 Very Good	1.80	1.80	1.80	1.80	1.19
231 Upton	3 Fair	1.42	1.42	1.42	1.42	1.08
238 Ward	1 Very Good	1.80	1.80	1.80	1.80	1.19
248 Winkler	2 Good	1.61	1.61	1.61	1.61	1.14

Table 125 (Continued). Sigma Values, by County, for Each TxDOT District.

District 7 (San Angelo)

County Number and Name	Subgrade Support	Sigma Values for...				
		Shallow Rutting	Deep Rutting	Alligator Cracking	Block Cracking	Ride Quality
41 Coke	2 Good	1.61	1.61	1.61	1.61	1.14
48 Concho	3 Fair	1.42	1.42	1.42	1.42	1.08
53 Crockett	1 Very Good	1.80	1.80	1.80	1.80	1.19
70 Edwards	1 Very Good	1.80	1.80	1.80	1.80	1.19
88 Glasscock	4 Poor	1.21	1.21	1.21	1.21	1.04
119 Irion	2 Good	1.61	1.61	1.61	1.61	1.14
134 Kimble	1 Very Good	1.80	1.80	1.80	1.80	1.19
164 Menard	1 Very Good	1.80	1.80	1.80	1.80	1.19
192 Reagan	4 Poor	1.21	1.21	1.21	1.21	1.04
193 Real	1 Very Good	1.80	1.80	1.80	1.80	1.19
200 Runnels	3 Fair	1.42	1.42	1.42	1.42	1.08
207 Schleicher	1 Very Good	1.80	1.80	1.80	1.80	1.19
216 Sterling	2 Good	1.61	1.61	1.61	1.61	1.14
218 Sutton	1 Very Good	1.80	1.80	1.80	1.80	1.19
226 Tom Green	3 Fair	1.42	1.42	1.42	1.42	1.08

District 8 (Abilene)

County Number and Name	Subgrade Support	Sigma Values for...				
		Shallow Rutting	Deep Rutting	Alligator Cracking	Block Cracking	Ride Quality
17 Borden	4 Poor	1.21	1.21	1.21	1.21	1.04
30 Callahan	1 Very Good	1.80	1.80	1.80	1.80	1.19
77 Fisher	4 Poor	1.21	1.21	1.21	1.21	1.04
105 Haskell	4 Poor	1.21	1.21	1.21	1.21	1.04
115 Howard	3 Fair	1.42	1.42	1.42	1.42	1.08
128 Jones	4 Poor	1.21	1.21	1.21	1.21	1.04
132 Kent	4 Poor	1.21	1.21	1.21	1.21	1.04
168 Mitchell	1 Very Good	1.80	1.80	1.80	1.80	1.19
177 Nolan	3 Fair	1.42	1.42	1.42	1.42	1.08
208 Scurry	3 Fair	1.42	1.42	1.42	1.42	1.08
209 Shackelford	2 Good	1.61	1.61	1.61	1.61	1.14
217 Stonewall	2 Good	1.61	1.61	1.61	1.61	1.14
221 Taylor	2 Good	1.61	1.61	1.61	1.61	1.14

Table 125 (Continued). Sigma Values, by County, for Each TxDOT District.

District 9 (Waco)

County Number and Name	Subgrade Support	Sigma Values for...				
		Shallow Rutting	Deep Rutting	Alligator Cracking	Block Cracking	Ride Quality
14 Bell	1 Very Good	1.80	1.80	1.80	1.80	1.19
18 Bosque	1 Very Good	1.80	1.80	1.80	1.80	1.19
50 Coryell	1 Very Good	1.80	1.80	1.80	1.80	1.19
74 Falls	4 Poor	1.21	1.21	1.21	1.21	1.04
98 Hamilton	1 Very Good	1.80	1.80	1.80	1.80	1.19
110 Hill	1 Very Good	1.80	1.80	1.80	1.80	1.19
147 Limestone	4 Poor	1.21	1.21	1.21	1.21	1.04
161 McLennan	2 Good	1.61	1.61	1.61	1.61	1.14

District 10 (Tyler)

County Number and Name	Subgrade Support	Sigma Values for...				
		Shallow Rutting	Deep Rutting	Alligator Cracking	Block Cracking	Ride Quality
1 Anderson	3 Fair	1.42	1.42	1.42	1.42	1.08
37 Cherokee	3 Fair	1.42	1.42	1.42	1.42	1.08
93 Gregg	3 Fair	1.42	1.42	1.42	1.42	1.08
108 Henderson	4 Poor	1.21	1.21	1.21	1.21	1.04
210 Rusk	3 Fair	1.42	1.42	1.42	1.42	1.08
212 Smith	3 Fair	1.42	1.42	1.42	1.42	1.08
234 Van Zandt	4 Poor	1.21	1.21	1.21	1.21	1.04
250 Wood	3 Fair	1.42	1.42	1.42	1.42	1.08

Table 125 (Continued). Sigma Values, by County, for Each TxDOT District.

District 11 (Lufkin)

County Number and Name	Subgrade Support	Sigma Values for...				
		Shallow Rutting	Deep Rutting	Alligator Cracking	Block Cracking	Ride Quality
3 Angelina	4 Poor	1.21	1.21	1.21	1.21	1.04
114 Houston	4 Poor	1.21	1.21	1.21	1.21	1.04
174 Nacogdoches	4 Poor	1.21	1.21	1.21	1.21	1.04
187 Polk	4 Poor	1.21	1.21	1.21	1.21	1.04
202 Sabine	4 Poor	1.21	1.21	1.21	1.21	1.04
203 San Augustine	4 Poor	1.21	1.21	1.21	1.21	1.04
204 San Jacinto	4 Poor	1.21	1.21	1.21	1.21	1.04
210 Shelby	4 Poor	1.21	1.21	1.21	1.21	1.04
228 Trinity	5 Very Poor	1.00	1.00	1.00	1.00	1.00

District 12 (Houston)

County Number and Name	Subgrade Support	Sigma Values for...				
		Shallow Rutting	Deep Rutting	Alligator Cracking	Block Cracking	Ride Quality
20 Brazoria	5 Very Poor	1.00	1.00	1.00	1.00	1.00
80 Fort Bend	5 Very Poor	1.00	1.00	1.00	1.00	1.00
85 Galveston	4 Poor	1.21	1.21	1.21	1.21	1.04
102 Harris	4 Poor	1.21	1.21	1.21	1.21	1.04
170 Montgomery	3 Fair	1.42	1.42	1.42	1.42	1.08
237 Waller	4 Poor	1.21	1.21	1.21	1.21	1.04

Table 125 (Continued). Sigma Values, by County, for Each TxDOT District.

District 13 (Yoakum)

County Number and Name	Subgrade Support	Sigma Values for...				
		Shallow Rutting	Deep Rutting	Alligator Cracking	Block Cracking	Ride Quality
8 Austin	4 Poor	1.21	1.21	1.21	1.21	1.04
29 Calhoun	5 Very Poor	1.00	1.00	1.00	1.00	1.00
45 Colorado	3 Fair	1.42	1.42	1.42	1.42	1.08
62 DeWitt	3 Fair	1.42	1.42	1.42	1.42	1.08
76 Fayette	3 Fair	1.42	1.42	1.42	1.42	1.08
90 Gonzales	4 Poor	1.21	1.21	1.21	1.21	1.04
121 Jackson	5 Very Poor	1.00	1.00	1.00	1.00	1.00
143 Lavaca	4 Poor	1.21	1.21	1.21	1.21	1.04
158 Matagorda	5 Very Poor	1.00	1.00	1.00	1.00	1.00
235 Victoria	4 Poor	1.21	1.21	1.21	1.21	1.04
241 Wharton	5 Very Poor	1.00	1.00	1.00	1.00	1.00

District 14 (Austin)

County Number and Name	Subgrade Support	Sigma Values for...				
		Shallow Rutting	Deep Rutting	Alligator Cracking	Block Cracking	Ride Quality
11 Bastrop	4 Poor	1.21	1.21	1.21	1.21	1.04
16 Blanco	1 Very Good	1.80	1.80	1.80	1.80	1.19
27 Burnet	1 Very Good	1.80	1.80	1.80	1.80	1.19
28 Caldwell	4 Poor	1.21	1.21	1.21	1.21	1.04
87 Gillespie	1 Very Good	1.80	1.80	1.80	1.80	1.19
106 Hays	1 Very Good	1.80	1.80	1.80	1.80	1.19
144 Lee	4 Poor	1.21	1.21	1.21	1.21	1.04
150 Llano	1 Very Good	1.80	1.80	1.80	1.80	1.19
157 Mason	1 Very Good	1.80	1.80	1.80	1.80	1.19
227 Travis	1 Very Good	1.80	1.80	1.80	1.80	1.19
246 Williamson	1 Very Good	1.80	1.80	1.80	1.80	1.19

Table 125 (Continued). Sigma Values, by County, for Each TxDOT District.

District 15 (San Antonio)

County Number and Name	Subgrade Support	Sigma Values for... Shallow Rutting	Deep Rutting	Alligator Cracking	Block Cracking	Ride Quality
7 Atascosa	4 Poor	1.21	1.21	1.21	1.21	1.04
10 Bandera	1 Very Good	1.80	1.80	1.80	1.80	1.19
15 Bexar	1 Very Good	1.80	1.80	1.80	1.80	1.19
46 Comal	1 Very Good	1.80	1.80	1.80	1.80	1.19
83 Frio	4 Poor	1.21	1.21	1.21	1.21	1.04
95 Guadalupe	3 Fair	1.42	1.42	1.42	1.42	1.08
131 Kendall	1 Very Good	1.80	1.80	1.80	1.80	1.19
133 Kerr	1 Very Good	1.80	1.80	1.80	1.80	1.19
162 McMullen	5 Very Poor	1.00	1.00	1.00	1.00	1.00
163 Medina	2 Good	1.61	1.61	1.61	1.61	1.14
232 Uvalde	2 Good	1.61	1.61	1.61	1.61	1.14
247 Wilson	4 Poor	1.21	1.21	1.21	1.21	1.04

District 16 (Corpus Christi)

County Number and Name	Subgrade Support	Sigma Values for... Shallow Rutting	Deep Rutting	Alligator Cracking	Block Cracking	Ride Quality
4 Aransas	5 Very Poor	1.00	1.00	1.00	1.00	1.00
13 Bee	4 Poor	1.21	1.21	1.21	1.21	1.04
89 Goliad	3 Fair	1.42	1.42	1.42	1.42	1.08
126 Jim Wells	5 Very Poor	1.00	1.00	1.00	1.00	1.00
129 Karnes	5 Very Poor	1.00	1.00	1.00	1.00	1.00
137 Kleberg	5 Very Poor	1.00	1.00	1.00	1.00	1.00
149 Live Oak	4 Poor	1.21	1.21	1.21	1.21	1.04
178 Nueces	5 Very Poor	1.00	1.00	1.00	1.00	1.00
196 Refugio	5 Very Poor	1.00	1.00	1.00	1.00	1.00
205 San Patricio	5 Very Poor	1.00	1.00	1.00	1.00	1.00

Table 125 (Continued). Sigma Values, by County, for Each TxDOT District.

District 17 (Bryan)

County Number and Name	Subgrade Support	Sigma Values for...				
		Shallow Rutting	Deep Rutting	Alligator Cracking	Block Cracking	Ride Quality
21 Brazos	1 Very Good	1.80	1.80	1.80	1.80	1.19
26 Burleson	4 Poor	1.21	1.21	1.21	1.21	1.04
82 Freestone	4 Poor	1.21	1.21	1.21	1.21	1.04
94 Grimes	4 Poor	1.21	1.21	1.21	1.21	1.04
145 Leon	4 Poor	1.21	1.21	1.21	1.21	1.04
154 Madison	4 Poor	1.21	1.21	1.21	1.21	1.04
166 Milam	4 Poor	1.21	1.21	1.21	1.21	1.04
198 Robertson	4 Poor	1.21	1.21	1.21	1.21	1.04
236 Walker	3 Fair	1.42	1.42	1.42	1.42	1.08
239 Washington	3 Fair	1.42	1.42	1.42	1.42	1.08

District 18 (Dallas)

County Number and Name	Subgrade Support	Sigma Values for...				
		Shallow Rutting	Deep Rutting	Alligator Cracking	Block Cracking	Ride Quality
43 Collin	3 Fair	1.42	1.42	1.42	1.42	1.08
57 Dallas	2 Good	1.61	1.61	1.61	1.61	1.14
61 Denton	1 Very Good	1.80	1.80	1.80	1.80	1.19
71 Ellis	2 Good	1.61	1.61	1.61	1.61	1.14
130 Kaufman	5 Very Poor	1.00	1.00	1.00	1.00	1.00
175 Navarro	4 Poor	1.21	1.21	1.21	1.21	1.04
199 Rockwall	4 Poor	1.21	1.21	1.21	1.21	1.04

Table 125 (Continued). Sigma Values, by County, for Each TxDOT District.

District 19 (Atlanta)

County Number and Name	Subgrade Support	Sigma Values for...				
		Shallow Rutting	Deep Rutting	Alligator Cracking	Block Cracking	Ride Quality
19 Bowie	3 Fair	1.42	1.42	1.42	1.42	1.08
32 Camp	3 Fair	1.42	1.42	1.42	1.42	1.08
34 Cass	3 Fair	1.42	1.42	1.42	1.42	1.08
103 Harrison	3 Fair	1.42	1.42	1.42	1.42	1.08
155 Marion	3 Fair	1.42	1.42	1.42	1.42	1.08
172 Morris	3 Fair	1.42	1.42	1.42	1.42	1.08
183 Panola	4 Poor	1.21	1.21	1.21	1.21	1.04
225 Titus	4 Poor	1.21	1.21	1.21	1.21	1.04
230 Upshur	3 Fair	1.42	1.42	1.42	1.42	1.08

District 20 (Beaumont)

County Number and Name	Subgrade Support	Sigma Values for...				
		Shallow Rutting	Deep Rutting	Alligator Cracking	Block Cracking	Ride Quality
36 Chambers	5 Very Poor	1.00	1.00	1.00	1.00	1.00
101 Hardin	5 Very Poor	1.00	1.00	1.00	1.00	1.00
122 Jasper	3 Fair	1.42	1.42	1.42	1.42	1.08
124 Jefferson	5 Very Poor	1.00	1.00	1.00	1.00	1.00
146 Liberty	4 Poor	1.21	1.21	1.21	1.21	1.04
176 Newton	3 Fair	1.42	1.42	1.42	1.42	1.08
181 Orange	5 Very Poor	1.00	1.00	1.00	1.00	1.00
229 Tyler	2 Good	1.61	1.61	1.61	1.61	1.14

Table 125 (Continued). Sigma Values, by County, for Each TxDOT District.

District 21 (Pharr)

County Number and Name	Subgrade Support	Sigma Values for... Shallow Rutting	Deep Rutting	Alligator Cracking	Block Cracking	Ride Quality
24 Brooks	4 Poor	1.21	1.21	1.21	1.21	1.04
31 Cameron	5 Very Poor	1.00	1.00	1.00	1.00	1.00
109 Hidalgo	5 Very Poor	1.00	1.00	1.00	1.00	1.00
125 Jim Hogg	3 Fair	1.42	1.42	1.42	1.42	1.08
66 Kenedy	4 Poor	1.21	1.21	1.21	1.21	1.04
214 Starr	4 Poor	1.21	1.21	1.21	1.21	1.04
245 Willacy	5 Very Poor	1.00	1.00	1.00	1.00	1.00
253 Zapata	4 Poor	1.21	1.21	1.21	1.21	1.04

District 22 (Laredo)

County Number and Name	Subgrade Support	Sigma Values for... Shallow Rutting	Deep Rutting	Alligator Cracking	Block Cracking	Ride Quality
64 Dimmitt	4 Poor	1.21	1.21	1.21	1.21	1.04
67 Duval	4 Poor	1.21	1.21	1.21	1.21	1.04
136 Kinney	2 Good	1.61	1.61	1.61	1.61	1.14
142 La Salle	4 Poor	1.21	1.21	1.21	1.21	1.04
159 Maverick	3 Fair	1.42	1.42	1.42	1.42	1.08
233 Val Verde	1 Very Good	1.80	1.80	1.80	1.80	1.19
240 Webb	4 Poor	1.21	1.21	1.21	1.21	1.04
254 Zavala	4 Poor	1.21	1.21	1.21	1.21	1.04

Table 125 (Continued). Sigma Values, by County, for Each TxDOT District.

District 23 (Brownwood)

County Number and Name	Subgrade Support	Sigma Values for...				
		Shallow Rutting	Deep Rutting	Alligator Cracking	Block Cracking	Ride Quality
25 Brown	2 Good	1.61	1.61	1.61	1.61	1.14
42 Coleman	2 Good	1.61	1.61	1.61	1.61	1.14
47 Comanche	2 Good	1.61	1.61	1.61	1.61	1.14
68 Eastland	1 Very Good	1.80	1.80	1.80	1.80	1.19
141 Lampasas	1 Very Good	1.80	1.80	1.80	1.80	1.19
160 McCulloch	1 Very Good	1.80	1.80	1.80	1.80	1.19
167 Mills	1 Very Good	1.80	1.80	1.80	1.80	1.19
206 San Saba	1 Very Good	1.80	1.80	1.80	1.80	1.19
215 Stephens	2 Good	1.61	1.61	1.61	1.61	1.14

District 24 (El Paso)

County Number and Name	Subgrade Support	Sigma Values for...				
		Shallow Rutting	Deep Rutting	Alligator Cracking	Block Cracking	Ride Quality
22 Brewster	2 Good	1.61	1.61	1.61	1.61	1.14
55 Culberson	1 Very Good	1.80	1.80	1.80	1.80	1.19
72 El Paso	4 Poor	1.21	1.21	1.21	1.21	1.04
116 Hudspeth	3 Fair	1.42	1.42	1.42	1.42	1.08
123 Jeff Davis	3 Fair	1.42	1.42	1.42	1.42	1.08
189 Presidio	4 Poor	1.21	1.21	1.21	1.21	1.04

Table 125 (Continued). Sigma Values, by County, for Each TxDOT District.

District 25 (Childress)

County Number and Name	Subgrade Support	Sigma Values for...				
		Shallow Rutting	Deep Rutting	Alligator Cracking	Block Cracking	Ride Quality
23 Briscoe	4 Poor	1.21	1.21	1.21	1.21	1.04
38 Childress	4 Poor	1.21	1.21	1.21	1.21	1.04
44 Collingsworth	4 Poor	1.21	1.21	1.21	1.21	1.04
51 Cottle	4 Poor	1.21	1.21	1.21	1.21	1.04
63 Dickens	4 Poor	1.21	1.21	1.21	1.21	1.04
65 Donley	3 Fair	1.42	1.42	1.42	1.42	1.08
79 Foard	4 Poor	1.21	1.21	1.21	1.21	1.04
97 Hall	4 Poor	1.21	1.21	1.21	1.21	1.04
100 Hardeman	3 Fair	1.42	1.42	1.42	1.42	1.08
135 King	3 Fair	1.42	1.42	1.42	1.42	1.08
138 Knox	4 Poor	1.21	1.21	1.21	1.21	1.04
173 Motley	3 Fair	1.42	1.42	1.42	1.42	1.08
242 Wheeler	4 Poor	1.21	1.21	1.21	1.21	1.04

PERFORMANCE CURVE COEFFICIENTS

We propose that PMIS use the performance curve coefficients shown in Tables 126-135 for pavement distress and ride quality. The "Heavy Rehabilitation" (HRhb) performance curve coefficients will be of special importance to the PMIS Needs Estimate and Optimization programs, as will be explained in Chapters 4 and 5, respectively. The rigid pavement (CRCP and JCP) coefficients are taken from Research Study 1908 ("*Texas Pavement Management System*"), conducted by the Center for Transportation Research — University of Texas at Austin.

Table 126. Performance Coefficients for Detailed Pavement Type 01.

Distress Type	Treatment Type	Alpha	Beta	Rho	Minimum Coefficient
Spalled Cracks	Preventive Maintenance	1.690	22.090	10.270	1.000
	Light Rehabilitation	1.690	22.090	10.270	1.000
	Medium Rehabilitation	1.690	22.090	10.270	1.000
	Heavy Rehabilitation	1.690	22.090	10.270	1.000
Punchouts	Preventive Maintenance	101.517	0.438	538.126	1.000
	Light Rehabilitation	101.517	0.438	538.126	1.000
	Medium Rehabilitation	101.517	0.438	538.126	1.000
	Heavy Rehabilitation	101.517	0.438	538.126	1.000
Asphalt Patches	Preventive Maintenance	96.476	0.375	824.139	1.000
	Light Rehabilitation	96.476	0.375	824.139	1.000
	Medium Rehabilitation	96.476	0.375	824.139	1.000
	Heavy Rehabilitation	96.476	0.375	824.139	1.000
Concrete Patches	Preventive Maintenance	146.000	1.234	40.320	1.000
	Light Rehabilitation	146.000	1.234	40.320	1.000
	Medium Rehabilitation	146.000	1.234	40.320	1.000
	Heavy Rehabilitation	146.000	1.234	40.320	1.000
Average Crack Spacing	Preventive Maintenance	35.370	0.861	0.059	1.000
	Light Rehabilitation	35.370	0.861	0.059	1.000
	Medium Rehabilitation	35.370	0.861	0.059	1.000
	Heavy Rehabilitation	35.370	0.861	0.059	1.000
Ride Score	Preventive Maintenance	1.000	1.000	25.000	1.000
	Light Rehabilitation	1.000	1.000	25.000	1.000
	Medium Rehabilitation	1.000	1.000	25.000	1.000
	Heavy Rehabilitation	1.000	1.000	25.000	1.000

Table 127. Performance Coefficients for Detailed Pavement Type 02.

Distress Type	Treatment Type	Alpha	Beta	Rho	Minimum Coefficient
Failed Joints and Cracks	Preventive Maintenance	37.020	5.210	7.950	1.000
	Light Rehabilitation	37.020	5.210	7.950	1.000
	Medium Rehabilitation	37.020	5.210	7.950	1.000
	Heavy Rehabilitation	37.020	5.210	7.950	1.000
JCP Failures	Preventive Maintenance	47.670	0.360	47.890	1.000
	Light Rehabilitation	47.670	0.360	47.890	1.000
	Medium Rehabilitation	47.670	0.360	47.890	1.000
	Heavy Rehabilitation	47.670	0.360	47.890	1.000
Slabs with Longitudinal Cracks	Preventive Maintenance	34.470	0.520	240.750	1.000
	Light Rehabilitation	34.470	0.520	240.750	1.000
	Medium Rehabilitation	34.470	0.520	240.750	1.000
	Heavy Rehabilitation	34.470	0.520	240.750	1.000
Shattered Slabs	Preventive Maintenance	80.000	1.000	30.000	1.000
	Light Rehabilitation	80.000	1.000	30.000	1.000
	Medium Rehabilitation	80.000	1.000	30.000	1.000
	Heavy Rehabilitation	80.000	1.000	30.000	1.000
Concrete Patching	Preventive Maintenance	478.600	0.370	504.570	1.000
	Light Rehabilitation	478.600	0.370	504.570	1.000
	Medium Rehabilitation	478.600	0.370	504.570	1.000
	Heavy Rehabilitation	478.600	0.370	504.570	1.000
Ride Score	Preventive Maintenance	1.000	1.500	10.000	1.000
	Light Rehabilitation	1.000	1.500	10.000	1.000
	Medium Rehabilitation	1.000	1.500	10.000	1.000
	Heavy Rehabilitation	1.000	1.500	10.000	1.000

Table 128. Performance Coefficients for Detailed Pavement Type 03.

Distress Type	Treatment Type	Alpha	Beta	Rho	Minimum Coefficient
Failed Joints and Cracks	Preventive Maintenance	37.020	5.210	7.950	1.000
	Light Rehabilitation	37.020	5.210	7.950	1.000
	Medium Rehabilitation	37.020	5.210	7.950	1.000
	Heavy Rehabilitation	37.020	5.210	7.950	1.000
JCP Failures	Preventive Maintenance	47.670	0.360	47.890	1.000
	Light Rehabilitation	47.670	0.360	47.890	1.000
	Medium Rehabilitation	47.670	0.360	47.890	1.000
	Heavy Rehabilitation	47.670	0.360	47.890	1.000
Slabs with Longitudinal Cracks	Preventive Maintenance	34.470	0.520	240.750	1.000
	Light Rehabilitation	34.470	0.520	240.750	1.000
	Medium Rehabilitation	34.470	0.520	240.750	1.000
	Heavy Rehabilitation	34.470	0.520	240.750	1.000
Shattered Slabs	Preventive Maintenance	80.000	1.000	30.000	1.000
	Light Rehabilitation	80.000	1.000	30.000	1.000
	Medium Rehabilitation	80.000	1.000	30.000	1.000
	Heavy Rehabilitation	80.000	1.000	30.000	1.000
Concrete Patching	Preventive Maintenance	478.600	0.370	504.570	1.000
	Light Rehabilitation	478.600	0.370	504.570	1.000
	Medium Rehabilitation	478.600	0.370	504.570	1.000
	Heavy Rehabilitation	478.600	0.370	504.570	1.000
Ride Score	Preventive Maintenance	1.000	1.500	10.000	1.000
	Light Rehabilitation	1.000	1.500	10.000	1.000
	Medium Rehabilitation	1.000	1.500	10.000	1.000
	Heavy Rehabilitation	1.000	1.500	10.000	1.000

Table 129. Performance Coefficients for Detailed Pavement Type 04.

Distress Type	Treatment Type	Alpha	Beta	Rho	Minimum Coefficient
Shallow Rutting	Preventive Maintenance	100.000	4.500	5.000	1.000
	Light Rehabilitation	100.000	2.750	7.530	1.000
	Medium Rehabilitation	100.000	2.670	7.520	1.000
	Heavy Rehabilitation	100.000	2.550	5.800	1.000
Deep Rutting	Preventive Maintenance	100.000	2.470	6.780	1.000
	Light Rehabilitation	100.000	1.370	11.910	1.000
	Medium Rehabilitation	100.000	1.330	12.080	1.000
	Heavy Rehabilitation	100.000	1.000	13.450	1.000
Failures	Preventive Maintenance	20.000	2.170	5.500	1.000
	Light Rehabilitation	20.000	2.290	5.850	1.000
	Medium Rehabilitation	20.000	1.340	8.520	1.000
	Heavy Rehabilitation	20.000	1.360	8.970	1.000
Block Cracking	Preventive Maintenance	100.000	2.510	7.080	1.000
	Light Rehabilitation	100.000	1.640	10.110	1.000
	Medium Rehabilitation	100.000	1.450	10.650	1.000
	Heavy Rehabilitation	100.000	1.430	11.430	1.000
Alligator Cracking	Preventive Maintenance	100.000	3.380	6.600	1.000
	Light Rehabilitation	100.000	1.950	9.290	1.000
	Medium Rehabilitation	100.000	1.750	9.670	1.000
	Heavy Rehabilitation	100.000	1.690	8.100	1.000
Longitudinal Cracking	Preventive Maintenance	500.000	1.780	6.000	1.000
	Light Rehabilitation	500.000	2.500	8.000	1.000
	Medium Rehabilitation	500.000	2.500	10.000	1.000
	Heavy Rehabilitation	500.000	0.900	19.060	1.000
Transverse Cracking	Preventive Maintenance	20.000	1.940	5.500	1.000
	Light Rehabilitation	20.000	2.080	7.500	1.000
	Medium Rehabilitation	20.000	2.360	9.000	1.000
	Heavy Rehabilitation	20.000	1.540	12.060	1.000
Ride Score	Preventive Maintenance	1.000	20.000	8.100	1.000
	Light Rehabilitation	1.000	20.000	8.100	1.000
	Medium Rehabilitation	1.000	20.000	8.100	1.000
	Heavy Rehabilitation	1.000	20.000	8.100	1.000

Table 130. Performance Coefficients for Detailed Pavement Type 05.

Distress Type	Treatment Type	Alpha	Beta	Rho	Minimum Coefficient
Shallow Rutting	Preventive Maintenance	100.000	4.500	5.000	1.000
	Light Rehabilitation	100.000	2.750	7.530	1.000
	Medium Rehabilitation	100.000	2.670	7.520	1.000
	Heavy Rehabilitation	100.000	2.550	6.600	1.000
Deep Rutting	Preventive Maintenance	100.000	2.470	6.780	1.000
	Light Rehabilitation	100.000	1.370	11.910	1.000
	Medium Rehabilitation	100.000	1.330	12.080	1.000
	Heavy Rehabilitation	100.000	1.000	13.450	1.000
Failures	Preventive Maintenance	20.000	2.170	5.500	1.000
	Light Rehabilitation	20.000	2.290	5.850	1.000
	Medium Rehabilitation	20.000	1.340	8.520	1.000
	Heavy Rehabilitation	20.000	1.360	8.970	1.000
Block Cracking	Preventive Maintenance	100.000	2.510	7.080	1.000
	Light Rehabilitation	100.000	1.640	10.110	1.000
	Medium Rehabilitation	100.000	1.450	10.650	1.000
	Heavy Rehabilitation	100.000	1.430	11.430	1.000
Alligator Cracking	Preventive Maintenance	100.000	3.380	6.600	1.000
	Light Rehabilitation	100.000	1.950	9.290	1.000
	Medium Rehabilitation	100.000	1.750	9.670	1.000
	Heavy Rehabilitation	100.000	1.690	8.400	1.000
Longitudinal Cracking	Preventive Maintenance	500.000	1.780	6.000	1.000
	Light Rehabilitation	500.000	2.500	8.000	1.000
	Medium Rehabilitation	500.000	2.500	10.000	1.000
	Heavy Rehabilitation	500.000	0.900	19.060	1.000
Transverse Cracking	Preventive Maintenance	20.000	1.940	5.500	1.000
	Light Rehabilitation	20.000	2.080	7.500	1.000
	Medium Rehabilitation	20.000	2.360	9.000	1.000
	Heavy Rehabilitation	20.000	1.540	12.060	1.000
Ride Score	Preventive Maintenance	1.000	20.000	8.500	1.000
	Light Rehabilitation	1.000	20.000	8.500	1.000
	Medium Rehabilitation	1.000	20.000	8.500	1.000
	Heavy Rehabilitation	1.000	20.000	8.500	1.000

Table 131. Performance Coefficients for Detailed Pavement Type 06.

Distress Type	Treatment Type	Alpha	Beta	Rho	Minimum Coefficient
Shallow Rutting	Preventive Maintenance	100.000	4.500	5.000	1.000
	Light Rehabilitation	100.000	2.750	7.530	1.000
	Medium Rehabilitation	100.000	2.670	7.520	1.000
	Heavy Rehabilitation	100.000	2.550	8.900	1.000
Deep Rutting	Preventive Maintenance	100.000	2.470	6.780	1.000
	Light Rehabilitation	100.000	1.370	11.910	1.000
	Medium Rehabilitation	100.000	1.330	12.080	1.000
	Heavy Rehabilitation	100.000	1.000	13.450	1.000
Failures	Preventive Maintenance	20.000	2.170	5.500	1.000
	Light Rehabilitation	20.000	2.290	5.850	1.000
	Medium Rehabilitation	20.000	1.340	8.520	1.000
	Heavy Rehabilitation	20.000	1.360	8.970	1.000
Block Cracking	Preventive Maintenance	100.000	2.510	7.080	1.000
	Light Rehabilitation	100.000	1.640	10.110	1.000
	Medium Rehabilitation	100.000	1.450	10.650	1.000
	Heavy Rehabilitation	100.000	1.430	11.430	1.000
Alligator Cracking	Preventive Maintenance	100.000	3.380	6.600	1.000
	Light Rehabilitation	100.000	1.950	9.290	1.000
	Medium Rehabilitation	100.000	1.750	9.670	1.000
	Heavy Rehabilitation	100.000	1.690	12.100	1.000
Longitudinal Cracking	Preventive Maintenance	500.000	1.780	6.000	1.000
	Light Rehabilitation	500.000	2.500	8.000	1.000
	Medium Rehabilitation	500.000	2.500	10.000	1.000
	Heavy Rehabilitation	500.000	0.900	19.060	1.000
Transverse Cracking	Preventive Maintenance	20.000	1.940	5.500	1.000
	Light Rehabilitation	20.000	2.080	7.500	1.000
	Medium Rehabilitation	20.000	2.360	9.000	1.000
	Heavy Rehabilitation	20.000	1.540	12.060	1.000
Ride Score	Preventive Maintenance	1.000	20.000	10.400	1.000
	Light Rehabilitation	1.000	20.000	10.400	1.000
	Medium Rehabilitation	1.000	20.000	10.400	1.000
	Heavy Rehabilitation	1.000	20.000	10.400	1.000

Table 132. Performance Coefficients for Detailed Pavement Type 07.

Distress Type	Treatment Type	Alpha	Beta	Rho	Minimum Coefficient
Shallow Rutting	Preventive Maintenance	100.000	4.500	5.000	1.000
	Light Rehabilitation	100.000	2.750	7.530	1.000
	Medium Rehabilitation	100.000	2.670	7.520	1.000
	Heavy Rehabilitation	100.000	2.550	7.800	1.000
Deep Rutting	Preventive Maintenance	100.000	2.470	6.780	1.000
	Light Rehabilitation	100.000	1.370	11.910	1.000
	Medium Rehabilitation	100.000	1.330	12.080	1.000
	Heavy Rehabilitation	100.000	1.000	13.450	1.000
Failures	Preventive Maintenance	20.000	2.170	5.500	1.000
	Light Rehabilitation	20.000	2.290	5.850	1.000
	Medium Rehabilitation	20.000	1.340	8.520	1.000
	Heavy Rehabilitation	20.000	1.360	8.970	1.000
Block Cracking	Preventive Maintenance	100.000	2.510	7.080	1.000
	Light Rehabilitation	100.000	1.640	10.110	1.000
	Medium Rehabilitation	100.000	1.450	10.650	1.000
	Heavy Rehabilitation	100.000	1.430	11.430	1.000
Alligator Cracking	Preventive Maintenance	100.000	3.380	6.600	1.000
	Light Rehabilitation	100.000	1.950	9.290	1.000
	Medium Rehabilitation	100.000	1.750	9.670	1.000
	Heavy Rehabilitation	100.000	1.690	11.900	1.000
Longitudinal Cracking	Preventive Maintenance	500.000	1.780	6.000	1.000
	Light Rehabilitation	500.000	2.500	8.000	1.000
	Medium Rehabilitation	500.000	2.500	10.000	1.000
	Heavy Rehabilitation	500.000	0.900	19.060	1.000
Transverse Cracking	Preventive Maintenance	20.000	1.940	5.500	1.000
	Light Rehabilitation	20.000	2.080	7.500	1.000
	Medium Rehabilitation	20.000	2.360	9.000	1.000
	Heavy Rehabilitation	20.000	1.540	12.060	1.000
Ride Score	Preventive Maintenance	1.000	20.000	9.900	1.000
	Light Rehabilitation	1.000	20.000	9.900	1.000
	Medium Rehabilitation	1.000	20.000	9.900	1.000
	Heavy Rehabilitation	1.000	20.000	9.900	1.000

Table 133. Performance Coefficients for Detailed Pavement Type 08.

Distress Type	Treatment Type	Alpha	Beta	Rho	Minimum Coefficient
Shallow Rutting	Preventive Maintenance	100.000	4.500	5.000	1.000
	Light Rehabilitation	100.000	2.750	7.530	1.000
	Medium Rehabilitation	100.000	2.670	7.520	1.000
	Heavy Rehabilitation	100.000	2.550	7.800	1.000
Deep Rutting	Preventive Maintenance	100.000	2.470	6.780	1.000
	Light Rehabilitation	100.000	1.370	11.910	1.000
	Medium Rehabilitation	100.000	1.330	12.080	1.000
	Heavy Rehabilitation	100.000	1.000	13.450	1.000
Failures	Preventive Maintenance	20.000	2.170	5.500	1.000
	Light Rehabilitation	20.000	2.290	5.850	1.000
	Medium Rehabilitation	20.000	1.340	8.520	1.000
	Heavy Rehabilitation	20.000	1.360	8.970	1.000
Block Cracking	Preventive Maintenance	100.000	2.510	7.080	1.000
	Light Rehabilitation	100.000	1.640	10.110	1.000
	Medium Rehabilitation	100.000	1.450	10.650	1.000
	Heavy Rehabilitation	100.000	1.430	11.430	1.000
Alligator Cracking	Preventive Maintenance	100.000	3.380	6.600	1.000
	Light Rehabilitation	100.000	1.950	9.290	1.000
	Medium Rehabilitation	100.000	1.750	9.670	1.000
	Heavy Rehabilitation	100.000	1.690	11.900	1.000
Longitudinal Cracking	Preventive Maintenance	500.000	8.100	8.390	1.000
	Light Rehabilitation	500.000	1.120	6.160	1.000
	Medium Rehabilitation	500.000	1.780	6.720	1.000
	Heavy Rehabilitation	500.000	0.900	19.060	1.000
Transverse Cracking	Preventive Maintenance	20.000	1.940	5.570	1.000
	Light Rehabilitation	20.000	2.080	5.410	1.000
	Medium Rehabilitation	20.000	2.360	6.600	1.000
	Heavy Rehabilitation	20.000	1.540	12.060	1.000
Ride Score	Preventive Maintenance	1.000	20.000	9.900	1.000
	Light Rehabilitation	1.000	20.000	9.900	1.000
	Medium Rehabilitation	1.000	20.000	9.900	1.000
	Heavy Rehabilitation	1.000	20.000	9.900	1.000

Table 134. Performance Coefficients for Detailed Pavement Type 09.

Distress Type	Treatment Type	Alpha	Beta	Rho	Minimum Coefficient
Shallow Rutting	Preventive Maintenance	100.000	4.500	5.000	1.000
	Light Rehabilitation	100.000	2.750	7.530	1.000
	Medium Rehabilitation	100.000	2.670	7.520	1.000
	Heavy Rehabilitation	100.000	2.550	7.800	1.000
Deep Rutting	Preventive Maintenance	100.000	2.470	6.780	1.000
	Light Rehabilitation	100.000	1.370	11.910	1.000
	Medium Rehabilitation	100.000	1.330	12.080	1.000
	Heavy Rehabilitation	100.000	1.000	13.450	1.000
Failures	Preventive Maintenance	20.000	2.170	5.500	1.000
	Light Rehabilitation	20.000	2.290	5.850	1.000
	Medium Rehabilitation	20.000	1.340	8.520	1.000
	Heavy Rehabilitation	20.000	1.360	8.970	1.000
					1.000
Block Cracking	Preventive Maintenance	100.000	2.510	7.080	1.000
	Light Rehabilitation	100.000	1.640	10.110	1.000
	Medium Rehabilitation	100.000	1.450	10.650	1.000
	Heavy Rehabilitation	100.000	1.430	11.430	1.000
Alligator Cracking	Preventive Maintenance	100.000	3.380	6.600	1.000
	Light Rehabilitation	100.000	1.950	9.290	1.000
	Medium Rehabilitation	100.000	1.750	9.670	1.000
	Heavy Rehabilitation	100.000	1.690	11.900	1.000
Longitudinal Cracking	Preventive Maintenance	500.000	1.780	6.000	1.000
	Light Rehabilitation	500.000	2.500	8.000	1.000
	Medium Rehabilitation	500.000	2.500	10.000	1.000
	Heavy Rehabilitation	500.000	0.900	19.060	1.000
Transverse Cracking	Preventive Maintenance	20.000	1.940	5.500	1.000
	Light Rehabilitation	20.000	2.080	7.500	1.000
	Medium Rehabilitation	20.000	2.360	9.000	1.000
	Heavy Rehabilitation	20.000	1.540	12.060	1.000
Ride Score	Preventive Maintenance	1.000	20.000	9.900	1.000
	Light Rehabilitation	1.000	20.000	9.900	1.000
	Medium Rehabilitation	1.000	20.000	9.900	1.000
	Heavy Rehabilitation	1.000	20.000	9.900	1.000

Table 135. Performance Coefficients for Detailed Pavement Type 10.

Distress Type	Treatment Type	Alpha	Beta	Rho	Minimum Coefficient
Shallow Rutting	Preventive Maintenance	100.000	4.500	5.000	1.000
	Light Rehabilitation	100.000	2.750	7.530	1.000
	Medium Rehabilitation	100.000	2.670	7.520	1.000
	Heavy Rehabilitation	100.000	2.550	7.100	1.000
Deep Rutting	Preventive Maintenance	100.000	2.470	6.780	1.000
	Light Rehabilitation	100.000	1.370	11.910	1.000
	Medium Rehabilitation	100.000	1.330	12.080	1.000
	Heavy Rehabilitation	100.000	1.000	13.450	1.000
Failures	Preventive Maintenance	20.000	2.170	5.500	1.000
	Light Rehabilitation	20.000	2.290	5.850	1.000
	Medium Rehabilitation	20.000	1.340	8.520	1.000
	Heavy Rehabilitation	20.000	1.360	8.970	1.000
Block Cracking	Preventive Maintenance	100.000	2.510	7.080	1.000
	Light Rehabilitation	100.000	1.640	10.110	1.000
	Medium Rehabilitation	100.000	1.450	10.650	1.000
	Heavy Rehabilitation	100.000	1.430	11.430	1.000
Alligator Cracking	Preventive Maintenance	100.000	3.380	6.600	1.000
	Light Rehabilitation	100.000	1.950	9.290	1.000
	Medium Rehabilitation	100.000	1.750	9.670	1.000
	Heavy Rehabilitation	100.000	1.690	11.300	1.000
Longitudinal Cracking	Preventive Maintenance	500.000	1.780	6.000	1.000
	Light Rehabilitation	500.000	2.500	8.000	1.000
	Medium Rehabilitation	500.000	2.500	10.000	1.000
	Heavy Rehabilitation	500.000	0.900	19.060	1.000
Transverse Cracking	Preventive Maintenance	20.000	1.940	5.500	1.000
	Light Rehabilitation	20.000	2.080	7.500	1.000
	Medium Rehabilitation	20.000	2.360	9.000	1.000
	Heavy Rehabilitation	20.000	1.540	12.060	1.000
Ride Score	Preventive Maintenance	1.000	20.000	8.100	1.000
	Light Rehabilitation	1.000	20.000	8.100	1.000
	Medium Rehabilitation	1.000	20.000	8.100	1.000
	Heavy Rehabilitation	1.000	20.000	8.100	1.000

TABLES FOR DISTRESS AND RIDE SCORE OVER TIME

For reference purposes, we have included Tables 136-209 which list distress and Ride Score values over time, based on the above-described performance curve coefficients. Tables 136-209 only cover "Very Poor" subgrade support (Sigma = 1.00). Similar Tables for the other four subgrade support values are available from TxDOT. The traffic factor (Chi) has also been set equal to 1.00 in these Tables.

ESTIMATING "THEORETICAL AGE"

The pavement performance curve equation gives the level of distress or ride quality at a particular age. The equation can also be "back-calculated" to give the age corresponding to a given level of distress or ride quality, as shown below:

$$AGE_i = \frac{\chi \epsilon \sigma \rho}{\left[\ln\left(\frac{\alpha}{L_i}\right)\right]^{\left(\frac{1}{\beta}\right)}}$$

where:

AGE	=	pavement section age, in years;
i	=	a PMIS distress type (e.g., Deep Rutting or Punchouts) or Ride Score;
χ	=	chi, a traffic factor that controls the effect of 18-k ESAL on performance;
ϵ	=	epsilon, a climate factor that controls the effect of rainfall and freeze-thaw cycles on performance;
σ	=	sigma, a subgrade support factor that controls the effect of subgrade strength on performance;
ρ	=	rho, a prolongation factor that controls "how long" the curve will "last" above a certain value;
α	=	alpha, a horizontal asymptote factor that controls the maximum amount of condition that can be lost;

Table 136. Projected Condition for Spalled Cracks on Detailed Pavement Type: 01.

How Projected: Percent of transverse cracks spalled

Subgrade Factor: 1.00 __ Very Poor

Time, in years	Preventive Maintenance	Light Rehabilitation	Medium Rehabilitation	Heavy Rehabilitation
1	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00
3	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00
5	0.00	0.00	0.00	0.00
6	0.00	0.00	0.00	0.00
7	0.00	0.00	0.00	0.00
8	0.00	0.00	0.00	0.00
9	0.00	0.00	0.00	0.00
10	0.28	0.28	0.28	0.28
11	1.36	1.36	1.36	1.36
12	1.64	1.64	1.64	1.64
13	1.68	1.68	1.68	1.68
14	1.69	1.69	1.69	1.69
15	1.69	1.69	1.69	1.69
16	1.69	1.69	1.69	1.69
17	1.69	1.69	1.69	1.69
18	1.69	1.69	1.69	1.69
19	1.69	1.69	1.69	1.69
20	1.69	1.69	1.69	1.69
21	1.69	1.69	1.69	1.69
22	1.69	1.69	1.69	1.69
23	1.69	1.69	1.69	1.69
24	1.69	1.69	1.69	1.69
25	1.69	1.69	1.69	1.69
26	1.69	1.69	1.69	1.69
27	1.69	1.69	1.69	1.69
28	1.69	1.69	1.69	1.69
29	1.69	1.69	1.69	1.69
30	1.69	1.69	1.69	1.69
31	1.69	1.69	1.69	1.69
32	1.69	1.69	1.69	1.69
33	1.69	1.69	1.69	1.69
34	1.69	1.69	1.69	1.69
35	1.69	1.69	1.69	1.69
36	1.69	1.69	1.69	1.69
37	1.69	1.69	1.69	1.69
38	1.69	1.69	1.69	1.69
39	1.69	1.69	1.69	1.69
40	1.69	1.69	1.69	1.69

Table 137. Projected Condition for Punchouts on Detailed Pavement Type: 01.

How Projected: Number per mile

Subgrade Factor: 1.00 __ Very Poor

Time, in years	Preventive Maintenance	Light Rehabilitation	Medium Rehabilitation	Heavy Rehabilitation
1	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00
3	0.01	0.01	0.01	0.01
4	0.02	0.02	0.02	0.02
5	0.04	0.04	0.04	0.04
6	0.08	0.08	0.08	0.08
7	0.13	0.13	0.13	0.13
8	0.18	0.18	0.18	0.18
9	0.25	0.25	0.25	0.25
10	0.33	0.33	0.33	0.33
11	0.42	0.42	0.42	0.42
12	0.51	0.51	0.51	0.51
13	0.61	0.61	0.61	0.61
14	0.72	0.72	0.72	0.72
15	0.84	0.84	0.84	0.84
16	0.96	0.96	0.96	0.96
17	1.08	1.08	1.08	1.08
18	1.21	1.21	1.21	1.21
19	1.34	1.34	1.34	1.34
20	1.48	1.48	1.48	1.48
21	1.62	1.62	1.62	1.62
22	1.76	1.76	1.76	1.76
23	1.90	1.90	1.90	1.90
24	2.05	2.05	2.05	2.05
25	2.19	2.19	2.19	2.19
26	2.34	2.34	2.34	2.34
27	2.49	2.49	2.49	2.49
28	2.64	2.64	2.64	2.64
29	2.79	2.79	2.79	2.79
30	2.94	2.94	2.94	2.94
31	3.09	3.09	3.09	3.09
32	3.25	3.25	3.25	3.25
33	3.40	3.40	3.40	3.40
34	3.55	3.55	3.55	3.55
35	3.71	3.71	3.71	3.71
36	3.86	3.86	3.86	3.86
37	4.01	4.01	4.01	4.01
38	4.17	4.17	4.17	4.17
39	4.32	4.32	4.32	4.32
40	4.47	4.47	4.47	4.47

Table 138. Projected Condition for Asphalt Patches on Detailed Pavement Type: 01.

How Projected: Number per mile

Subgrade Factor: 1.00 __ Very Poor

Time, in years	Preventive Maintenance	Light Rehabilitation	Medium Rehabilitation	Heavy Rehabilitation
1	0.00	0.00	0.00	0.00
2	0.01	0.01	0.01	0.01
3	0.03	0.03	0.03	0.03
4	0.06	0.06	0.06	0.06
5	0.11	0.11	0.11	0.11
6	0.17	0.17	0.17	0.17
7	0.24	0.24	0.24	0.24
8	0.33	0.33	0.33	0.33
9	0.42	0.42	0.42	0.42
10	0.52	0.52	0.52	0.52
11	0.62	0.62	0.62	0.62
12	0.73	0.73	0.73	0.73
13	0.84	0.84	0.84	0.84
14	0.96	0.96	0.96	0.96
15	1.08	1.08	1.08	1.08
16	1.20	1.20	1.20	1.20
17	1.33	1.33	1.33	1.33
18	1.45	1.45	1.45	1.45
19	1.58	1.58	1.58	1.58
20	1.71	1.71	1.71	1.71
21	1.84	1.84	1.84	1.84
22	1.97	1.97	1.97	1.97
23	2.10	2.10	2.10	2.10
24	2.23	2.23	2.23	2.23
25	2.36	2.36	2.36	2.36
26	2.50	2.50	2.50	2.50
27	2.63	2.63	2.63	2.63
28	2.76	2.76	2.76	2.76
29	2.89	2.89	2.89	2.89
30	3.02	3.02	3.02	3.02
31	3.15	3.15	3.15	3.15
32	3.28	3.28	3.28	3.28
33	3.41	3.41	3.41	3.41
34	3.54	3.54	3.54	3.54
35	3.67	3.67	3.67	3.67
36	3.80	3.80	3.80	3.80
37	3.92	3.92	3.92	3.92
38	4.05	4.05	4.05	4.05
39	4.18	4.18	4.18	4.18
40	4.30	4.30	4.30	4.30

Table 139. Projected Condition for Concrete Patches on Detailed Pavement Type: 01.

How Projected: Number per mile

Subgrade Factor: 1.00 __ Very Poor

Time, in years	Preventive Maintenance	Light Rehabilitation	Medium Rehabilitation	Heavy Rehabilitation
1	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00
3	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00
5	0.00	0.00	0.00	0.00
6	0.00	0.00	0.00	0.00
7	0.02	0.02	0.02	0.02
8	0.09	0.09	0.09	0.09
9	0.25	0.25	0.25	0.25
10	0.55	0.55	0.55	0.55
11	1.02	1.02	1.02	1.02
12	1.69	1.69	1.69	1.69
13	2.56	2.56	2.56	2.56
14	3.65	3.65	3.65	3.65
15	4.93	4.93	4.93	4.93
16	6.39	6.39	6.39	6.39
17	8.01	8.01	8.01	8.01
18	9.76	9.76	9.76	9.76
19	11.62	11.62	11.62	11.62
20	13.57	13.57	13.57	13.57
21	15.60	15.60	15.60	15.60
22	17.67	17.67	17.67	17.67
23	19.78	19.78	19.78	19.78
24	21.91	21.91	21.91	21.91
25	24.05	24.05	24.05	24.05
26	26.18	26.18	26.18	26.18
27	28.31	28.31	28.31	28.31
28	30.43	30.43	30.43	30.43
29	32.52	32.52	32.52	32.52
30	34.58	34.58	34.58	34.58
31	36.61	36.61	36.61	36.61
32	38.61	38.61	38.61	38.61
33	40.57	40.57	40.57	40.57
34	42.50	42.50	42.50	42.50
35	44.38	44.38	44.38	44.38
36	46.22	46.22	46.22	46.22
37	48.03	48.03	48.03	48.03
38	49.79	49.79	49.79	49.79
39	51.50	51.50	51.50	51.50
40	53.18	53.18	53.18	53.18

Table 140. Projected Condition for Average Crack Spacing on Detailed Pavement Type: 01.

How Projected: Number per 100' station

Subgrade Factor: 1.00 __ Very Poor

Time, in years	Preventive Maintenance	Light Rehabilitation	Medium Rehabilitation	Heavy Rehabilitation
1	32.41	32.41	32.41	32.41
2	33.71	33.71	33.71	33.71
3	34.19	34.19	34.19	34.19
4	34.44	34.44	34.44	34.44
5	34.60	34.60	34.60	34.60
6	34.71	34.71	34.71	34.71
7	34.80	34.80	34.80	34.80
8	34.86	34.86	34.86	34.86
9	34.91	34.91	34.91	34.91
10	34.95	34.95	34.95	34.95
11	34.98	34.98	34.98	34.98
12	35.01	35.01	35.01	35.01
13	35.03	35.03	35.03	35.03
14	35.05	35.05	35.05	35.05
15	35.07	35.07	35.07	35.07
16	35.09	35.09	35.09	35.09
17	35.10	35.10	35.10	35.10
18	35.11	35.11	35.11	35.11
19	35.13	35.13	35.13	35.13
20	35.14	35.14	35.14	35.14
21	35.15	35.15	35.15	35.15
22	35.15	35.15	35.15	35.15
23	35.16	35.16	35.16	35.16
24	35.17	35.17	35.17	35.17
25	35.18	35.18	35.18	35.18
26	35.18	35.18	35.18	35.18
27	35.19	35.19	35.19	35.19
28	35.19	35.19	35.19	35.19
29	35.20	35.20	35.20	35.20
30	35.20	35.20	35.20	35.20
31	35.21	35.21	35.21	35.21
32	35.21	35.21	35.21	35.21
33	35.22	35.22	35.22	35.22
34	35.22	35.22	35.22	35.22
35	35.23	35.23	35.23	35.23
36	35.23	35.23	35.23	35.23
37	35.23	35.23	35.23	35.23
38	35.24	35.24	35.24	35.24
39	35.24	35.24	35.24	35.24
40	35.24	35.24	35.24	35.24

Table 141. Projected Condition for Ride Score on Detailed Pavement Type: 01.

How Projected: Percent of Ride Quality Lost (0-1)

Subgrade Factor: 1.00 __ Very Poor

Time, in years	Preventive Maintenance	Light Rehabilitation	Medium Rehabilitation	Heavy Rehabilitation
1	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00
3	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00
5	0.01	0.01	0.01	0.01
6	0.02	0.02	0.02	0.02
7	0.03	0.03	0.03	0.03
8	0.04	0.04	0.04	0.04
9	0.06	0.06	0.06	0.06
10	0.08	0.08	0.08	0.08
11	0.10	0.10	0.10	0.10
12	0.12	0.12	0.12	0.12
13	0.15	0.15	0.15	0.15
14	0.17	0.17	0.17	0.17
15	0.19	0.19	0.19	0.19
16	0.21	0.21	0.21	0.21
17	0.23	0.23	0.23	0.23
18	0.25	0.25	0.25	0.25
19	0.27	0.27	0.27	0.27
20	0.29	0.29	0.29	0.29
21	0.30	0.30	0.30	0.30
22	0.32	0.32	0.32	0.32
23	0.34	0.34	0.34	0.34
24	0.35	0.35	0.35	0.35
25	0.37	0.37	0.37	0.37
26	0.38	0.38	0.38	0.38
27	0.40	0.40	0.40	0.40
28	0.41	0.41	0.41	0.41
29	0.42	0.42	0.42	0.42
30	0.43	0.43	0.43	0.43
31	0.45	0.45	0.45	0.45
32	0.46	0.46	0.46	0.46
33	0.47	0.47	0.47	0.47
34	0.48	0.48	0.48	0.48
35	0.49	0.49	0.49	0.49
36	0.50	0.50	0.50	0.50
37	0.51	0.51	0.51	0.51
38	0.52	0.52	0.52	0.52
39	0.53	0.53	0.53	0.53
40	0.54	0.54	0.54	0.54

Table 142. Projected Condition for Failed Joints and Cracks on Detailed Pavement Type: 02.

How Projected: Percent of transverse joints and cracks failed

Subgrade Factor: 1.00 __ Very Poor

Time, in years	Preventive Maintenance	Light Rehabilitation	Medium Rehabilitation	Heavy Rehabilitation
1	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00
3	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00
5	0.00	0.00	0.00	0.00
6	0.49	0.49	0.49	0.49
7	5.32	5.32	5.32	5.32
8	14.06	14.06	14.06	14.06
9	21.92	21.92	21.92	21.92
10	27.35	27.35	27.35	27.35
11	30.79	30.79	30.79	30.79
12	32.93	32.93	32.93	32.93
13	34.27	34.27	34.27	34.27
14	35.13	35.13	35.13	35.13
15	35.69	35.69	35.69	35.69
16	36.06	36.06	36.06	36.06
17	36.32	36.32	36.32	36.32
18	36.50	36.50	36.50	36.50
19	36.63	36.63	36.63	36.63
20	36.72	36.72	36.72	36.72
21	36.79	36.79	36.79	36.79
22	36.84	36.84	36.84	36.84
23	36.87	36.87	36.87	36.87
24	36.90	36.90	36.90	36.90
25	36.93	36.93	36.93	36.93
26	36.94	36.94	36.94	36.94
27	36.96	36.96	36.96	36.96
28	36.97	36.97	36.97	36.97
29	36.98	36.98	36.98	36.98
30	36.98	36.98	36.98	36.98
31	36.99	36.99	36.99	36.99
32	36.99	36.99	36.99	36.99
33	37.00	37.00	37.00	37.00
34	37.00	37.00	37.00	37.00
35	37.00	37.00	37.00	37.00
36	37.01	37.01	37.01	37.01
37	37.01	37.01	37.01	37.01
38	37.01	37.01	37.01	37.01
39	37.01	37.01	37.01	37.01
40	37.01	37.01	37.01	37.01

Table 143. Projected Condition for JCP Failures on Detailed Pavement Type: 02.

How Projected: Number per mile

Subgrade Factor: 1.00 __ Very Poor

Time, in years	Preventive Maintenance	Light Rehabilitation	Medium Rehabilitation	Heavy Rehabilitation
1	0.85	0.85	0.85	0.85
2	2.07	2.07	2.07	2.07
3	3.17	3.17	3.17	3.17
4	4.14	4.14	4.14	4.14
5	5.00	5.00	5.00	5.00
6	5.77	5.77	5.77	5.77
7	6.46	6.46	6.46	6.46
8	7.10	7.10	7.10	7.10
9	7.68	7.68	7.68	7.68
10	8.22	8.22	8.22	8.22
11	8.72	8.72	8.72	8.72
12	9.19	9.19	9.19	9.19
13	9.63	9.63	9.63	9.63
14	10.05	10.05	10.05	10.05
15	10.44	10.44	10.44	10.44
16	10.81	10.81	10.81	10.81
17	11.16	11.16	11.16	11.16
18	11.50	11.50	11.50	11.50
19	11.82	11.82	11.82	11.82
20	12.12	12.12	12.12	12.12
21	12.41	12.41	12.41	12.41
22	12.69	12.69	12.69	12.69
23	12.96	12.96	12.96	12.96
24	13.22	13.22	13.22	13.22
25	13.47	13.47	13.47	13.47
26	13.71	13.71	13.71	13.71
27	13.95	13.95	13.95	13.95
28	14.17	14.17	14.17	14.17
29	14.39	14.39	14.39	14.39
30	14.60	14.60	14.60	14.60
31	14.80	14.80	14.80	14.80
32	15.00	15.00	15.00	15.00
33	15.19	15.19	15.19	15.19
34	15.38	15.38	15.38	15.38
35	15.56	15.56	15.56	15.56
36	15.74	15.74	15.74	15.74
37	15.91	15.91	15.91	15.91
38	16.08	16.08	16.08	16.08
39	16.24	16.24	16.24	16.24
40	16.40	16.40	16.40	16.40

Table 144. Projected Condition for Shattered Slabs on Detailed Pavement Type: 02.

How Projected: Percent of slabs shattered

Subgrade Factor: 1.00 __ Very Poor

Time, in years	Preventive Maintenance	Light Rehabilitation	Medium Rehabilitation	Heavy Rehabilitation
1	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00
3	0.00	0.00	0.00	0.00
4	0.04	0.04	0.04	0.04
5	0.20	0.20	0.20	0.20
6	0.54	0.54	0.54	0.54
7	1.10	1.10	1.10	1.10
8	1.88	1.88	1.88	1.88
9	2.85	2.85	2.85	2.85
10	3.98	3.98	3.98	3.98
11	5.23	5.23	5.23	5.23
12	6.57	6.57	6.57	6.57
13	7.96	7.96	7.96	7.96
14	9.39	9.39	9.39	9.39
15	10.83	10.83	10.83	10.83
16	12.27	12.27	12.27	12.27
17	13.70	13.70	13.70	13.70
18	15.11	15.11	15.11	15.11
19	16.50	16.50	16.50	16.50
20	17.85	17.85	17.85	17.85
21	19.17	19.17	19.17	19.17
22	20.46	20.46	20.46	20.46
23	21.71	21.71	21.71	21.71
24	22.92	22.92	22.92	22.92
25	24.10	24.10	24.10	24.10
26	25.23	25.23	25.23	25.23
27	26.34	26.34	26.34	26.34
28	27.40	27.40	27.40	27.40
29	28.43	28.43	28.43	28.43
30	29.43	29.43	29.43	29.43
31	30.40	30.40	30.40	30.40
32	31.33	31.33	31.33	31.33
33	32.23	32.23	32.23	32.23
34	33.10	33.10	33.10	33.10
35	33.95	33.95	33.95	33.95
36	34.77	34.77	34.77	34.77
37	35.56	35.56	35.56	35.56
38	36.33	36.33	36.33	36.33
39	37.07	37.07	37.07	37.07
40	37.79	37.79	37.79	37.79

Table 145. Projected Condition for Slabs with Longitudinal Cracks on Detailed Pavement Type: 02.

How Projected: Percent of slab with longitudinal cracks

Subgrade Factor: 1.00 __ Very Poor

Time, in years	Preventive Maintenance	Light Rehabilitation	Medium Rehabilitation	Heavy Rehabilitation
1	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00
3	0.00	0.00	0.00	0.00
4	0.01	0.01	0.01	0.01
5	0.02	0.02	0.02	0.02
6	0.04	0.04	0.04	0.04
7	0.06	0.06	0.06	0.06
8	0.10	0.10	0.10	0.10
9	0.14	0.14	0.14	0.14
10	0.18	0.18	0.18	0.18
11	0.24	0.24	0.24	0.24
12	0.30	0.30	0.30	0.30
13	0.36	0.36	0.36	0.36
14	0.43	0.43	0.43	0.43
15	0.50	0.50	0.50	0.50
16	0.57	0.57	0.57	0.57
17	0.65	0.65	0.65	0.65
18	0.73	0.73	0.73	0.73
19	0.81	0.81	0.81	0.81
20	0.90	0.90	0.90	0.90
21	0.99	0.99	0.99	0.99
22	1.07	1.07	1.07	1.07
23	1.16	1.16	1.16	1.16
24	1.25	1.25	1.25	1.25
25	1.34	1.34	1.34	1.34
26	1.43	1.43	1.43	1.43
27	1.52	1.52	1.52	1.52
28	1.61	1.61	1.61	1.61
29	1.71	1.71	1.71	1.71
30	1.80	1.80	1.80	1.80
31	1.89	1.89	1.89	1.89
32	1.98	1.98	1.98	1.98
33	2.07	2.07	2.07	2.07
34	2.17	2.17	2.17	2.17
35	2.26	2.26	2.26	2.26
36	2.35	2.35	2.35	2.35
37	2.44	2.44	2.44	2.44
38	2.53	2.53	2.53	2.53
39	2.62	2.62	2.62	2.62
40	2.71	2.71	2.71	2.71

Table 146. Projected Condition for Concrete Patching on Detailed Pavement Type: 02.

How Projected: Number per mile

Subgrade Factor: 1.00 __ Very Poor

Time, in years	Preventive Maintenance	Light Rehabilitation	Medium Rehabilitation	Heavy Rehabilitation
1	0.02	0.02	0.02	0.02
2	0.21	0.21	0.21	0.21
3	0.61	0.61	0.61	0.61
4	1.20	1.20	1.20	1.20
5	1.93	1.93	1.93	1.93
6	2.76	2.76	2.76	2.76
7	3.68	3.68	3.68	3.68
8	4.65	4.65	4.65	4.65
9	5.67	5.67	5.67	5.67
10	6.71	6.71	6.71	6.71
11	7.78	7.78	7.78	7.78
12	8.87	8.87	8.87	8.87
13	9.96	9.96	9.96	9.96
14	11.06	11.06	11.06	11.06
15	12.17	12.17	12.17	12.17
16	13.27	13.27	13.27	13.27
17	14.37	14.37	14.37	14.37
18	15.46	15.46	15.46	15.46
19	16.55	16.55	16.55	16.55
20	17.63	17.63	17.63	17.63
21	18.70	18.70	18.70	18.70
22	19.76	19.76	19.76	19.76
23	20.82	20.82	20.82	20.82
24	21.86	21.86	21.86	21.86
25	22.90	22.90	22.90	22.90
26	23.92	23.92	23.92	23.92
27	24.94	24.94	24.94	24.94
28	25.94	25.94	25.94	25.94
29	26.94	26.94	26.94	26.94
30	27.92	27.92	27.92	27.92
31	28.89	28.89	28.89	28.89
32	29.86	29.86	29.86	29.86
33	30.81	30.81	30.81	30.81
34	31.75	31.75	31.75	31.75
35	32.68	32.68	32.68	32.68
36	33.61	33.61	33.61	33.61
37	34.52	34.52	34.52	34.52
38	35.42	35.42	35.42	35.42
39	36.32	36.32	36.32	36.32
40	37.20	37.20	37.20	37.20

Table 147. Projected Condition for Ride Score on Detailed Pavement Type: 02.

How Projected: Percent of Ride Quality Lost (0-1)

Subgrade Factor: 1.00 __ Very Poor

Time, in years	Preventive Maintenance	Light Rehabilitation	Medium Rehabilitation	Heavy Rehabilitation
1	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00
3	0.00	0.00	0.00	0.00
4	0.02	0.02	0.02	0.02
5	0.06	0.06	0.06	0.06
6	0.12	0.12	0.12	0.12
7	0.18	0.18	0.18	0.18
8	0.25	0.25	0.25	0.25
9	0.31	0.31	0.31	0.31
10	0.37	0.37	0.37	0.37
11	0.42	0.42	0.42	0.42
12	0.47	0.47	0.47	0.47
13	0.51	0.51	0.51	0.51
14	0.55	0.55	0.55	0.55
15	0.58	0.58	0.58	0.58
16	0.61	0.61	0.61	0.61
17	0.64	0.64	0.64	0.64
18	0.66	0.66	0.66	0.66
19	0.68	0.68	0.68	0.68
20	0.70	0.70	0.70	0.70
21	0.72	0.72	0.72	0.72
22	0.74	0.74	0.74	0.74
23	0.75	0.75	0.75	0.75
24	0.76	0.76	0.76	0.76
25	0.78	0.78	0.78	0.78
26	0.79	0.79	0.79	0.79
27	0.80	0.80	0.80	0.80
28	0.81	0.81	0.81	0.81
29	0.82	0.82	0.82	0.82
30	0.82	0.82	0.82	0.82
31	0.83	0.83	0.83	0.83
32	0.84	0.84	0.84	0.84
33	0.85	0.85	0.85	0.85
34	0.85	0.85	0.85	0.85
35	0.86	0.86	0.86	0.86
36	0.86	0.86	0.86	0.86
37	0.87	0.87	0.87	0.87
38	0.87	0.87	0.87	0.87
39	0.88	0.88	0.88	0.88
40	0.88	0.88	0.88	0.88

Table 148. Projected Condition for Failed Joints and Cracks on Detailed Pavement Type: 03.

How Projected: Percent of transverse joints and cracks failed

Subgrade Factor: 1.00 __ Very Poor

Time, in years	Preventive Maintenance	Light Rehabilitation	Medium Rehabilitation	Heavy Rehabilitation
1	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00
3	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00
5	0.00	0.00	0.00	0.00
6	0.49	0.49	0.49	0.49
7	5.32	5.32	5.32	5.32
8	14.06	14.06	14.06	14.06
9	21.92	21.92	21.92	21.92
10	27.35	27.35	27.35	27.35
11	30.79	30.79	30.79	30.79
12	32.93	32.93	32.93	32.93
13	34.27	34.27	34.27	34.27
14	35.13	35.13	35.13	35.13
15	35.69	35.69	35.69	35.69
16	36.06	36.06	36.06	36.06
17	36.32	36.32	36.32	36.32
18	36.50	36.50	36.50	36.50
19	36.63	36.63	36.63	36.63
20	36.72	36.72	36.72	36.72
21	36.79	36.79	36.79	36.79
22	36.84	36.84	36.84	36.84
23	36.87	36.87	36.87	36.87
24	36.90	36.90	36.90	36.90
25	36.93	36.93	36.93	36.93
26	36.94	36.94	36.94	36.94
27	36.96	36.96	36.96	36.96
28	36.97	36.97	36.97	36.97
29	36.98	36.98	36.98	36.98
30	36.98	36.98	36.98	36.98
31	36.99	36.99	36.99	36.99
32	36.99	36.99	36.99	36.99
33	37.00	37.00	37.00	37.00
34	37.00	37.00	37.00	37.00
35	37.00	37.00	37.00	37.00
36	37.01	37.01	37.01	37.01
37	37.01	37.01	37.01	37.01
38	37.01	37.01	37.01	37.01
39	37.01	37.01	37.01	37.01
40	37.01	37.01	37.01	37.01

Table 149. Projected Condition for JCP Failures on Detailed Pavement Type: 03.

How Projected: Number per mile

Subgrade Factor: 1.00 __ Very Poor

Time, in years	Preventive Maintenance	Light Rehabilitation	Medium Rehabilitation	Heavy Rehabilitation
1	0.85	0.85	0.85	0.85
2	2.07	2.07	2.07	2.07
3	3.17	3.17	3.17	3.17
4	4.14	4.14	4.14	4.14
5	5.00	5.00	5.00	5.00
6	5.77	5.77	5.77	5.77
7	6.46	6.46	6.46	6.46
8	7.10	7.10	7.10	7.10
9	7.68	7.68	7.68	7.68
10	8.22	8.22	8.22	8.22
11	8.72	8.72	8.72	8.72
12	9.19	9.19	9.19	9.19
13	9.63	9.63	9.63	9.63
14	10.05	10.05	10.05	10.05
15	10.44	10.44	10.44	10.44
16	10.81	10.81	10.81	10.81
17	11.16	11.16	11.16	11.16
18	11.50	11.50	11.50	11.50
19	11.82	11.82	11.82	11.82
20	12.12	12.12	12.12	12.12
21	12.41	12.41	12.41	12.41
22	12.69	12.69	12.69	12.69
23	12.96	12.96	12.96	12.96
24	13.22	13.22	13.22	13.22
25	13.47	13.47	13.47	13.47
26	13.71	13.71	13.71	13.71
27	13.95	13.95	13.95	13.95
28	14.17	14.17	14.17	14.17
29	14.39	14.39	14.39	14.39
30	14.60	14.60	14.60	14.60
31	14.80	14.80	14.80	14.80
32	15.00	15.00	15.00	15.00
33	15.19	15.19	15.19	15.19
34	15.38	15.38	15.38	15.38
35	15.56	15.56	15.56	15.56
36	15.74	15.74	15.74	15.74
37	15.91	15.91	15.91	15.91
38	16.08	16.08	16.08	16.08
39	16.24	16.24	16.24	16.24
40	16.40	16.40	16.40	16.40

Table 150. Projected Condition for Shattered Slabs on Detailed Pavement Type: 03.

How Projected: Percent of slabs shattered

Subgrade Factor: 1.00 __ Very Poor

Time, in years	Preventive Maintenance	Light Rehabilitation	Medium Rehabilitation	Heavy Rehabilitation
1	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00
3	0.00	0.00	0.00	0.00
4	0.04	0.04	0.04	0.04
5	0.20	0.20	0.20	0.20
6	0.54	0.54	0.54	0.54
7	1.10	1.10	1.10	1.10
8	1.88	1.88	1.88	1.88
9	2.85	2.85	2.85	2.85
10	3.98	3.98	3.98	3.98
11	5.23	5.23	5.23	5.23
12	6.57	6.57	6.57	6.57
13	7.96	7.96	7.96	7.96
14	9.39	9.39	9.39	9.39
15	10.83	10.83	10.83	10.83
16	12.27	12.27	12.27	12.27
17	13.70	13.70	13.70	13.70
18	15.11	15.11	15.11	15.11
19	16.50	16.50	16.50	16.50
20	17.85	17.85	17.85	17.85
21	19.17	19.17	19.17	19.17
22	20.46	20.46	20.46	20.46
23	21.71	21.71	21.71	21.71
24	22.92	22.92	22.92	22.92
25	24.10	24.10	24.10	24.10
26	25.23	25.23	25.23	25.23
27	26.34	26.34	26.34	26.34
28	27.40	27.40	27.40	27.40
29	28.43	28.43	28.43	28.43
30	29.43	29.43	29.43	29.43
31	30.40	30.40	30.40	30.40
32	31.33	31.33	31.33	31.33
33	32.23	32.23	32.23	32.23
34	33.10	33.10	33.10	33.10
35	33.95	33.95	33.95	33.95
36	34.77	34.77	34.77	34.77
37	35.56	35.56	35.56	35.56
38	36.33	36.33	36.33	36.33
39	37.07	37.07	37.07	37.07
40	37.79	37.79	37.79	37.79

Table 151. Projected Condition for Slabs with Longitudinal Cracks on Detailed Pavement Type: 03.

How Projected: Percent of slabs with longitudinal cracks

Subgrade Factor: 1.00 __ Very Poor

Time, in years	Preventive Maintenance	Light Rehabilitation	Medium Rehabilitation	Heavy Rehabilitation
1	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00
3	0.00	0.00	0.00	0.00
4	0.01	0.01	0.01	0.01
5	0.02	0.02	0.02	0.02
6	0.04	0.04	0.04	0.04
7	0.06	0.06	0.06	0.06
8	0.10	0.10	0.10	0.10
9	0.14	0.14	0.14	0.14
10	0.18	0.18	0.18	0.18
11	0.24	0.24	0.24	0.24
12	0.30	0.30	0.30	0.30
13	0.36	0.36	0.36	0.36
14	0.43	0.43	0.43	0.43
15	0.50	0.50	0.50	0.50
16	0.57	0.57	0.57	0.57
17	0.65	0.65	0.65	0.65
18	0.73	0.73	0.73	0.73
19	0.81	0.81	0.81	0.81
20	0.90	0.90	0.90	0.90
21	0.99	0.99	0.99	0.99
22	1.07	1.07	1.07	1.07
23	1.16	1.16	1.16	1.16
24	1.25	1.25	1.25	1.25
25	1.34	1.34	1.34	1.34
26	1.43	1.43	1.43	1.43
27	1.52	1.52	1.52	1.52
28	1.61	1.61	1.61	1.61
29	1.71	1.71	1.71	1.71
30	1.80	1.80	1.80	1.80
31	1.89	1.89	1.89	1.89
32	1.98	1.98	1.98	1.98
33	2.07	2.07	2.07	2.07
34	2.17	2.17	2.17	2.17
35	2.26	2.26	2.26	2.26
36	2.35	2.35	2.35	2.35
37	2.44	2.44	2.44	2.44
38	2.53	2.53	2.53	2.53
39	2.62	2.62	2.62	2.62
40	2.71	2.71	2.71	2.71

Table 152. Projected Condition for Concrete Patching on Detailed Pavement Type: 03.

How Projected: Number per mile

Subgrade Factor: 1.00 __ Very Poor

Time, in years	Preventive Maintenance	Light Rehabilitation	Medium Rehabilitation	Heavy Rehabilitation
1	0.02	0.02	0.02	0.02
2	0.21	0.21	0.21	0.21
3	0.61	0.61	0.61	0.61
4	1.20	1.20	1.20	1.20
5	1.93	1.93	1.93	1.93
6	2.76	2.76	2.76	2.76
7	3.68	3.68	3.68	3.68
8	4.65	4.65	4.65	4.65
9	5.67	5.67	5.67	5.67
10	6.71	6.71	6.71	6.71
11	7.78	7.78	7.78	7.78
12	8.87	8.87	8.87	8.87
13	9.96	9.96	9.96	9.96
14	11.06	11.06	11.06	11.06
15	12.17	12.17	12.17	12.17
16	13.27	13.27	13.27	13.27
17	14.37	14.37	14.37	14.37
18	15.46	15.46	15.46	15.46
19	16.55	16.55	16.55	16.55
20	17.63	17.63	17.63	17.63
21	18.70	18.70	18.70	18.70
22	19.76	19.76	19.76	19.76
23	20.82	20.82	20.82	20.82
24	21.86	21.86	21.86	21.86
25	22.90	22.90	22.90	22.90
26	23.92	23.92	23.92	23.92
27	24.94	24.94	24.94	24.94
28	25.94	25.94	25.94	25.94
29	26.94	26.94	26.94	26.94
30	27.92	27.92	27.92	27.92
31	28.89	28.89	28.89	28.89
32	29.86	29.86	29.86	29.86
33	30.81	30.81	30.81	30.81
34	31.75	31.75	31.75	31.75
35	32.68	32.68	32.68	32.68
36	33.61	33.61	33.61	33.61
37	34.52	34.52	34.52	34.52
38	35.42	35.42	35.42	35.42
39	36.32	36.32	36.32	36.32
40	37.20	37.20	37.20	37.20

Table 153. Projected Condition for Ride Score on Detailed Pavement Type: 03.

How Projected: Percent of Ride Quality Lost (0-1)

Subgrade Factor: 1.00 __ Very Poor

Time, in years	Preventive Maintenance	Light Rehabilitation	Medium Rehabilitation	Heavy Rehabilitation
1	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00
3	0.00	0.00	0.00	0.00
4	0.02	0.02	0.02	0.02
5	0.06	0.06	0.06	0.06
6	0.12	0.12	0.12	0.12
7	0.18	0.18	0.18	0.18
8	0.25	0.25	0.25	0.25
9	0.31	0.31	0.31	0.31
10	0.37	0.37	0.37	0.37
11	0.42	0.42	0.42	0.42
12	0.47	0.47	0.47	0.47
13	0.51	0.51	0.51	0.51
14	0.55	0.55	0.55	0.55
15	0.58	0.58	0.58	0.58
16	0.61	0.61	0.61	0.61
17	0.64	0.64	0.64	0.64
18	0.66	0.66	0.66	0.66
19	0.68	0.68	0.68	0.68
20	0.70	0.70	0.70	0.70
21	0.72	0.72	0.72	0.72
22	0.74	0.74	0.74	0.74
23	0.75	0.75	0.75	0.75
24	0.76	0.76	0.76	0.76
25	0.78	0.78	0.78	0.78
26	0.79	0.79	0.79	0.79
27	0.80	0.80	0.80	0.80
28	0.81	0.81	0.81	0.81
29	0.82	0.82	0.82	0.82
30	0.82	0.82	0.82	0.82
31	0.83	0.83	0.83	0.83
32	0.84	0.84	0.84	0.84
33	0.85	0.85	0.85	0.85
34	0.85	0.85	0.85	0.85
35	0.86	0.86	0.86	0.86
36	0.86	0.86	0.86	0.86
37	0.87	0.87	0.87	0.87
38	0.87	0.87	0.87	0.87
39	0.88	0.88	0.88	0.88
40	0.88	0.88	0.88	0.88

Table 154. Projected Condition for Shallow Rutting on Detailed Pavement Type: 04.

How Projected: Percent of wheelpath length

Subgrade Factor: 1.00 __ Very Poor

Time, in years	Preventive Maintenance	Light Rehabilitation	Medium Rehabilitation	Heavy Rehabilitation
1	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00
3	0.00	0.00	0.00	0.46
4	6.52	0.34	0.45	7.58
5	36.79	4.58	5.11	23.22
6	64.39	15.45	16.08	39.96
7	80.25	29.46	29.79	53.84
8	88.64	42.89	42.84	64.38
9	93.15	54.21	53.85	72.17
10	95.68	63.23	62.68	77.93
11	97.16	70.28	69.61	82.24
12	98.07	75.76	75.04	85.50
13	98.65	80.03	79.30	88.01
14	99.03	83.39	82.67	89.97
15	99.29	86.05	85.36	91.52
16	99.47	88.17	87.53	92.76
17	99.59	89.90	89.29	93.76
18	99.69	91.30	90.73	94.58
19	99.75	92.45	91.93	95.26
20	99.80	93.41	92.92	95.83
21	99.84	94.22	93.76	96.31
22	99.87	94.89	94.47	96.72
23	99.90	95.47	95.07	97.06
24	99.91	95.96	95.59	97.36
25	99.93	96.38	96.03	97.62
26	99.94	96.74	96.42	97.84
27	99.95	97.06	96.76	98.04
28	99.96	97.34	97.05	98.21
29	99.96	97.58	97.31	98.36
30	99.97	97.79	97.54	98.50
31	99.97	97.98	97.75	98.62
32	99.98	98.15	97.93	98.72
33	99.98	98.30	98.09	98.82
34	99.98	98.43	98.24	98.91
35	99.98	98.55	98.37	98.98
36	99.99	98.66	98.48	99.05
37	99.99	98.75	98.59	99.12
38	99.99	98.84	98.69	99.17
39	99.99	98.92	98.77	99.23
40	99.99	98.99	98.85	99.28

Table 155. Projected Condition for Deep Rutting on Detailed Pavement Type: 04.

How Projected: Percent of wheelpath length

Subgrade Factor: 1.00 __ Very Poor

Time, in years	Preventive Maintenance	Light Rehabilitation	Medium Rehabilitation	Heavy Rehabilitation
1	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.12
3	0.06	0.13	0.17	1.13
4	2.52	1.16	1.29	3.46
5	11.98	3.75	3.95	6.79
6	25.86	7.74	7.92	10.63
7	39.69	12.60	12.67	14.64
8	51.45	17.82	17.73	18.61
9	60.85	23.04	22.78	22.44
10	68.18	28.07	27.64	26.05
11	73.89	32.79	32.22	29.44
12	78.34	37.17	36.46	32.60
13	81.85	41.19	40.37	35.54
14	84.64	44.87	43.96	38.26
15	86.88	48.24	47.25	40.79
16	88.70	51.31	50.25	43.14
17	90.19	54.11	53.00	45.33
18	91.42	56.67	55.52	47.37
19	92.45	59.02	57.84	49.27
20	93.32	61.17	59.96	51.04
21	94.06	63.14	61.92	52.70
22	94.68	64.96	63.73	54.26
23	95.22	66.64	65.40	55.72
24	95.69	68.19	66.94	57.10
25	96.10	69.62	68.38	58.39
26	96.45	70.95	69.71	59.61
27	96.76	72.19	70.96	60.77
28	97.03	73.34	72.11	61.86
29	97.28	74.42	73.20	62.89
30	97.49	75.42	74.21	63.87
31	97.69	76.36	75.16	64.80
32	97.86	77.24	76.05	65.68
33	98.01	78.07	76.89	66.53
34	98.15	78.85	77.68	67.33
35	98.28	79.58	78.43	68.09
36	98.39	80.27	79.13	68.82
37	98.50	80.93	79.80	69.52
38	98.59	81.54	80.43	70.19
39	98.68	82.13	81.03	70.83
40	98.76	82.68	81.59	71.44

Table 156. Projected Condition for Failures on Detailed Pavement Type: 04.

How Projected: Number per mile

Subgrade Factor: 1.00 __ Very Poor

Time, in years	Preventive Maintenance	Light Rehabilitation	Medium Rehabilitation	Heavy Rehabilitation
1	0.00	0.00	0.00	0.00
2	0.00	0.00	0.02	0.01
3	0.48	0.20	0.35	0.24
4	2.72	1.84	1.27	1.00
5	5.85	4.77	2.59	2.19
6	8.74	7.78	4.04	3.55
7	11.06	10.31	5.44	4.93
8	12.84	12.27	6.74	6.22
9	14.19	13.77	7.90	7.39
10	15.22	14.92	8.93	8.44
11	16.01	15.80	9.83	9.37
12	16.64	16.49	10.63	10.20
13	17.13	17.03	11.34	10.94
14	17.53	17.46	11.96	11.59
15	17.86	17.81	12.52	12.17
16	18.12	18.10	13.01	12.69
17	18.34	18.34	13.46	13.15
18	18.53	18.53	13.86	13.57
19	18.69	18.70	14.22	13.95
20	18.82	18.84	14.54	14.29
21	18.94	18.96	14.84	14.60
22	19.04	19.06	15.11	14.89
23	19.12	19.15	15.36	15.15
24	19.20	19.23	15.58	15.39
25	19.27	19.29	15.79	15.61
26	19.32	19.35	15.98	15.81
27	19.38	19.41	16.16	16.00
28	19.42	19.45	16.32	16.17
29	19.47	19.49	16.48	16.33
30	19.50	19.53	16.62	16.48
31	19.54	19.57	16.75	16.62
32	19.57	19.60	16.88	16.75
33	19.59	19.62	16.99	16.87
34	19.62	19.65	17.10	16.99
35	19.64	19.67	17.20	17.09
36	19.66	19.69	17.30	17.20
37	19.68	19.71	17.39	17.29
38	19.70	19.73	17.48	17.38
39	19.72	19.74	17.56	17.47
40	19.73	19.76	17.63	17.55

Table 157. Projected Condition for Block Cracking on Detailed Pavement Type: 04.

How Projected: Percent of lane area

Subgrade Factor: 1.00 __ Very Poor

Time, in years	Preventive Maintenance	Light Rehabilitation	Medium Rehabilitation	Heavy Rehabilitation
1	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00
3	0.02	0.07	0.19	0.11
4	1.51	1.03	1.60	1.12
5	9.12	4.19	5.01	3.83
6	21.98	9.51	10.05	8.10
7	35.74	16.08	15.92	13.32
8	47.91	23.04	22.00	18.91
9	57.84	29.82	27.90	24.48
10	65.68	36.13	33.43	29.80
11	71.83	41.86	38.51	34.77
12	76.65	47.00	43.12	39.35
13	80.45	51.58	47.29	43.52
14	83.47	55.64	51.04	47.32
15	85.91	59.24	54.41	50.77
16	87.88	62.44	57.45	53.89
17	89.50	65.28	60.19	56.73
18	90.83	67.82	62.67	59.31
19	91.95	70.09	64.92	61.66
20	92.89	72.13	66.96	63.81
21	93.68	73.97	68.82	65.77
22	94.36	75.62	70.52	67.57
23	94.94	77.12	72.08	69.22
24	95.44	78.49	73.50	70.74
25	95.87	79.73	74.81	72.14
26	96.25	80.86	76.02	73.44
27	96.59	81.90	77.14	74.64
28	96.88	82.85	78.18	75.75
29	97.14	83.73	79.14	76.79
30	97.37	84.54	80.03	77.76
31	97.57	85.28	80.86	78.66
32	97.76	85.97	81.64	79.50
33	97.92	86.62	82.37	80.29
34	98.07	87.21	83.05	81.03
35	98.21	87.77	83.68	81.72
36	98.33	88.29	84.28	82.38
37	98.44	88.77	84.84	82.99
38	98.54	89.22	85.38	83.57
39	98.63	89.65	85.88	84.12
40	98.71	90.05	86.35	84.64

Table 158. Projected Condition for Alligator Cracking on Detailed Pavement Type: 04.

How Projected: Percent of wheelpath length

Subgrade Factor: 1.00 __ Very Poor

Time, in years	Preventive Maintenance	Light Rehabilitation	Medium Rehabilitation	Heavy Rehabilitation
1	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00
3	0.00	0.01	0.04	0.47
4	0.44	0.57	0.92	3.71
5	7.76	3.52	4.19	10.44
6	25.16	9.58	9.97	19.00
7	44.06	17.61	17.20	27.81
8	59.34	26.22	24.82	36.02
9	70.43	34.51	32.18	43.31
10	78.23	42.05	38.95	49.64
11	83.70	48.71	45.02	55.09
12	87.58	54.50	50.39	59.77
13	90.38	59.49	55.11	63.79
14	92.43	63.80	59.25	67.26
15	93.95	67.51	62.89	70.26
16	95.11	70.72	66.08	72.87
17	96.00	73.51	68.90	75.15
18	96.69	75.93	71.38	77.15
19	97.23	78.05	73.59	78.92
20	97.67	79.92	75.55	80.49
21	98.02	81.56	77.31	81.88
22	98.31	83.01	78.88	83.13
23	98.54	84.31	80.29	84.25
24	98.73	85.46	81.57	85.26
25	98.90	86.49	82.72	86.17
26	99.03	87.42	83.77	86.99
27	99.15	88.26	84.72	87.75
28	99.25	89.02	85.59	88.43
29	99.33	89.71	86.39	89.06
30	99.40	90.33	87.12	89.64
31	99.47	90.90	87.79	90.17
32	99.52	91.42	88.41	90.66
33	99.57	91.90	88.98	91.11
34	99.61	92.34	89.51	91.53
35	99.64	92.75	90.01	91.91
36	99.68	93.12	90.46	92.28
37	99.71	93.47	90.89	92.61
38	99.73	93.79	91.29	92.93
39	99.75	94.09	91.66	93.22
40	99.77	94.36	92.00	93.49

Table 159. Projected Condition for Longitudinal Cracking on Detailed Pavement Type: 04.

How Projected: Length per 100' station

Subgrade Factor: 1.00 __ Very Poor

Time, in years	Preventive Maintenance	Light Rehabilitation	Medium Rehabilitation	Heavy Rehabilitation
1	0.00	0.00	0.00	0.00
2	0.43	0.00	0.00	0.25
3	16.12	0.00	0.00	2.54
4	63.86	1.75	0.03	8.49
5	125.36	19.62	1.75	17.82
6	183.94	64.19	13.85	29.51
7	233.82	123.76	43.61	42.58
8	274.61	183.94	87.15	56.27
9	307.57	237.38	136.08	70.10
10	334.22	282.08	183.94	83.74
11	355.90	318.47	227.38	96.99
12	373.69	347.83	265.25	109.74
13	388.42	371.49	297.57	121.94
14	400.73	390.64	324.86	133.56
15	411.12	406.21	347.83	144.61
16	419.94	418.98	367.16	155.09
17	427.50	429.53	383.46	165.04
18	434.03	438.31	397.25	174.47
19	439.70	445.67	408.97	183.42
20	444.66	451.88	418.98	191.91
21	449.02	457.16	427.58	199.97
22	452.88	461.68	434.98	207.62
23	456.30	465.57	441.40	214.90
24	459.35	468.93	446.99	221.83
25	462.09	471.86	451.88	228.43
26	464.55	474.42	456.17	234.72
27	466.78	476.67	459.95	240.73
28	468.80	478.65	463.30	246.46
29	470.63	480.41	466.28	251.94
30	472.30	481.97	468.93	257.18
31	473.83	483.37	471.31	262.20
32	475.23	484.62	473.44	267.02
33	476.52	485.74	475.35	271.63
34	477.71	486.75	477.08	276.06
35	478.80	487.67	478.65	280.31
36	479.82	488.49	480.07	284.41
37	480.76	489.25	481.37	288.34
38	481.64	489.93	482.55	292.13
39	482.45	490.56	483.63	295.78
40	483.21	491.14	484.62	299.30

Table 160. Projected Condition for Transverse Cracks on Detailed Pavement Type: 04.

How Projected: Number per 100' station

Subgrade Factor: 1.00 __ Very Poor

Time, in years	Preventive Maintenance	Light Rehabilitation	Medium Rehabilitation	Heavy Rehabilitation
1	0.00	0.00	0.00	0.00
2	0.02	0.00	0.00	0.00
3	0.78	0.02	0.00	0.00
4	3.13	0.50	0.02	0.08
5	6.01	1.96	0.37	0.41
6	8.59	4.08	1.48	1.07
7	10.69	6.31	3.27	1.98
8	12.33	8.34	5.34	3.05
9	13.61	10.09	7.36	4.16
10	14.62	11.54	9.17	5.27
11	15.41	12.74	10.73	6.32
12	16.05	13.73	12.04	7.30
13	16.56	14.54	13.14	8.21
14	16.99	15.22	14.06	9.03
15	17.34	15.79	14.82	9.79
16	17.63	16.26	15.46	10.47
17	17.88	16.67	16.00	11.09
18	18.09	17.01	16.46	11.66
19	18.27	17.31	16.85	12.17
20	18.43	17.56	17.18	12.64
21	18.57	17.78	17.47	13.07
22	18.69	17.98	17.72	13.46
23	18.79	18.15	17.93	13.81
24	18.88	18.30	18.12	14.14
25	18.97	18.43	18.28	14.44
26	19.04	18.55	18.43	14.72
27	19.11	18.65	18.56	14.98
28	19.17	18.75	18.67	15.22
29	19.22	18.83	18.78	15.44
30	19.27	18.91	18.87	15.64
31	19.31	18.98	18.95	15.83
32	19.35	19.05	19.02	16.01
33	19.39	19.10	19.09	16.18
34	19.42	19.16	19.15	16.33
35	19.46	19.20	19.21	16.48
36	19.48	19.25	19.26	16.61
37	19.51	19.29	19.30	16.74
38	19.53	19.33	19.34	16.86
39	19.56	19.36	19.38	16.97
40	19.58	19.39	19.42	17.08

Table 161. Projected Condition for Ride Score on Detailed Pavement Type: 04.

How Projected: Percent of Ride Quality Lost (0-1)

Subgrade Factor: 1.00 __ Very Poor

Time, in years	Preventive Maintenance	Light Rehabilitation	Medium Rehabilitation	Heavy Rehabilitation
1	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00
3	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00
5	0.00	0.00	0.00	0.00
6	0.00	0.00	0.00	0.00
7	0.00	0.00	0.00	0.00
8	0.28	0.28	0.28	0.28
9	0.89	0.89	0.89	0.89
10	0.99	0.99	0.99	0.99
11	1.00	1.00	1.00	1.00
12	1.00	1.00	1.00	1.00
13	1.00	1.00	1.00	1.00
14	1.00	1.00	1.00	1.00
15	1.00	1.00	1.00	1.00
16	1.00	1.00	1.00	1.00
17	1.00	1.00	1.00	1.00
18	1.00	1.00	1.00	1.00
19	1.00	1.00	1.00	1.00
20	1.00	1.00	1.00	1.00
21	1.00	1.00	1.00	1.00
22	1.00	1.00	1.00	1.00
23	1.00	1.00	1.00	1.00
24	1.00	1.00	1.00	1.00
25	1.00	1.00	1.00	1.00
26	1.00	1.00	1.00	1.00
27	1.00	1.00	1.00	1.00
28	1.00	1.00	1.00	1.00
29	1.00	1.00	1.00	1.00
30	1.00	1.00	1.00	1.00
31	1.00	1.00	1.00	1.00
32	1.00	1.00	1.00	1.00
33	1.00	1.00	1.00	1.00
34	1.00	1.00	1.00	1.00
35	1.00	1.00	1.00	1.00
36	1.00	1.00	1.00	1.00
37	1.00	1.00	1.00	1.00
38	1.00	1.00	1.00	1.00
39	1.00	1.00	1.00	1.00
40	1.00	1.00	1.00	1.00

Table 162. Projected Condition for Shallow Rutting on Detailed Pavement Type: 05.

How Projected: Percent of wheelpath length

Subgrade Factor: 1.00 __ Very Poor

Time, in years	Preventive Maintenance	Light Rehabilitation	Medium Rehabilitation	Heavy Rehabilitation
1	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00
3	0.00	0.00	0.00	0.06
4	6.52	0.34	0.45	2.77
5	36.79	4.58	5.11	13.14
6	64.39	15.45	16.08	27.94
7	80.25	29.46	29.79	42.29
8	88.64	42.89	42.84	54.21
9	93.15	54.21	53.85	63.54
10	95.68	63.23	62.68	70.71
11	97.16	70.28	69.61	76.20
12	98.07	75.76	75.04	80.43
13	98.65	80.03	79.30	83.73
14	99.03	83.39	82.67	86.33
15	99.29	86.05	85.36	88.40
16	99.47	88.17	87.53	90.07
17	99.59	89.90	89.29	91.43
18	99.69	91.30	90.73	92.55
19	99.75	92.45	91.93	93.48
20	99.80	93.41	92.92	94.25
21	99.84	94.22	93.76	94.91
22	99.87	94.89	94.47	95.46
23	99.90	95.47	95.07	95.94
24	99.91	95.96	95.59	96.35
25	99.93	96.38	96.03	96.71
26	99.94	96.74	96.42	97.01
27	99.95	97.06	96.76	97.28
28	99.96	97.34	97.05	97.52
29	99.96	97.58	97.31	97.73
30	99.97	97.79	97.54	97.92
31	99.97	97.98	97.75	98.08
32	99.98	98.15	97.93	98.23
33	99.98	98.30	98.09	98.36
34	99.98	98.43	98.24	98.48
35	99.98	98.55	98.37	98.59
36	99.99	98.66	98.48	98.69
37	99.99	98.75	98.59	98.77
38	99.99	98.84	98.69	98.85
39	99.99	98.92	98.77	98.93
40	99.99	98.99	98.85	98.99

Table 163. Projected Condition for Deep Rutting on Detailed Pavement Type: 05.

How Projected: Percent of wheelpath length

Subgrade Factor: 1.00 __ Very Poor

Time, in years	Preventive Maintenance	Light Rehabilitation	Medium Rehabilitation	Heavy Rehabilitation
1	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.12
3	0.06	0.13	0.17	1.13
4	2.52	1.16	1.29	3.46
5	11.98	3.75	3.95	6.79
6	25.86	7.74	7.92	10.63
7	39.69	12.60	12.67	14.64
8	51.45	17.82	17.73	18.61
9	60.85	23.04	22.78	22.44
10	68.18	28.07	27.64	26.05
11	73.89	32.79	32.22	29.44
12	78.34	37.17	36.46	32.60
13	81.85	41.19	40.37	35.54
14	84.64	44.87	43.96	38.26
15	86.88	48.24	47.25	40.79
16	88.70	51.31	50.25	43.14
17	90.19	54.11	53.00	45.33
18	91.42	56.67	55.52	47.37
19	92.45	59.02	57.84	49.27
20	93.32	61.17	59.96	51.04
21	94.06	63.14	61.92	52.70
22	94.68	64.96	63.73	54.26
23	95.22	66.64	65.40	55.72
24	95.69	68.19	66.94	57.10
25	96.10	69.62	68.38	58.39
26	96.45	70.95	69.71	59.61
27	96.76	72.19	70.96	60.77
28	97.03	73.34	72.11	61.86
29	97.28	74.42	73.20	62.89
30	97.49	75.42	74.21	63.87
31	97.69	76.36	75.16	64.80
32	97.86	77.24	76.05	65.68
33	98.01	78.07	76.89	66.53
34	98.15	78.85	77.68	67.33
35	98.28	79.58	78.43	68.09
36	98.39	80.27	79.13	68.82
37	98.50	80.93	79.80	69.52
38	98.59	81.54	80.43	70.19
39	98.68	82.13	81.03	70.83
40	98.76	82.68	81.59	71.44

Table 164. Projected Condition for Failures on Detailed Pavement Type: 05.

How Projected: Number per mile

Subgrade Factor: 1.00 __ Very Poor

Time, in years	Preventive Maintenance	Light Rehabilitation	Medium Rehabilitation	Heavy Rehabilitation
1	0.00	0.00	0.00	0.00
2	0.00	0.00	0.02	0.01
3	0.48	0.20	0.35	0.24
4	2.72	1.84	1.27	1.00
5	5.85	4.77	2.59	2.19
6	8.74	7.78	4.04	3.55
7	11.06	10.31	5.44	4.93
8	12.84	12.27	6.74	6.22
9	14.19	13.77	7.90	7.39
10	15.22	14.92	8.93	8.44
11	16.01	15.80	9.83	9.37
12	16.64	16.49	10.63	10.20
13	17.13	17.03	11.34	10.94
14	17.53	17.46	11.96	11.59
15	17.86	17.81	12.52	12.17
16	18.12	18.10	13.01	12.69
17	18.34	18.34	13.46	13.15
18	18.53	18.53	13.86	13.57
19	18.69	18.70	14.22	13.95
20	18.82	18.84	14.54	14.29
21	18.94	18.96	14.84	14.60
22	19.04	19.06	15.11	14.89
23	19.12	19.15	15.36	15.15
24	19.20	19.23	15.58	15.39
25	19.27	19.29	15.79	15.61
26	19.32	19.35	15.98	15.81
27	19.38	19.41	16.16	16.00
28	19.42	19.45	16.32	16.17
29	19.47	19.49	16.48	16.33
30	19.50	19.53	16.62	16.48
31	19.54	19.57	16.75	16.62
32	19.57	19.60	16.88	16.75
33	19.59	19.62	16.99	16.87
34	19.62	19.65	17.10	16.99
35	19.64	19.67	17.20	17.09
36	19.66	19.69	17.30	17.20
37	19.68	19.71	17.39	17.29
38	19.70	19.73	17.48	17.38
39	19.72	19.74	17.56	17.47
40	19.73	19.76	17.63	17.55

Table 165. Projected Conditions for Block Cracking on Detailed Pavement Type: 05.

How Projected: Percent of lane area

Subgrade Factor: 1.00 __ Very Poor

Time, in years	Preventive Maintenance	Light Rehabilitation	Medium Rehabilitation	Heavy Rehabilitation
1	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00
3	0.02	0.07	0.19	0.11
4	1.51	1.03	1.60	1.12
5	9.12	4.19	5.01	3.83
6	21.98	9.51	10.05	8.10
7	35.74	16.08	15.92	13.32
8	47.91	23.04	22.00	18.91
9	57.84	29.82	27.90	24.48
10	65.68	36.13	33.43	29.80
11	71.83	41.86	38.51	34.77
12	76.65	47.00	43.12	39.35
13	80.45	51.58	47.29	43.52
14	83.47	55.64	51.04	47.32
15	85.91	59.24	54.41	50.77
16	87.88	62.44	57.45	53.89
17	89.50	65.28	60.19	56.73
18	90.83	67.82	62.67	59.31
19	91.95	70.09	64.92	61.66
20	92.89	72.13	66.96	63.81
21	93.68	73.97	68.82	65.77
22	94.36	75.62	70.52	67.57
23	94.94	77.12	72.08	69.22
24	95.44	78.49	73.50	70.74
25	95.87	79.73	74.81	72.14
26	96.25	80.86	76.02	73.44
27	96.59	81.90	77.14	74.64
28	96.88	82.85	78.18	75.75
29	97.14	83.73	79.14	76.79
30	97.37	84.54	80.03	77.76
31	97.57	85.28	80.86	78.66
32	97.76	85.97	81.64	79.50
33	97.92	86.62	82.37	80.29
34	98.07	87.21	83.05	81.03
35	98.21	87.77	83.68	81.72
36	98.33	88.29	84.28	82.38
37	98.44	88.77	84.84	82.99
38	98.54	89.22	85.38	83.57
39	98.63	89.65	85.88	84.12
40	98.71	90.05	86.35	84.64

Table 166. Projected Condition for Alligator Cracking on Detailed Pavement Type: 05.

How Projected: Percent of wheelpath length

Subgrade Factor: 1.00 __ Very Poor

Time, in years	Preventive Maintenance	Light Rehabilitation	Medium Rehabilitation	Heavy Rehabilitation
1	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00
3	0.00	0.01	0.04	0.34
4	0.44	0.57	0.92	3.01
5	7.76	3.52	4.19	9.04
6	25.16	9.58	9.97	17.10
7	44.06	17.61	17.20	25.64
8	59.34	26.22	24.82	33.76
9	70.43	34.51	32.18	41.07
10	78.23	42.05	38.95	47.48
11	83.70	48.71	45.02	53.05
12	87.58	54.50	50.39	57.85
13	90.38	59.49	55.11	62.00
14	92.43	63.80	59.25	65.59
15	93.95	67.51	62.89	68.70
16	95.11	70.72	66.08	71.42
17	96.00	73.51	68.90	73.80
18	96.69	75.93	71.38	75.90
19	97.23	78.05	73.59	77.75
20	97.67	79.92	75.55	79.39
21	98.02	81.56	77.31	80.85
22	98.31	83.01	78.88	82.16
23	98.54	84.31	80.29	83.34
24	98.73	85.46	81.57	84.40
25	98.90	86.49	82.72	85.36
26	99.03	87.42	83.77	86.23
27	99.15	88.26	84.72	87.02
28	99.25	89.02	85.59	87.75
29	99.33	89.71	86.39	88.41
30	99.40	90.33	87.12	89.02
31	99.47	90.90	87.79	89.58
32	99.52	91.42	88.41	90.09
33	99.57	91.90	88.98	90.57
34	99.61	92.34	89.51	91.01
35	99.64	92.75	90.01	91.42
36	99.68	93.12	90.46	91.81
37	99.71	93.47	90.89	92.16
38	99.73	93.79	91.29	92.49
39	99.75	94.09	91.66	92.81
40	99.77	94.36	92.00	93.10

Table 167. Projected Condition for Longitudinal Cracking on Detailed Pavement Type: 05.

How Projected: Length per 100' station

Subgrade Factor: 1.00 __ Very Poor

Time, in years	Preventive Maintenance	Light Rehabilitation	Medium Rehabilitation	Heavy Rehabilitation
1	0.00	0.00	0.00	0.00
2	0.43	0.00	0.00	0.25
3	16.12	0.00	0.00	2.54
4	63.86	1.75	0.03	8.49
5	125.36	19.62	1.75	17.82
6	183.94	64.19	13.85	29.51
7	233.82	123.76	43.61	42.58
8	274.61	183.94	87.15	56.27
9	307.57	237.38	136.08	70.10
10	334.22	282.08	183.94	83.74
11	355.90	318.47	227.38	96.99
12	373.69	347.83	265.25	109.74
13	388.42	371.49	297.57	121.94
14	400.73	390.64	324.86	133.56
15	411.12	406.21	347.83	144.61
16	419.94	418.98	367.16	155.09
17	427.50	429.53	383.46	165.04
18	434.03	438.31	397.25	174.47
19	439.70	445.67	408.97	183.42
20	444.66	451.88	418.98	191.91
21	449.02	457.16	427.58	199.97
22	452.88	461.68	434.98	207.62
23	456.30	465.57	441.40	214.90
24	459.35	468.93	446.99	221.83
25	462.09	471.86	451.88	228.43
26	464.55	474.42	456.17	234.72
27	466.78	476.67	459.95	240.73
28	468.80	478.65	463.30	246.46
29	470.63	480.41	466.28	251.94
30	472.30	481.97	468.93	257.18
31	473.83	483.37	471.31	262.20
32	475.23	484.62	473.44	267.02
33	476.52	485.74	475.35	271.63
34	477.71	486.75	477.08	276.06
35	478.80	487.67	478.65	280.31
36	479.82	488.49	480.07	284.41
37	480.76	489.25	481.37	288.34
38	481.64	489.93	482.55	292.13
39	482.45	490.56	483.63	295.78
40	483.21	491.14	484.62	299.30

Table 168. Projected Condition for Transverse Cracking on Detailed Pavement Type: 05.

How Projected: Number per 100' station

Subgrade Factor: 1.00 __ Very Poor

Time, in years	Preventive Maintenance	Light Rehabilitation	Medium Rehabilitation	Heavy Rehabilitation
1	0.00	0.00	0.00	0.00
2	0.02	0.00	0.00	0.00
3	0.78	0.02	0.00	0.00
4	3.13	0.50	0.02	0.08
5	6.01	1.96	0.37	0.41
6	8.59	4.08	1.48	1.07
7	10.69	6.31	3.27	1.98
8	12.33	8.34	5.34	3.05
9	13.61	10.09	7.36	4.16
10	14.62	11.54	9.17	5.27
11	15.41	12.74	10.73	6.32
12	16.05	13.73	12.04	7.30
13	16.56	14.54	13.14	8.21
14	16.99	15.22	14.06	9.03
15	17.34	15.79	14.82	9.79
16	17.63	16.26	15.46	10.47
17	17.88	16.67	16.00	11.09
18	18.09	17.01	16.46	11.66
19	18.27	17.31	16.85	12.17
20	18.43	17.56	17.18	12.64
21	18.57	17.78	17.47	13.07
22	18.69	17.98	17.72	13.46
23	18.79	18.15	17.93	13.81
24	18.88	18.30	18.12	14.14
25	18.97	18.43	18.28	14.44
26	19.04	18.55	18.43	14.72
27	19.11	18.65	18.56	14.98
28	19.17	18.75	18.67	15.22
29	19.22	18.83	18.78	15.44
30	19.27	18.91	18.87	15.64
31	19.31	18.98	18.95	15.83
32	19.35	19.05	19.02	16.01
33	19.39	19.10	19.09	16.18
34	19.42	19.16	19.15	16.33
35	19.46	19.20	19.21	16.48
36	19.48	19.25	19.26	16.61
37	19.51	19.29	19.30	16.74
38	19.53	19.33	19.34	16.86
39	19.56	19.36	19.38	16.97
40	19.58	19.39	19.42	17.08

Table 169. Projected Condition for Ride Score on Detailed Pavement Type: 05.

How Projected: Percent of Ride Quality Lost (0-1)

Subgrade Factor: 1.00 __ Very Poor

Time, in years	Preventive Maintenance	Light Rehabilitation	Medium Rehabilitation	Heavy Rehabilitation
1	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00
3	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00
5	0.00	0.00	0.00	0.00
6	0.00	0.00	0.00	0.00
7	0.00	0.00	0.00	0.00
8	0.03	0.03	0.03	0.03
9	0.73	0.73	0.73	0.73
10	0.96	0.96	0.96	0.96
11	0.99	0.99	0.99	0.99
12	1.00	1.00	1.00	1.00
13	1.00	1.00	1.00	1.00
14	1.00	1.00	1.00	1.00
15	1.00	1.00	1.00	1.00
16	1.00	1.00	1.00	1.00
17	1.00	1.00	1.00	1.00
18	1.00	1.00	1.00	1.00
19	1.00	1.00	1.00	1.00
20	1.00	1.00	1.00	1.00
21	1.00	1.00	1.00	1.00
22	1.00	1.00	1.00	1.00
23	1.00	1.00	1.00	1.00
24	1.00	1.00	1.00	1.00
25	1.00	1.00	1.00	1.00
26	1.00	1.00	1.00	1.00
27	1.00	1.00	1.00	1.00
28	1.00	1.00	1.00	1.00
29	1.00	1.00	1.00	1.00
30	1.00	1.00	1.00	1.00
31	1.00	1.00	1.00	1.00
32	1.00	1.00	1.00	1.00
33	1.00	1.00	1.00	1.00
34	1.00	1.00	1.00	1.00
35	1.00	1.00	1.00	1.00
36	1.00	1.00	1.00	1.00
37	1.00	1.00	1.00	1.00
38	1.00	1.00	1.00	1.00
39	1.00	1.00	1.00	1.00
40	1.00	1.00	1.00	1.00

Table 170. Projected Condition for Shallow Rutting on Detailed Pavement Type: 06.

How Projected: Percent of wheelpath length

Subgrade Factor: 1.00 __ Very Poor

Time, in years	Preventive Maintenance	Light Rehabilitation	Medium Rehabilitation	Heavy Rehabilitation
1	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00
3	0.00	0.00	0.00	0.00
4	6.52	0.34	0.45	0.05
5	36.79	4.58	5.11	1.29
6	64.39	15.45	16.08	6.50
7	80.25	29.46	29.79	15.81
8	88.64	42.89	42.84	26.92
9	93.15	54.21	53.85	37.84
10	95.68	63.23	62.68	47.57
11	97.16	70.28	69.61	55.84
12	98.07	75.76	75.04	62.71
13	98.65	80.03	79.30	68.35
14	99.03	83.39	82.67	72.98
15	99.29	86.05	85.36	76.78
16	99.47	88.17	87.53	79.92
17	99.59	89.90	89.29	82.53
18	99.69	91.30	90.73	84.71
19	99.75	92.45	91.93	86.54
20	99.80	93.41	92.92	88.09
21	99.84	94.22	93.76	89.40
22	99.87	94.89	94.47	90.53
23	99.90	95.47	95.07	91.50
24	99.91	95.96	95.59	92.34
25	99.93	96.38	96.03	93.07
26	99.94	96.74	96.42	93.71
27	99.95	97.06	96.76	94.27
28	99.96	97.34	97.05	94.76
29	99.96	97.58	97.31	95.20
30	99.97	97.79	97.54	95.59
31	99.97	97.98	97.75	95.94
32	99.98	98.15	97.93	96.25
33	99.98	98.30	98.09	96.52
34	99.98	98.43	98.24	96.77
35	99.98	98.55	98.37	97.00
36	99.99	98.66	98.48	97.21
37	99.99	98.75	98.59	97.39
38	99.99	98.84	98.69	97.56
39	99.99	98.92	98.77	97.72
40	99.99	98.99	98.85	97.86

Table 171. Projected Condition for Deep Rutting on Detailed Pavement Type: 06.

How Projected: Percent of wheelpath length

Subgrade Factor: 1.00 __ Very Poor

Time, in years	Preventive Maintenance	Light Rehabilitation	Medium Rehabilitation	Heavy Rehabilitation
1	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.12
3	0.06	0.13	0.17	1.13
4	2.52	1.16	1.29	3.46
5	11.98	3.75	3.95	6.79
6	25.86	7.74	7.92	10.63
7	39.69	12.60	12.67	14.64
8	51.45	17.82	17.73	18.61
9	60.85	23.04	22.78	22.44
10	68.18	28.07	27.64	26.05
11	73.89	32.79	32.22	29.44
12	78.34	37.17	36.46	32.60
13	81.85	41.19	40.37	35.54
14	84.64	44.87	43.96	38.26
15	86.88	48.24	47.25	40.79
16	88.70	51.31	50.25	43.14
17	90.19	54.11	53.00	45.33
18	91.42	56.67	55.52	47.37
19	92.45	59.02	57.84	49.27
20	93.32	61.17	59.96	51.04
21	94.06	63.14	61.92	52.70
22	94.68	64.96	63.73	54.26
23	95.22	66.64	65.40	55.72
24	95.69	68.19	66.94	57.10
25	96.10	69.62	68.38	58.39
26	96.45	70.95	69.71	59.61
27	96.76	72.19	70.96	60.77
28	97.03	73.34	72.11	61.86
29	97.28	74.42	73.20	62.89
30	97.49	75.42	74.21	63.87
31	97.69	76.36	75.16	64.80
32	97.86	77.24	76.05	65.68
33	98.01	78.07	76.89	66.53
34	98.15	78.85	77.68	67.33
35	98.28	79.58	78.43	68.09
36	98.39	80.27	79.13	68.82
37	98.50	80.93	79.80	69.52
38	98.59	81.54	80.43	70.19
39	98.68	82.13	81.03	70.83
40	98.76	82.68	81.59	71.44

Table 172. Projected Condition for Failures on Detailed Pavement Type: 06.

How Projected: Number per mile

Subgrade Factor: 1.00 __ Very Poor

Time, in years	Preventive Maintenance	Light Rehabilitation	Medium Rehabilitation	Heavy Rehabilitation
1	0.00	0.00	0.00	0.00
2	0.00	0.00	0.02	0.01
3	0.48	0.20	0.35	0.24
4	2.72	1.84	1.27	1.00
5	5.85	4.77	2.59	2.19
6	8.74	7.78	4.04	3.55
7	11.06	10.31	5.44	4.93
8	12.84	12.27	6.74	6.22
9	14.19	13.77	7.90	7.39
10	15.22	14.92	8.93	8.44
11	16.01	15.80	9.83	9.37
12	16.64	16.49	10.63	10.20
13	17.13	17.03	11.34	10.94
14	17.53	17.46	11.96	11.59
15	17.86	17.81	12.52	12.17
16	18.12	18.10	13.01	12.69
17	18.34	18.34	13.46	13.15
18	18.53	18.53	13.86	13.57
19	18.69	18.70	14.22	13.95
20	18.82	18.84	14.54	14.29
21	18.94	18.96	14.84	14.60
22	19.04	19.06	15.11	14.89
23	19.12	19.15	15.36	15.15
24	19.20	19.23	15.58	15.39
25	19.27	19.29	15.79	15.61
26	19.32	19.35	15.98	15.81
27	19.38	19.41	16.16	16.00
28	19.42	19.45	16.32	16.17
29	19.47	19.49	16.48	16.33
30	19.50	19.53	16.62	16.48
31	19.54	19.57	16.75	16.62
32	19.57	19.60	16.88	16.75
33	19.59	19.62	16.99	16.87
34	19.62	19.65	17.10	16.99
35	19.64	19.67	17.20	17.09
36	19.66	19.69	17.30	17.20
37	19.68	19.71	17.39	17.29
38	19.70	19.73	17.48	17.38
39	19.72	19.74	17.56	17.47
40	19.73	19.76	17.63	17.55

Table 173. Projected Condition for Block Cracking on Detailed Pavement Type: 06.

How Projected: Percent of lane area

Subgrade Factor: 1.00 __ Very Poor

Time, in years	Preventive Maintenance	Light Rehabilitation	Medium Rehabilitation	Heavy Rehabilitation
1	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00
3	0.02	0.07	0.19	0.11
4	1.51	1.03	1.60	1.12
5	9.12	4.19	5.01	3.83
6	21.98	9.51	10.05	8.10
7	35.74	16.08	15.92	13.32
8	47.91	23.04	22.00	18.91
9	57.84	29.82	27.90	24.48
10	65.68	36.13	33.43	29.80
11	71.83	41.86	38.51	34.77
12	76.65	47.00	43.12	39.35
13	80.45	51.58	47.29	43.52
14	83.47	55.64	51.04	47.32
15	85.91	59.24	54.41	50.77
16	87.88	62.44	57.45	53.89
17	89.50	65.28	60.19	56.73
18	90.83	67.82	62.67	59.31
19	91.95	70.09	64.92	61.66
20	92.89	72.13	66.96	63.81
21	93.68	73.97	68.82	65.77
22	94.36	75.62	70.52	67.57
23	94.94	77.12	72.08	69.22
24	95.44	78.49	73.50	70.74
25	95.87	79.73	74.81	72.14
26	96.25	80.86	76.02	73.44
27	96.59	81.90	77.14	74.64
28	96.88	82.85	78.18	75.75
29	97.14	83.73	79.14	76.79
30	97.37	84.54	80.03	77.76
31	97.57	85.28	80.86	78.66
32	97.76	85.97	81.64	79.50
33	97.92	86.62	82.37	80.29
34	98.07	87.21	83.05	81.03
35	98.21	87.77	83.68	81.72
36	98.33	88.29	84.28	82.38
37	98.44	88.77	84.84	82.99
38	98.54	89.22	85.38	83.57
39	98.63	89.65	85.88	84.12
40	98.71	90.05	86.35	84.64

Table 174. Projected Condition for Alligator Cracking on Detailed Pavement Type: 06.

How Projected: Percent of wheelpath length

Subgrade Factor: 1.00 __ Very Poor

Time, in years	Preventive Maintenance	Light Rehabilitation	Medium Rehabilitation	Heavy Rehabilitation
1	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00
3	0.00	0.01	0.04	0.00
4	0.44	0.57	0.92	0.15
5	7.76	3.52	4.19	1.16
6	25.16	9.58	9.97	3.79
7	44.06	17.61	17.20	8.03
8	59.34	26.22	24.82	13.37
9	70.43	34.51	32.18	19.22
10	78.23	42.05	38.95	25.16
11	83.70	48.71	45.02	30.89
12	87.58	54.50	50.39	36.27
13	90.38	59.49	55.11	41.24
14	92.43	63.80	59.25	45.77
15	93.95	67.51	62.89	49.88
16	95.11	70.72	66.08	53.60
17	96.00	73.51	68.90	56.95
18	96.69	75.93	71.38	59.98
19	97.23	78.05	73.59	62.72
20	97.67	79.92	75.55	65.20
21	98.02	81.56	77.31	67.44
22	98.31	83.01	78.88	69.48
23	98.54	84.31	80.29	71.34
24	98.73	85.46	81.57	73.03
25	98.90	86.49	82.72	74.58
26	99.03	87.42	83.77	75.99
27	99.15	88.26	84.72	77.29
28	99.25	89.02	85.59	78.49
29	99.33	89.71	86.39	79.59
30	99.40	90.33	87.12	80.61
31	99.47	90.90	87.79	81.55
32	99.52	91.42	88.41	82.42
33	99.57	91.90	88.98	83.24
34	99.61	92.34	89.51	83.99
35	99.64	92.75	90.01	84.69
36	99.68	93.12	90.46	85.35
37	99.71	93.47	90.89	85.96
38	99.73	93.79	91.29	86.54
39	99.75	94.09	91.66	87.08
40	99.77	94.36	92.00	87.58

Table 175. Projected Condition for Longitudinal Cracking on Detailed Pavement Type: 06.

How Projected: Length per 100' station

Subgrade Factor: 1.00 __ Very Poor

Time, in years	Preventive Maintenance	Light Rehabilitation	Medium Rehabilitation	Heavy Rehabilitation
1	0.00	0.00	0.00	0.00
2	0.43	0.00	0.00	0.25
3	16.12	0.00	0.00	2.54
4	63.86	1.75	0.03	8.49
5	125.36	19.62	1.75	17.82
6	183.94	64.19	13.85	29.51
7	233.82	123.76	43.61	42.58
8	274.61	183.94	87.15	56.27
9	307.57	237.38	136.08	70.10
10	334.22	282.08	183.94	83.74
11	355.90	318.47	227.38	96.99
12	373.69	347.83	265.25	109.74
13	388.42	371.49	297.57	121.94
14	400.73	390.64	324.86	133.56
15	411.12	406.21	347.83	144.61
16	419.94	418.98	367.16	155.09
17	427.50	429.53	383.46	165.04
18	434.03	438.31	397.25	174.47
19	439.70	445.67	408.97	183.42
20	444.66	451.88	418.98	191.91
21	449.02	457.16	427.58	199.97
22	452.88	461.68	434.98	207.62
23	456.30	465.57	441.40	214.90
24	459.35	468.93	446.99	221.83
25	462.09	471.86	451.88	228.43
26	464.55	474.42	456.17	234.72
27	466.78	476.67	459.95	240.73
28	468.80	478.65	463.30	246.46
29	470.63	480.41	466.28	251.94
30	472.30	481.97	468.93	257.18
31	473.83	483.37	471.31	262.20
32	475.23	484.62	473.44	267.02
33	476.52	485.74	475.35	271.63
34	477.71	486.75	477.08	276.06
35	478.80	487.67	478.65	280.31
36	479.82	488.49	480.07	284.41
37	480.76	489.25	481.37	288.34
38	481.64	489.93	482.55	292.13
39	482.45	490.56	483.63	295.78
40	483.21	491.14	484.62	299.30

Table 176. Projected Condition for Transverse Cracking on Detailed Pavement Type: 06.

How Projected: Number per 100' station

Subgrade Factor: 1.00 __ Very Poor

Time, in years	Preventive Maintenance	Light Rehabilitation	Medium Rehabilitation	Heavy Rehabilitation
1	0.00	0.00	0.00	0.00
2	0.02	0.00	0.00	0.00
3	0.78	0.02	0.00	0.00
4	3.13	0.50	0.02	0.08
5	6.01	1.96	0.37	0.41
6	8.59	4.08	1.48	1.07
7	10.69	6.31	3.27	1.98
8	12.33	8.34	5.34	3.05
9	13.61	10.09	7.36	4.16
10	14.62	11.54	9.17	5.27
11	15.41	12.74	10.73	6.32
12	16.05	13.73	12.04	7.30
13	16.56	14.54	13.14	8.21
14	16.99	15.22	14.06	9.03
15	17.34	15.79	14.82	9.79
16	17.63	16.26	15.46	10.47
17	17.88	16.67	16.00	11.09
18	18.09	17.01	16.46	11.66
19	18.27	17.31	16.85	12.17
20	18.43	17.56	17.18	12.64
21	18.57	17.78	17.47	13.07
22	18.69	17.98	17.72	13.46
23	18.79	18.15	17.93	13.81
24	18.88	18.30	18.12	14.14
25	18.97	18.43	18.28	14.44
26	19.04	18.55	18.43	14.72
27	19.11	18.65	18.56	14.98
28	19.17	18.75	18.67	15.22
29	19.22	18.83	18.78	15.44
30	19.27	18.91	18.87	15.64
31	19.31	18.98	18.95	15.83
32	19.35	19.05	19.02	16.01
33	19.39	19.10	19.09	16.18
34	19.42	19.16	19.15	16.33
35	19.46	19.20	19.21	16.48
36	19.48	19.25	19.26	16.61
37	19.51	19.29	19.30	16.74
38	19.53	19.33	19.34	16.86
39	19.56	19.36	19.38	16.97
40	19.58	19.39	19.42	17.08

Table 177. Projected Condition for Ride Score on Detailed Pavement Type: 06.

How Projected: Percent of Ride Quality Lost

Subgrade Factor: 1.00 __ Very Poor

Time, in years	Preventive Maintenance	Light Rehabilitation	Medium Rehabilitation	Heavy Rehabilitation
1	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00
3	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00
5	0.00	0.00	0.00	0.00
6	0.00	0.00	0.00	0.00
7	0.00	0.00	0.00	0.00
8	0.00	0.00	0.00	0.00
9	0.00	0.00	0.00	0.00
10	0.11	0.11	0.11	0.11
11	0.72	0.72	0.72	0.72
12	0.94	0.94	0.94	0.94
13	0.99	0.99	0.99	0.99
14	1.00	1.00	1.00	1.00
15	1.00	1.00	1.00	1.00
16	1.00	1.00	1.00	1.00
17	1.00	1.00	1.00	1.00
18	1.00	1.00	1.00	1.00
19	1.00	1.00	1.00	1.00
20	1.00	1.00	1.00	1.00
21	1.00	1.00	1.00	1.00
22	1.00	1.00	1.00	1.00
23	1.00	1.00	1.00	1.00
24	1.00	1.00	1.00	1.00
25	1.00	1.00	1.00	1.00
26	1.00	1.00	1.00	1.00
27	1.00	1.00	1.00	1.00
28	1.00	1.00	1.00	1.00
29	1.00	1.00	1.00	1.00
30	1.00	1.00	1.00	1.00
31	1.00	1.00	1.00	1.00
32	1.00	1.00	1.00	1.00
33	1.00	1.00	1.00	1.00
34	1.00	1.00	1.00	1.00
35	1.00	1.00	1.00	1.00
36	1.00	1.00	1.00	1.00
37	1.00	1.00	1.00	1.00
38	1.00	1.00	1.00	1.00
39	1.00	1.00	1.00	1.00
40	1.00	1.00	1.00	1.00

Table 178. Projected Condition for Shallow Rutting on Detailed Pavement Type: 07.

How Projected: Percent of wheelpath length

Subgrade Factor: 1.00 __ Very Poor

Time, in years	Preventive Maintenance	Light Rehabilitation	Medium Rehabilitation	Heavy Rehabilitation
1	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00
3	0.00	0.00	0.00	0.04
4	6.52	0.34	0.45	2.21
5	36.79	4.58	5.11	11.56
6	64.39	15.45	16.08	25.78
7	80.25	29.46	29.79	40.06
8	88.64	42.89	42.84	52.16
9	93.15	54.21	53.85	61.75
10	95.68	63.23	62.68	69.18
11	97.16	70.28	69.61	74.91
12	98.07	75.76	75.04	79.34
13	98.65	80.03	79.30	82.80
14	99.03	83.39	82.67	85.54
15	99.29	86.05	85.36	87.72
16	99.47	88.17	87.53	89.48
17	99.59	89.90	89.29	90.92
18	99.69	91.30	90.73	92.10
19	99.75	92.45	91.93	93.08
20	99.80	93.41	92.92	93.90
21	99.84	94.22	93.76	94.60
22	99.87	94.89	94.47	95.19
23	99.90	95.47	95.07	95.69
24	99.91	95.96	95.59	96.12
25	99.93	96.38	96.03	96.50
26	99.94	96.74	96.42	96.83
27	99.95	97.06	96.76	97.12
28	99.96	97.34	97.05	97.37
29	99.96	97.58	97.31	97.59
30	99.97	97.79	97.54	97.79
31	99.97	97.98	97.75	97.96
32	99.98	98.15	97.93	98.12
33	99.98	98.30	98.09	98.26
34	99.98	98.43	98.24	98.39
35	99.98	98.55	98.37	98.50
36	99.99	98.66	98.48	98.60
37	99.99	98.75	98.59	98.70
38	99.99	98.84	98.69	98.78
39	99.99	98.92	98.77	98.86
40	99.99	98.99	98.85	98.93

Table 179. Projected Condition for Deep Rutting on Detailed Pavement Type: 07.

How Projected: Percent of wheelpath length

Subgrade Factor: 1.00 __ Very Poor

Time, in years	Preventive Maintenance	Light Rehabilitation	Medium Rehabilitation	Heavy Rehabilitation
1	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.12
3	0.06	0.13	0.17	1.13
4	2.52	1.16	1.29	3.46
5	11.98	3.75	3.95	6.79
6	25.86	7.74	7.92	10.63
7	39.69	12.60	12.67	14.64
8	51.45	17.82	17.73	18.61
9	60.85	23.04	22.78	22.44
10	68.18	28.07	27.64	26.05
11	73.89	32.79	32.22	29.44
12	78.34	37.17	36.46	32.60
13	81.85	41.19	40.37	35.54
14	84.64	44.87	43.96	38.26
15	86.88	48.24	47.25	40.79
16	88.70	51.31	50.25	43.14
17	90.19	54.11	53.00	45.33
18	91.42	56.67	55.52	47.37
19	92.45	59.02	57.84	49.27
20	93.32	61.17	59.96	51.04
21	94.06	63.14	61.92	52.70
22	94.68	64.96	63.73	54.26
23	95.22	66.64	65.40	55.72
24	95.69	68.19	66.94	57.10
25	96.10	69.62	68.38	58.39
26	96.45	70.95	69.71	59.61
27	96.76	72.19	70.96	60.77
28	97.03	73.34	72.11	61.86
29	97.28	74.42	73.20	62.89
30	97.49	75.42	74.21	63.87
31	97.69	76.36	75.16	64.80
32	97.86	77.24	76.05	65.68
33	98.01	78.07	76.89	66.53
34	98.15	78.85	77.68	67.33
35	98.28	79.58	78.43	68.09
36	98.39	80.27	79.13	68.82
37	98.50	80.93	79.80	69.52
38	98.59	81.54	80.43	70.19
39	98.68	82.13	81.03	70.83
40	98.76	82.68	81.59	71.44

Table 180. Projected Condition for Failures on Detailed Pavement Type: 07.

How Projected: Number per mile

Subgrade Factor: 1.00 __ Very Poor

Time, in years	Preventive Maintenance	Light Rehabilitation	Medium Rehabilitation	Heavy Rehabilitation
1	0.00	0.00	0.00	0.00
2	0.00	0.00	0.02	0.01
3	0.48	0.20	0.35	0.24
4	2.72	1.84	1.27	1.00
5	5.85	4.77	2.59	2.19
6	8.74	7.78	4.04	3.55
7	11.06	10.31	5.44	4.93
8	12.84	12.27	6.74	6.22
9	14.19	13.77	7.90	7.39
10	15.22	14.92	8.93	8.44
11	16.01	15.80	9.83	9.37
12	16.64	16.49	10.63	10.20
13	17.13	17.03	11.34	10.94
14	17.53	17.46	11.96	11.59
15	17.86	17.81	12.52	12.17
16	18.12	18.10	13.01	12.69
17	18.34	18.34	13.46	13.15
18	18.53	18.53	13.86	13.57
19	18.69	18.70	14.22	13.95
20	18.82	18.84	14.54	14.29
21	18.94	18.96	14.84	14.60
22	19.04	19.06	15.11	14.89
23	19.12	19.15	15.36	15.15
24	19.20	19.23	15.58	15.39
25	19.27	19.29	15.79	15.61
26	19.32	19.35	15.98	15.81
27	19.38	19.41	16.16	16.00
28	19.42	19.45	16.32	16.17
29	19.47	19.49	16.48	16.33
30	19.50	19.53	16.62	16.48
31	19.54	19.57	16.75	16.62
32	19.57	19.60	16.88	16.75
33	19.59	19.62	16.99	16.87
34	19.62	19.65	17.10	16.99
35	19.64	19.67	17.20	17.09
36	19.66	19.69	17.30	17.20
37	19.68	19.71	17.39	17.29
38	19.70	19.73	17.48	17.38
39	19.72	19.74	17.56	17.47
40	19.73	19.76	17.63	17.55

Table 181. Projected Condition for Block Cracking on Detailed Pavement Type: 07.

How Projected: Percent of lane area

Subgrade Factor: 1.00 __ Very Poor

Time, in years	Preventive Maintenance	Light Rehabilitation	Medium Rehabilitation	Heavy Rehabilitation
1	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00
3	0.02	0.07	0.19	0.11
4	1.51	1.03	1.60	1.12
5	9.12	4.19	5.01	3.83
6	21.98	9.51	10.05	8.10
7	35.74	16.08	15.92	13.32
8	47.91	23.04	22.00	18.91
9	57.84	29.82	27.90	24.48
10	65.68	36.13	33.43	29.80
11	71.83	41.86	38.51	34.77
12	76.65	47.00	43.12	39.35
13	80.45	51.58	47.29	43.52
14	83.47	55.64	51.04	47.32
15	85.91	59.24	54.41	50.77
16	87.88	62.44	57.45	53.89
17	89.50	65.28	60.19	56.73
18	90.83	67.82	62.67	59.31
19	91.95	70.09	64.92	61.66
20	92.89	72.13	66.96	63.81
21	93.68	73.97	68.82	65.77
22	94.36	75.62	70.52	67.57
23	94.94	77.12	72.08	69.22
24	95.44	78.49	73.50	70.74
25	95.87	79.73	74.81	72.14
26	96.25	80.86	76.02	73.44
27	96.59	81.90	77.14	74.64
28	96.88	82.85	78.18	75.75
29	97.14	83.73	79.14	76.79
30	97.37	84.54	80.03	77.76
31	97.57	85.28	80.86	78.66
32	97.76	85.97	81.64	79.50
33	97.92	86.62	82.37	80.29
34	98.07	87.21	83.05	81.03
35	98.21	87.77	83.68	81.72
36	98.33	88.29	84.28	82.38
37	98.44	88.77	84.84	82.99
38	98.54	89.22	85.38	83.57
39	98.63	89.65	85.88	84.12
40	98.71	90.05	86.35	84.64

Table 182. Projected Condition for Alligator Cracking on Detailed Pavement Type: 07.

How Projected: Percent of wheelpath length

Subgrade Factor: 1.00 __ Very Poor

Time, in years	Preventive Maintenance	Light Rehabilitation	Medium Rehabilitation	Heavy Rehabilitation
1	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00
3	0.00	0.01	0.04	0.00
4	0.44	0.57	0.92	0.18
5	7.76	3.52	4.19	1.32
6	25.16	9.58	9.97	4.15
7	44.06	17.61	17.20	8.62
8	59.34	26.22	24.82	14.14
9	70.43	34.51	32.18	20.12
10	78.23	42.05	38.95	26.14
11	83.70	48.71	45.02	31.91
12	87.58	54.50	50.39	37.31
13	90.38	59.49	55.11	42.26
14	92.43	63.80	59.25	46.77
15	93.95	67.51	62.89	50.85
16	95.11	70.72	66.08	54.53
17	96.00	73.51	68.90	57.85
18	96.69	75.93	71.38	60.84
19	97.23	78.05	73.59	63.54
20	97.67	79.92	75.55	65.98
21	98.02	81.56	77.31	68.19
22	98.31	83.01	78.88	70.19
23	98.54	84.31	80.29	72.01
24	98.73	85.46	81.57	73.67
25	98.90	86.49	82.72	75.19
26	99.03	87.42	83.77	76.57
27	99.15	88.26	84.72	77.85
28	99.25	89.02	85.59	79.02
29	99.33	89.71	86.39	80.10
30	99.40	90.33	87.12	81.09
31	99.47	90.90	87.79	82.01
32	99.52	91.42	88.41	82.87
33	99.57	91.90	88.98	83.66
34	99.61	92.34	89.51	84.40
35	99.64	92.75	90.01	85.09
36	99.68	93.12	90.46	85.73
37	99.71	93.47	90.89	86.33
38	99.73	93.79	91.29	86.89
39	99.75	94.09	91.66	87.41
40	99.77	94.36	92.00	87.91

Table 183. Projected Condition for Longitudinal Cracking on Detailed Pavement Type: 07.

How Projected: Length per 100' station

Subgrade Factor: 1.00 __ Very Poor

Time, in years	Preventive Maintenance	Light Rehabilitation	Medium Rehabilitation	Heavy Rehabilitation
1	0.00	0.00	0.00	0.00
2	0.43	0.00	0.00	0.25
3	16.12	0.00	0.00	2.54
4	63.86	1.75	0.03	8.49
5	125.36	19.62	1.75	17.82
6	183.94	64.19	13.85	29.51
7	233.82	123.76	43.61	42.58
8	274.61	183.94	87.15	56.27
9	307.57	237.38	136.08	70.10
10	334.22	282.08	183.94	83.74
11	355.90	318.47	227.38	96.99
12	373.69	347.83	265.25	109.74
13	388.42	371.49	297.57	121.94
14	400.73	390.64	324.86	133.56
15	411.12	406.21	347.83	144.61
16	419.94	418.98	367.16	155.09
17	427.50	429.53	383.46	165.04
18	434.03	438.31	397.25	174.47
19	439.70	445.67	408.97	183.42
20	444.66	451.88	418.98	191.91
21	449.02	457.16	427.58	199.97
22	452.88	461.68	434.98	207.62
23	456.30	465.57	441.40	214.90
24	459.35	468.93	446.99	221.83
25	462.09	471.86	451.88	228.43
26	464.55	474.42	456.17	234.72
27	466.78	476.67	459.95	240.73
28	468.80	478.65	463.30	246.46
29	470.63	480.41	466.28	251.94
30	472.30	481.97	468.93	257.18
31	473.83	483.37	471.31	262.20
32	475.23	484.62	473.44	267.02
33	476.52	485.74	475.35	271.63
34	477.71	486.75	477.08	276.06
35	478.80	487.67	478.65	280.31
36	479.82	488.49	480.07	284.41
37	480.76	489.25	481.37	288.34
38	481.64	489.93	482.55	292.13
39	482.45	490.56	483.63	295.78
40	483.21	491.14	484.62	299.30

Table 184. Projected Condition for Transverse Cracking on Detailed Pavement Type: 07.

How Projected: Number per 100' station

Subgrade Factor: 1.00 __ Very Poor

Time, in years	Preventive Maintenance	Light Rehabilitation	Medium Rehabilitation	Heavy Rehabilitation
1	0.00	0.00	0.00	0.00
2	0.02	0.00	0.00	0.00
3	0.78	0.02	0.00	0.00
4	3.13	0.50	0.02	0.08
5	6.01	1.96	0.37	0.41
6	8.59	4.08	1.48	1.07
7	10.69	6.31	3.27	1.98
8	12.33	8.34	5.34	3.05
9	13.61	10.09	7.36	4.16
10	14.62	11.54	9.17	5.27
11	15.41	12.74	10.73	6.32
12	16.05	13.73	12.04	7.30
13	16.56	14.54	13.14	8.21
14	16.99	15.22	14.06	9.03
15	17.34	15.79	14.82	9.79
16	17.63	16.26	15.46	10.47
17	17.88	16.67	16.00	11.09
18	18.09	17.01	16.46	11.66
19	18.27	17.31	16.85	12.17
20	18.43	17.56	17.18	12.64
21	18.57	17.78	17.47	13.07
22	18.69	17.98	17.72	13.46
23	18.79	18.15	17.93	13.81
24	18.88	18.30	18.12	14.14
25	18.97	18.43	18.28	14.44
26	19.04	18.55	18.43	14.72
27	19.11	18.65	18.56	14.98
28	19.17	18.75	18.67	15.22
29	19.22	18.83	18.78	15.44
30	19.27	18.91	18.87	15.64
31	19.31	18.98	18.95	15.83
32	19.35	19.05	19.02	16.01
33	19.39	19.10	19.09	16.18
34	19.42	19.16	19.15	16.33
35	19.46	19.20	19.21	16.48
36	19.48	19.25	19.26	16.61
37	19.51	19.29	19.30	16.74
38	19.53	19.33	19.34	16.86
39	19.56	19.36	19.38	16.97
40	19.58	19.39	19.42	17.08

Table 185. Projected Condition for Ride Score on Detailed Pavement Type: 07.

How Projected: Percent of Ride Quality Lost (0-1)

Subgrade Factor: 1.00 __ Very Poor

Time, in years	Preventive Maintenance	Light Rehabilitation	Medium Rehabilitation	Heavy Rehabilitation
1	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00
3	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00
5	0.00	0.00	0.00	0.00
6	0.00	0.00	0.00	0.00
7	0.00	0.00	0.00	0.00
8	0.00	0.00	0.00	0.00
9	0.00	0.00	0.00	0.00
10	0.44	0.44	0.44	0.44
11	0.89	0.89	0.89	0.89
12	0.98	0.98	0.98	0.98
13	1.00	1.00	1.00	1.00
14	1.00	1.00	1.00	1.00
15	1.00	1.00	1.00	1.00
16	1.00	1.00	1.00	1.00
17	1.00	1.00	1.00	1.00
18	1.00	1.00	1.00	1.00
19	1.00	1.00	1.00	1.00
20	1.00	1.00	1.00	1.00
21	1.00	1.00	1.00	1.00
22	1.00	1.00	1.00	1.00
23	1.00	1.00	1.00	1.00
24	1.00	1.00	1.00	1.00
25	1.00	1.00	1.00	1.00
26	1.00	1.00	1.00	1.00
27	1.00	1.00	1.00	1.00
28	1.00	1.00	1.00	1.00
29	1.00	1.00	1.00	1.00
30	1.00	1.00	1.00	1.00
31	1.00	1.00	1.00	1.00
32	1.00	1.00	1.00	1.00
33	1.00	1.00	1.00	1.00
34	1.00	1.00	1.00	1.00
35	1.00	1.00	1.00	1.00
36	1.00	1.00	1.00	1.00
37	1.00	1.00	1.00	1.00
38	1.00	1.00	1.00	1.00
39	1.00	1.00	1.00	1.00
40	1.00	1.00	1.00	1.00

Table 186. Projected Condition for Shallow Rutting on Detailed Pavement Type: 08.

How Projected: Percent of wheelpath length

Subgrade Factor: 1.00 __ Very Poor

Time, in years	Preventive Maintenance	Light Rehabilitation	Medium Rehabilitation	Heavy Rehabilitation
1	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00
3	0.00	0.00	0.00	0.00
4	6.52	0.34	0.45	0.41
5	36.79	4.58	5.11	4.47
6	64.39	15.45	16.08	14.19
7	80.25	29.46	29.79	26.77
8	88.64	42.89	42.84	39.16
9	93.15	54.21	53.85	49.94
10	95.68	63.23	62.68	58.82
11	97.16	70.28	69.61	65.96
12	98.07	75.76	75.04	71.65
13	98.65	80.03	79.30	76.20
14	99.03	83.39	82.67	79.85
15	99.29	86.05	85.36	82.80
16	99.47	88.17	87.53	85.21
17	99.59	89.90	89.29	87.18
18	99.69	91.30	90.73	88.82
19	99.75	92.45	91.93	90.19
20	99.80	93.41	92.92	91.34
21	99.84	94.22	93.76	92.31
22	99.87	94.89	94.47	93.14
23	99.90	95.47	95.07	93.85
24	99.91	95.96	95.59	94.47
25	99.93	96.38	96.03	95.00
26	99.94	96.74	96.42	95.46
27	99.95	97.06	96.76	95.87
28	99.96	97.34	97.05	96.23
29	99.96	97.58	97.31	96.55
30	99.97	97.79	97.54	96.83
31	99.97	97.98	97.75	97.08
32	99.98	98.15	97.93	97.30
33	99.98	98.30	98.09	97.50
34	99.98	98.43	98.24	97.69
35	99.98	98.55	98.37	97.85
36	99.99	98.66	98.48	98.00
37	99.99	98.75	98.59	98.13
38	99.99	98.84	98.69	98.25
39	99.99	98.92	98.77	98.36
40	99.99	98.99	98.85	98.46

Table 187. Projected Condition for Deep Rutting on Detailed Pavement Type: 08.

How Projected: Percent of wheelpath length

Subgrade Factor: 1.00 __ Very Poor

Time, in years	Preventive Maintenance	Light Rehabilitation	Medium Rehabilitation	Heavy Rehabilitation
1	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.12
3	0.06	0.13	0.17	1.13
4	2.52	1.16	1.29	3.46
5	11.98	3.75	3.95	6.79
6	25.86	7.74	7.92	10.63
7	39.69	12.60	12.67	14.64
8	51.45	17.82	17.73	18.61
9	60.85	23.04	22.78	22.44
10	68.18	28.07	27.64	26.05
11	73.89	32.79	32.22	29.44
12	78.34	37.17	36.46	32.60
13	81.85	41.19	40.37	35.54
14	84.64	44.87	43.96	38.26
15	86.88	48.24	47.25	40.79
16	88.70	51.31	50.25	43.14
17	90.19	54.11	53.00	45.33
18	91.42	56.67	55.52	47.37
19	92.45	59.02	57.84	49.27
20	93.32	61.17	59.96	51.04
21	94.06	63.14	61.92	52.70
22	94.68	64.96	63.73	54.26
23	95.22	66.64	65.40	55.72
24	95.69	68.19	66.94	57.10
25	96.10	69.62	68.38	58.39
26	96.45	70.95	69.71	59.61
27	96.76	72.19	70.96	60.77
28	97.03	73.34	72.11	61.86
29	97.28	74.42	73.20	62.89
30	97.49	75.42	74.21	63.87
31	97.69	76.36	75.16	64.80
32	97.86	77.24	76.05	65.68
33	98.01	78.07	76.89	66.53
34	98.15	78.85	77.68	67.33
35	98.28	79.58	78.43	68.09
36	98.39	80.27	79.13	68.82
37	98.50	80.93	79.80	69.52
38	98.59	81.54	80.43	70.19
39	98.68	82.13	81.03	70.83
40	98.76	82.68	81.59	71.44

Table 188. Projected Condition for Failures on Detailed Pavement Type: 08.

How Projected: Number per mile

Subgrade Factor: 1.00 __ Very Poor

Time, in years	Preventive Maintenance	Light Rehabilitation	Medium Rehabilitation	Heavy Rehabilitation
1	0.00	0.00	0.00	0.00
2	0.00	0.00	0.02	0.01
3	0.48	0.20	0.35	0.24
4	2.72	1.84	1.27	1.00
5	5.85	4.77	2.59	2.19
6	8.74	7.78	4.04	3.55
7	11.06	10.31	5.44	4.93
8	12.84	12.27	6.74	6.22
9	14.19	13.77	7.90	7.39
10	15.22	14.92	8.93	8.44
11	16.01	15.80	9.83	9.37
12	16.64	16.49	10.63	10.20
13	17.13	17.03	11.34	10.94
14	17.53	17.46	11.96	11.59
15	17.86	17.81	12.52	12.17
16	18.12	18.10	13.01	12.69
17	18.34	18.34	13.46	13.15
18	18.53	18.53	13.86	13.57
19	18.69	18.70	14.22	13.95
20	18.82	18.84	14.54	14.29
21	18.94	18.96	14.84	14.60
22	19.04	19.06	15.11	14.89
23	19.12	19.15	15.36	15.15
24	19.20	19.23	15.58	15.39
25	19.27	19.29	15.79	15.61
26	19.32	19.35	15.98	15.81
27	19.38	19.41	16.16	16.00
28	19.42	19.45	16.32	16.17
29	19.47	19.49	16.48	16.33
30	19.50	19.53	16.62	16.48
31	19.54	19.57	16.75	16.62
32	19.57	19.60	16.88	16.75
33	19.59	19.62	16.99	16.87
34	19.62	19.65	17.10	16.99
35	19.64	19.67	17.20	17.09
36	19.66	19.69	17.30	17.20
37	19.68	19.71	17.39	17.29
38	19.70	19.73	17.48	17.38
39	19.72	19.74	17.56	17.47
40	19.73	19.76	17.63	17.55

Table 189. Projected Condition for Block Cracking on Detailed Pavement Type: 08.

How Projected: Percent of lane area

Subgrade Factor: 1.00 __ Very Poor

Time, in years	Preventive Maintenance	Light Rehabilitation	Medium Rehabilitation	Heavy Rehabilitation
1	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00
3	0.02	0.07	0.19	0.11
4	1.51	1.03	1.60	1.12
5	9.12	4.19	5.01	3.83
6	21.98	9.51	10.05	8.10
7	35.74	16.08	15.92	13.32
8	47.91	23.04	22.00	18.91
9	57.84	29.82	27.90	24.48
10	65.68	36.13	33.43	29.80
11	71.83	41.86	38.51	34.77
12	76.65	47.00	43.12	39.35
13	80.45	51.58	47.29	43.52
14	83.47	55.64	51.04	47.32
15	85.91	59.24	54.41	50.77
16	87.88	62.44	57.45	53.89
17	89.50	65.28	60.19	56.73
18	90.83	67.82	62.67	59.31
19	91.95	70.09	64.92	61.66
20	92.89	72.13	66.96	63.81
21	93.68	73.97	68.82	65.77
22	94.36	75.62	70.52	67.57
23	94.94	77.12	72.08	69.22
24	95.44	78.49	73.50	70.74
25	95.87	79.73	74.81	72.14
26	96.25	80.86	76.02	73.44
27	96.59	81.90	77.14	74.64
28	96.88	82.85	78.18	75.75
29	97.14	83.73	79.14	76.79
30	97.37	84.54	80.03	77.76
31	97.57	85.28	80.86	78.66
32	97.76	85.97	81.64	79.50
33	97.92	86.62	82.37	80.29
34	98.07	87.21	83.05	81.03
35	98.21	87.77	83.68	81.72
36	98.33	88.29	84.28	82.38
37	98.44	88.77	84.84	82.99
38	98.54	89.22	85.38	83.57
39	98.63	89.65	85.88	84.12
40	98.71	90.05	86.35	84.64

Table 190. Projected Condition for Alligator Cracking on Detailed Pavement Type: 08.

How Projected: Percent of wheelpath length

Subgrade Factor: 1.00 __ Very Poor

Time, in years	Preventive Maintenance	Light Rehabilitation	Medium Rehabilitation	Heavy Rehabilitation
1	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00
3	0.00	0.01	0.04	0.00
4	0.44	0.57	0.92	0.18
5	7.76	3.52	4.19	1.32
6	25.16	9.58	9.97	4.15
7	44.06	17.61	17.20	8.62
8	59.34	26.22	24.82	14.14
9	70.43	34.51	32.18	20.12
10	78.23	42.05	38.95	26.14
11	83.70	48.71	45.02	31.91
12	87.58	54.50	50.39	37.31
13	90.38	59.49	55.11	42.26
14	92.43	63.80	59.25	46.77
15	93.95	67.51	62.89	50.85
16	95.11	70.72	66.08	54.53
17	96.00	73.51	68.90	57.85
18	96.69	75.93	71.38	60.84
19	97.23	78.05	73.59	63.54
20	97.67	79.92	75.55	65.98
21	98.02	81.56	77.31	68.19
22	98.31	83.01	78.88	70.19
23	98.54	84.31	80.29	72.01
24	98.73	85.46	81.57	73.67
25	98.90	86.49	82.72	75.19
26	99.03	87.42	83.77	76.57
27	99.15	88.26	84.72	77.85
28	99.25	89.02	85.59	79.02
29	99.33	89.71	86.39	80.10
30	99.40	90.33	87.12	81.09
31	99.47	90.90	87.79	82.01
32	99.52	91.42	88.41	82.87
33	99.57	91.90	88.98	83.66
34	99.61	92.34	89.51	84.40
35	99.64	92.75	90.01	85.09
36	99.68	93.12	90.46	85.73
37	99.71	93.47	90.89	86.33
38	99.73	93.79	91.29	86.89
39	99.75	94.09	91.66	87.41
40	99.77	94.36	92.00	87.91

Table 191. Projected Condition for Longitudinal Cracking on Detailed Pavement Type: 08.

How Projected: Length per 100' station

Subgrade Factor: 1.00 __ Very Poor

Time, in years	Preventive Maintenance	Light Rehabilitation	Medium Rehabilitation	Heavy Rehabilitation
1	0.00	0.24	0.00	0.00
2	0.00	14.72	0.09	0.25
3	0.00	53.31	7.48	2.54
4	0.00	98.76	40.31	8.49
5	0.00	141.37	92.02	17.82
6	0.00	178.52	147.10	29.51
7	6.54	210.19	197.29	42.58
8	114.91	237.08	240.19	56.27
9	283.79	259.98	275.91	70.10
10	392.82	279.61	305.44	83.74
11	447.26	296.56	329.86	96.99
12	473.20	311.30	350.14	109.74
13	485.80	324.21	367.11	121.94
14	492.16	335.59	381.39	133.56
15	495.50	345.69	393.52	144.61
16	497.33	354.70	403.88	155.09
17	498.36	362.79	412.80	165.04
18	498.97	370.08	420.52	174.47
19	499.33	376.68	427.25	183.42
20	499.56	382.68	433.16	191.91
21	499.70	388.16	438.36	199.97
22	499.80	393.18	442.97	207.62
23	499.86	397.80	447.07	214.90
24	499.90	402.06	450.73	221.83
25	499.93	405.99	454.02	228.43
26	499.95	409.64	456.98	234.72
27	499.96	413.04	459.66	240.73
28	499.97	416.20	462.09	246.46
29	499.98	419.15	464.30	251.94
30	499.98	421.91	466.32	257.18
31	499.99	424.51	468.17	262.20
32	499.99	426.94	469.86	267.02
33	499.99	429.23	471.42	271.63
34	499.99	431.39	472.86	276.06
35	500.00	433.43	474.19	280.31
36	500.00	435.36	475.42	284.41
37	500.00	437.18	476.56	288.34
38	500.00	438.91	477.62	292.13
39	500.00	440.56	478.61	295.78
40	500.00	442.12	479.54	299.30

Table 192. Projected Condition for Transverse Cracking on Detailed Pavement Type: 08.

How Projected: Number per 100' station

Subgrade Factor: 1.00 __ Very Poor

Time, in years	Preventive Maintenance	Light Rehabilitation	Medium Rehabilitation	Heavy Rehabilitation
1	0.00	0.00	0.00	0.00
2	0.01	0.01	0.00	0.00
3	0.72	0.66	0.03	0.00
4	2.99	3.07	0.77	0.08
5	5.83	6.16	2.92	0.41
6	8.42	8.93	5.72	1.07
7	10.53	11.14	8.38	1.98
8	12.19	12.84	10.60	3.05
9	13.48	14.14	12.36	4.16
10	14.50	15.14	13.74	5.27
11	15.31	15.91	14.82	6.32
12	15.96	16.53	15.67	7.30
13	16.49	17.02	16.34	8.21
14	16.92	17.42	16.88	9.03
15	17.28	17.74	17.32	9.79
16	17.58	18.01	17.67	10.47
17	17.83	18.23	17.97	11.09
18	18.05	18.42	18.21	11.66
19	18.23	18.59	18.42	12.17
20	18.39	18.72	18.59	12.64
21	18.53	18.84	18.74	13.07
22	18.66	18.95	18.87	13.46
23	18.76	19.04	18.98	13.81
24	18.86	19.12	19.07	14.14
25	18.94	19.19	19.16	14.44
26	19.02	19.25	19.23	14.72
27	19.09	19.31	19.29	14.98
28	19.15	19.36	19.35	15.22
29	19.20	19.40	19.40	15.44
30	19.25	19.44	19.45	15.64
31	19.30	19.48	19.49	15.83
32	19.34	19.51	19.52	16.01
33	19.38	19.54	19.56	16.18
34	19.41	19.57	19.59	16.33
35	19.44	19.59	19.61	16.48
36	19.47	19.62	19.64	16.61
37	19.50	19.64	19.66	16.74
38	19.52	19.66	19.68	16.86
39	19.55	19.67	19.70	16.97
40	19.57	19.69	19.72	17.08

Table 193. Projected Condition for Ride Score on Detailed Pavement Type: 08.

How Projected: Percent of Ride Quality Lost (0-1)

Subgrade Factor: 1.00 __ Very Poor

Time, in years	Preventive Maintenance	Light Rehabilitation	Medium Rehabilitation	Heavy Rehabilitation
1	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00
3	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00
5	0.00	0.00	0.00	0.00
6	0.00	0.00	0.00	0.00
7	0.00	0.00	0.00	0.00
8	0.00	0.00	0.00	0.00
9	0.00	0.00	0.00	0.00
10	0.44	0.44	0.44	0.44
11	0.89	0.89	0.89	0.89
12	0.98	0.98	0.98	0.98
13	1.00	1.00	1.00	1.00
14	1.00	1.00	1.00	1.00
15	1.00	1.00	1.00	1.00
16	1.00	1.00	1.00	1.00
17	1.00	1.00	1.00	1.00
18	1.00	1.00	1.00	1.00
19	1.00	1.00	1.00	1.00
20	1.00	1.00	1.00	1.00
21	1.00	1.00	1.00	1.00
22	1.00	1.00	1.00	1.00
23	1.00	1.00	1.00	1.00
24	1.00	1.00	1.00	1.00
25	1.00	1.00	1.00	1.00
26	1.00	1.00	1.00	1.00
27	1.00	1.00	1.00	1.00
28	1.00	1.00	1.00	1.00
29	1.00	1.00	1.00	1.00
30	1.00	1.00	1.00	1.00
31	1.00	1.00	1.00	1.00
32	1.00	1.00	1.00	1.00
33	1.00	1.00	1.00	1.00
34	1.00	1.00	1.00	1.00
35	1.00	1.00	1.00	1.00
36	1.00	1.00	1.00	1.00
37	1.00	1.00	1.00	1.00
38	1.00	1.00	1.00	1.00
39	1.00	1.00	1.00	1.00
40	1.00	1.00	1.00	1.00

Table 194. Projected Condition for Shallow Rutting on Detailed Pavement Type: 09.

How Projected: Percent of wheelpath length

Subgrade Factor: 1.00 __ Very Poor

Time, in years	Preventive Maintenance	Light Rehabilitation	Medium Rehabilitation	Heavy Rehabilitation
1	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00
3	0.00	0.00	0.00	0.00
4	6.52	0.34	0.45	0.41
5	36.79	4.58	5.11	4.47
6	64.39	15.45	16.08	14.19
7	80.25	29.46	29.79	26.77
8	88.64	42.89	42.84	39.16
9	93.15	54.21	53.85	49.94
10	95.68	63.23	62.68	58.82
11	97.16	70.28	69.61	65.96
12	98.07	75.76	75.04	71.65
13	98.65	80.03	79.30	76.20
14	99.03	83.39	82.67	79.85
15	99.29	86.05	85.36	82.80
16	99.47	88.17	87.53	85.21
17	99.59	89.90	89.29	87.18
18	99.69	91.30	90.73	88.82
19	99.75	92.45	91.93	90.19
20	99.80	93.41	92.92	91.34
21	99.84	94.22	93.76	92.31
22	99.87	94.89	94.47	93.14
23	99.90	95.47	95.07	93.85
24	99.91	95.96	95.59	94.47
25	99.93	96.38	96.03	95.00
26	99.94	96.74	96.42	95.46
27	99.95	97.06	96.76	95.87
28	99.96	97.34	97.05	96.23
29	99.96	97.58	97.31	96.55
30	99.97	97.79	97.54	96.83
31	99.97	97.98	97.75	97.08
32	99.98	98.15	97.93	97.30
33	99.98	98.30	98.09	97.50
34	99.98	98.43	98.24	97.69
35	99.98	98.55	98.37	97.85
36	99.99	98.66	98.48	98.00
37	99.99	98.75	98.59	98.13
38	99.99	98.84	98.69	98.25
39	99.99	98.92	98.77	98.36
40	99.99	98.99	98.85	98.46

Table 195. Projected Condition for Deep Rutting on Detailed Pavement Type: 09.

How Projected: Percent of wheelpath length

Subgrade Factor: 1.00 __ Very Poor

Time, in years	Preventive Maintenance	Light Rehabilitation	Medium Rehabilitation	Heavy Rehabilitation
1	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.12
3	0.06	0.13	0.17	1.13
4	2.52	1.16	1.29	3.46
5	11.98	3.75	3.95	6.79
6	25.86	7.74	7.92	10.63
7	39.69	12.60	12.67	14.64
8	51.45	17.82	17.73	18.61
9	60.85	23.04	22.78	22.44
10	68.18	28.07	27.64	26.05
11	73.89	32.79	32.22	29.44
12	78.34	37.17	36.46	32.60
13	81.85	41.19	40.37	35.54
14	84.64	44.87	43.96	38.26
15	86.88	48.24	47.25	40.79
16	88.70	51.31	50.25	43.14
17	90.19	54.11	53.00	45.33
18	91.42	56.67	55.52	47.37
19	92.45	59.02	57.84	49.27
20	93.32	61.17	59.96	51.04
21	94.06	63.14	61.92	52.70
22	94.68	64.96	63.73	54.26
23	95.22	66.64	65.40	55.72
24	95.69	68.19	66.94	57.10
25	96.10	69.62	68.38	58.39
26	96.45	70.95	69.71	59.61
27	96.76	72.19	70.96	60.77
28	97.03	73.34	72.11	61.86
29	97.28	74.42	73.20	62.89
30	97.49	75.42	74.21	63.87
31	97.69	76.36	75.16	64.80
32	97.86	77.24	76.05	65.68
33	98.01	78.07	76.89	66.53
34	98.15	78.85	77.68	67.33
35	98.28	79.58	78.43	68.09
36	98.39	80.27	79.13	68.82
37	98.50	80.93	79.80	69.52
38	98.59	81.54	80.43	70.19
39	98.68	82.13	81.03	70.83
40	98.76	82.68	81.59	71.44

Table 196. Projected Condition for Failures on Detailed Pavement Type: 09.

How Projected: Number per mile

Subgrade Factor: 1.00 __ Very Poor

Time, in years	Preventive Maintenance	Light Rehabilitation	Medium Rehabilitation	Heavy Rehabilitation
1	0.00	0.00	0.00	0.00
2	0.00	0.00	0.02	0.01
3	0.48	0.20	0.35	0.24
4	2.72	1.84	1.27	1.00
5	5.85	4.77	2.59	2.19
6	8.74	7.78	4.04	3.55
7	11.06	10.31	5.44	4.93
8	12.84	12.27	6.74	6.22
9	14.19	13.77	7.90	7.39
10	15.22	14.92	8.93	8.44
11	16.01	15.80	9.83	9.37
12	16.64	16.49	10.63	10.20
13	17.13	17.03	11.34	10.94
14	17.53	17.46	11.96	11.59
15	17.86	17.81	12.52	12.17
16	18.12	18.10	13.01	12.69
17	18.34	18.34	13.46	13.15
18	18.53	18.53	13.86	13.57
19	18.69	18.70	14.22	13.95
20	18.82	18.84	14.54	14.29
21	18.94	18.96	14.84	14.60
22	19.04	19.06	15.11	14.89
23	19.12	19.15	15.36	15.15
24	19.20	19.23	15.58	15.39
25	19.27	19.29	15.79	15.61
26	19.32	19.35	15.98	15.81
27	19.38	19.41	16.16	16.00
28	19.42	19.45	16.32	16.17
29	19.47	19.49	16.48	16.33
30	19.50	19.53	16.62	16.48
31	19.54	19.57	16.75	16.62
32	19.57	19.60	16.88	16.75
33	19.59	19.62	16.99	16.87
34	19.62	19.65	17.10	16.99
35	19.64	19.67	17.20	17.09
36	19.66	19.69	17.30	17.20
37	19.68	19.71	17.39	17.29
38	19.70	19.73	17.48	17.38
39	19.72	19.74	17.56	17.47
40	19.73	19.76	17.63	17.55

Table 197. Projected Condition for Block Cracking on Detailed Pavement Type: 09.

How Projected: Percent of lane area

Subgrade Factor: 1.00 __ Very Poor

Time, in years	Preventive Maintenance	Light Rehabilitation	Medium Rehabilitation	Heavy Rehabilitation
1	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00
3	0.02	0.07	0.19	0.11
4	1.51	1.03	1.60	1.12
5	9.12	4.19	5.01	3.83
6	21.98	9.51	10.05	8.10
7	35.74	16.08	15.92	13.32
8	47.91	23.04	22.00	18.91
9	57.84	29.82	27.90	24.48
10	65.68	36.13	33.43	29.80
11	71.83	41.86	38.51	34.77
12	76.65	47.00	43.12	39.35
13	80.45	51.58	47.29	43.52
14	83.47	55.64	51.04	47.32
15	85.91	59.24	54.41	50.77
16	87.88	62.44	57.45	53.89
17	89.50	65.28	60.19	56.73
18	90.83	67.82	62.67	59.31
19	91.95	70.09	64.92	61.66
20	92.89	72.13	66.96	63.81
21	93.68	73.97	68.82	65.77
22	94.36	75.62	70.52	67.57
23	94.94	77.12	72.08	69.22
24	95.44	78.49	73.50	70.74
25	95.87	79.73	74.81	72.14
26	96.25	80.86	76.02	73.44
27	96.59	81.90	77.14	74.64
28	96.88	82.85	78.18	75.75
29	97.14	83.73	79.14	76.79
30	97.37	84.54	80.03	77.76
31	97.57	85.28	80.86	78.66
32	97.76	85.97	81.64	79.50
33	97.92	86.62	82.37	80.29
34	98.07	87.21	83.05	81.03
35	98.21	87.77	83.68	81.72
36	98.33	88.29	84.28	82.38
37	98.44	88.77	84.84	82.99
38	98.54	89.22	85.38	83.57
39	98.63	89.65	85.88	84.12
40	98.71	90.05	86.35	84.64

Table 198. Projected Condition for Alligator Cracking on Detailed Pavement Type: 09.

How Projected: Percent of wheelpath length

Subgrade Factor: 1.00 __ Very Poor

Time, in years	Preventive Maintenance	Light Rehabilitation	Medium Rehabilitation	Heavy Rehabilitation
1	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00
3	0.00	0.01	0.04	0.00
4	0.44	0.57	0.92	0.18
5	7.76	3.52	4.19	1.32
6	25.16	9.58	9.97	4.15
7	44.06	17.61	17.20	8.62
8	59.34	26.22	24.82	14.14
9	70.43	34.51	32.18	20.12
10	78.23	42.05	38.95	26.14
11	83.70	48.71	45.02	31.91
12	87.58	54.50	50.39	37.31
13	90.38	59.49	55.11	42.26
14	92.43	63.80	59.25	46.77
15	93.95	67.51	62.89	50.85
16	95.11	70.72	66.08	54.53
17	96.00	73.51	68.90	57.85
18	96.69	75.93	71.38	60.84
19	97.23	78.05	73.59	63.54
20	97.67	79.92	75.55	65.98
21	98.02	81.56	77.31	68.19
22	98.31	83.01	78.88	70.19
23	98.54	84.31	80.29	72.01
24	98.73	85.46	81.57	73.67
25	98.90	86.49	82.72	75.19
26	99.03	87.42	83.77	76.57
27	99.15	88.26	84.72	77.85
28	99.25	89.02	85.59	79.02
29	99.33	89.71	86.39	80.10
30	99.40	90.33	87.12	81.09
31	99.47	90.90	87.79	82.01
32	99.52	91.42	88.41	82.87
33	99.57	91.90	88.98	83.66
34	99.61	92.34	89.51	84.40
35	99.64	92.75	90.01	85.09
36	99.68	93.12	90.46	85.73
37	99.71	93.47	90.89	86.33
38	99.73	93.79	91.29	86.89
39	99.75	94.09	91.66	87.41
40	99.77	94.36	92.00	87.91

Table 199. Projected Condition for Longitudinal Cracking on Detailed Pavement Type: 09.

How Projected: Length per 100' station

Subgrade Factor: 1.00 __ Very Poor

Time, in years	Preventive Maintenance	Light Rehabilitation	Medium Rehabilitation	Heavy Rehabilitation
1	0.00	0.00	0.00	0.00
2	0.43	0.00	0.00	0.25
3	16.12	0.00	0.00	2.54
4	63.86	1.75	0.03	8.49
5	125.36	19.62	1.75	17.82
6	183.94	64.19	13.85	29.51
7	233.82	123.76	43.61	42.58
8	274.61	183.94	87.15	56.27
9	307.57	237.38	136.08	70.10
10	334.22	282.08	183.94	83.74
11	355.90	318.47	227.38	96.99
12	373.69	347.83	265.25	109.74
13	388.42	371.49	297.57	121.94
14	400.73	390.64	324.86	133.56
15	411.12	406.21	347.83	144.61
16	419.94	418.98	367.16	155.09
17	427.50	429.53	383.46	165.04
18	434.03	438.31	397.25	174.47
19	439.70	445.67	408.97	183.42
20	444.66	451.88	418.98	191.91
21	449.02	457.16	427.58	199.97
22	452.88	461.68	434.98	207.62
23	456.30	465.57	441.40	214.90
24	459.35	468.93	446.99	221.83
25	462.09	471.86	451.88	228.43
26	464.55	474.42	456.17	234.72
27	466.78	476.67	459.95	240.73
28	468.80	478.65	463.30	246.46
29	470.63	480.41	466.28	251.94
30	472.30	481.97	468.93	257.18
31	473.83	483.37	471.31	262.20
32	475.23	484.62	473.44	267.02
33	476.52	485.74	475.35	271.63
34	477.71	486.75	477.08	276.06
35	478.80	487.67	478.65	280.31
36	479.82	488.49	480.07	284.41
37	480.76	489.25	481.37	288.34
38	481.64	489.93	482.55	292.13
39	482.45	490.56	483.63	295.78
40	483.21	491.14	484.62	299.30

Table 200. Projected Condition for Transverse Cracking on Detailed Pavement Type: 09.

How Projected: Number per 100' station

Subgrade Factor: 1.00 __ Very Poor

Time, in years	Preventive Maintenance	Light Rehabilitation	Medium Rehabilitation	Heavy Rehabilitation
1	0.00	0.00	0.00	0.00
2	0.02	0.00	0.00	0.00
3	0.78	0.02	0.00	0.00
4	3.13	0.50	0.02	0.08
5	6.01	1.96	0.37	0.41
6	8.59	4.08	1.48	1.07
7	10.69	6.31	3.27	1.98
8	12.33	8.34	5.34	3.05
9	13.61	10.09	7.36	4.16
10	14.62	11.54	9.17	5.27
11	15.41	12.74	10.73	6.32
12	16.05	13.73	12.04	7.30
13	16.56	14.54	13.14	8.21
14	16.99	15.22	14.06	9.03
15	17.34	15.79	14.82	9.79
16	17.63	16.26	15.46	10.47
17	17.88	16.67	16.00	11.09
18	18.09	17.01	16.46	11.66
19	18.27	17.31	16.85	12.17
20	18.43	17.56	17.18	12.64
21	18.57	17.78	17.47	13.07
22	18.69	17.98	17.72	13.46
23	18.79	18.15	17.93	13.81
24	18.88	18.30	18.12	14.14
25	18.97	18.43	18.28	14.44
26	19.04	18.55	18.43	14.72
27	19.11	18.65	18.56	14.98
28	19.17	18.75	18.67	15.22
29	19.22	18.83	18.78	15.44
30	19.27	18.91	18.87	15.64
31	19.31	18.98	18.95	15.83
32	19.35	19.05	19.02	16.01
33	19.39	19.10	19.09	16.18
34	19.42	19.16	19.15	16.33
35	19.46	19.20	19.21	16.48
36	19.48	19.25	19.26	16.61
37	19.51	19.29	19.30	16.74
38	19.53	19.33	19.34	16.86
39	19.56	19.36	19.38	16.97
40	19.58	19.39	19.42	17.08

Table 201. Projected Condition for Ride Score on Detailed Pavement Type: 09.

How Projected: Percent of Ride Quality Lost (0-1)

Subgrade Factor: 1.00 __ Very Poor

Time, in years	Preventive Maintenance	Light Rehabilitation	Medium Rehabilitation	Heavy Rehabilitation
1	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00
3	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00
5	0.00	0.00	0.00	0.00
6	0.00	0.00	0.00	0.00
7	0.00	0.00	0.00	0.00
8	0.00	0.00	0.00	0.00
9	0.00	0.00	0.00	0.00
10	0.44	0.44	0.44	0.44
11	0.89	0.89	0.89	0.89
12	0.98	0.98	0.98	0.98
13	1.00	1.00	1.00	1.00
14	1.00	1.00	1.00	1.00
15	1.00	1.00	1.00	1.00
16	1.00	1.00	1.00	1.00
17	1.00	1.00	1.00	1.00
18	1.00	1.00	1.00	1.00
19	1.00	1.00	1.00	1.00
20	1.00	1.00	1.00	1.00
21	1.00	1.00	1.00	1.00
22	1.00	1.00	1.00	1.00
23	1.00	1.00	1.00	1.00
24	1.00	1.00	1.00	1.00
25	1.00	1.00	1.00	1.00
26	1.00	1.00	1.00	1.00
27	1.00	1.00	1.00	1.00
28	1.00	1.00	1.00	1.00
29	1.00	1.00	1.00	1.00
30	1.00	1.00	1.00	1.00
31	1.00	1.00	1.00	1.00
32	1.00	1.00	1.00	1.00
33	1.00	1.00	1.00	1.00
34	1.00	1.00	1.00	1.00
35	1.00	1.00	1.00	1.00
36	1.00	1.00	1.00	1.00
37	1.00	1.00	1.00	1.00
38	1.00	1.00	1.00	1.00
39	1.00	1.00	1.00	1.00
40	1.00	1.00	1.00	1.00

Table 202. Projected Condition for Shallow Rutting on Detailed Pavement Type: 10.

How Projected: Percent of wheelpath length

Subgrade Factor: 1.00 __ Very Poor

Time, in years	Preventive Maintenance	Light Rehabilitation	Medium Rehabilitation	Heavy Rehabilitation
1	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00
3	0.00	0.00	0.00	0.01
4	6.52	0.34	0.45	1.33
5	36.79	4.58	5.11	8.67
6	64.39	15.45	16.08	21.52
7	80.25	29.46	29.79	35.46
8	88.64	42.89	42.84	47.83
9	93.15	54.21	53.85	57.91
10	95.68	63.23	62.68	65.87
11	97.16	70.28	69.61	72.08
12	98.07	75.76	75.04	76.93
13	98.65	80.03	79.30	80.75
14	99.03	83.39	82.67	83.77
15	99.29	86.05	85.36	86.20
16	99.47	88.17	87.53	88.17
17	99.59	89.90	89.29	89.77
18	99.69	91.30	90.73	91.09
19	99.75	92.45	91.93	92.20
20	99.80	93.41	92.92	93.12
21	99.84	94.22	93.76	93.90
22	99.87	94.89	94.47	94.56
23	99.90	95.47	95.07	95.13
24	99.91	95.96	95.59	95.62
25	99.93	96.38	96.03	96.04
26	99.94	96.74	96.42	96.41
27	99.95	97.06	96.76	96.74
28	99.96	97.34	97.05	97.02
29	99.96	97.58	97.31	97.27
30	99.97	97.79	97.54	97.50
31	99.97	97.98	97.75	97.69
32	99.98	98.15	97.93	97.87
33	99.98	98.30	98.09	98.03
34	99.98	98.43	98.24	98.17
35	99.98	98.55	98.37	98.30
36	99.99	98.66	98.48	98.42
37	99.99	98.75	98.59	98.53
38	99.99	98.84	98.69	98.62
39	99.99	98.92	98.77	98.71
40	99.99	98.99	98.85	98.79

Table 203. Projected Condition for Deep Rutting on Detailed Pavement Type: 10.

How Projected: Percent of wheelpath length

Subgrade Factor: 1.00 __ Very Poor

Time, in years	Preventive Maintenance	Light Rehabilitation	Medium Rehabilitation	Heavy Rehabilitation
1	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.12
3	0.06	0.13	0.17	1.13
4	2.52	1.16	1.29	3.46
5	11.98	3.75	3.95	6.79
6	25.86	7.74	7.92	10.63
7	39.69	12.60	12.67	14.64
8	51.45	17.82	17.73	18.61
9	60.85	23.04	22.78	22.44
10	68.18	28.07	27.64	26.05
11	73.89	32.79	32.22	29.44
12	78.34	37.17	36.46	32.60
13	81.85	41.19	40.37	35.54
14	84.64	44.87	43.96	38.26
15	86.88	48.24	47.25	40.79
16	88.70	51.31	50.25	43.14
17	90.19	54.11	53.00	45.33
18	91.42	56.67	55.52	47.37
19	92.45	59.02	57.84	49.27
20	93.32	61.17	59.96	51.04
21	94.06	63.14	61.92	52.70
22	94.68	64.96	63.73	54.26
23	95.22	66.64	65.40	55.72
24	95.69	68.19	66.94	57.10
25	96.10	69.62	68.38	58.39
26	96.45	70.95	69.71	59.61
27	96.76	72.19	70.96	60.77
28	97.03	73.34	72.11	61.86
29	97.28	74.42	73.20	62.89
30	97.49	75.42	74.21	63.87
31	97.69	76.36	75.16	64.80
32	97.86	77.24	76.05	65.68
33	98.01	78.07	76.89	66.53
34	98.15	78.85	77.68	67.33
35	98.28	79.58	78.43	68.09
36	98.39	80.27	79.13	68.82
37	98.50	80.93	79.80	69.52
38	98.59	81.54	80.43	70.19
39	98.68	82.13	81.03	70.83
40	98.76	82.68	81.59	71.44

Table 204. Projected Condition for Failures on Detailed Pavement Type: 10.

How Projected: Number per mile

Subgrade Factor: 1.00 __ Very Poor

Time, in years	Preventive Maintenance	Light Rehabilitation	Medium Rehabilitation	Heavy Rehabilitation
1	0.00	0.00	0.00	0.00
2	0.00	0.00	0.02	0.01
3	0.48	0.20	0.35	0.24
4	2.72	1.84	1.27	1.00
5	5.85	4.77	2.59	2.19
6	8.74	7.78	4.04	3.55
7	11.06	10.31	5.44	4.93
8	12.84	12.27	6.74	6.22
9	14.19	13.77	7.90	7.39
10	15.22	14.92	8.93	8.44
11	16.01	15.80	9.83	9.37
12	16.64	16.49	10.63	10.20
13	17.13	17.03	11.34	10.94
14	17.53	17.46	11.96	11.59
15	17.86	17.81	12.52	12.17
16	18.12	18.10	13.01	12.69
17	18.34	18.34	13.46	13.15
18	18.53	18.53	13.86	13.57
19	18.69	18.70	14.22	13.95
20	18.82	18.84	14.54	14.29
21	18.94	18.96	14.84	14.60
22	19.04	19.06	15.11	14.89
23	19.12	19.15	15.36	15.15
24	19.20	19.23	15.58	15.39
25	19.27	19.29	15.79	15.61
26	19.32	19.35	15.98	15.81
27	19.38	19.41	16.16	16.00
28	19.42	19.45	16.32	16.17
29	19.47	19.49	16.48	16.33
30	19.50	19.53	16.62	16.48
31	19.54	19.57	16.75	16.62
32	19.57	19.60	16.88	16.75
33	19.59	19.62	16.99	16.87
34	19.62	19.65	17.10	16.99
35	19.64	19.67	17.20	17.09
36	19.66	19.69	17.30	17.20
37	19.68	19.71	17.39	17.29
38	19.70	19.73	17.48	17.38
39	19.72	19.74	17.56	17.47
40	19.73	19.76	17.63	17.55

Table 205. Projected Condition for Block Cracking on Detailed Pavement Type: 10.

How Projected: Percent of lane area

Subgrade Factor: 1.00 __ Very Poor

Time, in years	Preventive Maintenance	Light Rehabilitation	Medium Rehabilitation	Heavy Rehabilitation
1	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00
3	0.02	0.07	0.19	0.11
4	1.51	1.03	1.60	1.12
5	9.12	4.19	5.01	3.83
6	21.98	9.51	10.05	8.10
7	35.74	16.08	15.92	13.32
8	47.91	23.04	22.00	18.91
9	57.84	29.82	27.90	24.48
10	65.68	36.13	33.43	29.80
11	71.83	41.86	38.51	34.77
12	76.65	47.00	43.12	39.35
13	80.45	51.58	47.29	43.52
14	83.47	55.64	51.04	47.32
15	85.91	59.24	54.41	50.77
16	87.88	62.44	57.45	53.89
17	89.50	65.28	60.19	56.73
18	90.83	67.82	62.67	59.31
19	91.95	70.09	64.92	61.66
20	92.89	72.13	66.96	63.81
21	93.68	73.97	68.82	65.77
22	94.36	75.62	70.52	67.57
23	94.94	77.12	72.08	69.22
24	95.44	78.49	73.50	70.74
25	95.87	79.73	74.81	72.14
26	96.25	80.86	76.02	73.44
27	96.59	81.90	77.14	74.64
28	96.88	82.85	78.18	75.75
29	97.14	83.73	79.14	76.79
30	97.37	84.54	80.03	77.76
31	97.57	85.28	80.86	78.66
32	97.76	85.97	81.64	79.50
33	97.92	86.62	82.37	80.29
34	98.07	87.21	83.05	81.03
35	98.21	87.77	83.68	81.72
36	98.33	88.29	84.28	82.38
37	98.44	88.77	84.84	82.99
38	98.54	89.22	85.38	83.57
39	98.63	89.65	85.88	84.12
40	98.71	90.05	86.35	84.64

Table 206. Projected Condition for Alligator Cracking on Detailed Pavement Type: 10.

How Projected: Percent of wheelpath length

Subgrade Factor: 1.00 __ Very Poor

Time, in years	Preventive Maintenance	Light Rehabilitation	Medium Rehabilitation	Heavy Rehabilitation
1	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00
3	0.00	0.01	0.04	0.01
4	0.44	0.57	0.92	0.31
5	7.76	3.52	4.19	1.89
6	25.16	9.58	9.97	5.42
7	44.06	17.61	17.20	10.58
8	59.34	26.22	24.82	16.65
9	70.43	34.51	32.18	23.01
10	78.23	42.05	38.95	29.25
11	83.70	48.71	45.02	35.12
12	87.58	54.50	50.39	40.52
13	90.38	59.49	55.11	45.42
14	92.43	63.80	59.25	49.85
15	93.95	67.51	62.89	53.82
16	95.11	70.72	66.08	57.37
17	96.00	73.51	68.90	60.56
18	96.69	75.93	71.38	63.43
19	97.23	78.05	73.59	66.00
20	97.67	79.92	75.55	68.32
21	98.02	81.56	77.31	70.41
22	98.31	83.01	78.88	72.30
23	98.54	84.31	80.29	74.02
24	98.73	85.46	81.57	75.58
25	98.90	86.49	82.72	77.00
26	99.03	87.42	83.77	78.30
27	99.15	88.26	84.72	79.50
28	99.25	89.02	85.59	80.59
29	99.33	89.71	86.39	81.60
30	99.40	90.33	87.12	82.53
31	99.47	90.90	87.79	83.39
32	99.52	91.42	88.41	84.18
33	99.57	91.90	88.98	84.92
34	99.61	92.34	89.51	85.61
35	99.64	92.75	90.01	86.24
36	99.68	93.12	90.46	86.84
37	99.71	93.47	90.89	87.40
38	99.73	93.79	91.29	87.92
39	99.75	94.09	91.66	88.40
40	99.77	94.36	92.00	88.86

Table 207. Projected Condition for Longitudinal Cracking on Detailed Pavement Type: 10.

How Projected: Length per 100' station

Subgrade Factor: 1.00 __ Very Poor

Time, in years	Preventive Maintenance	Light Rehabilitation	Medium Rehabilitation	Heavy Rehabilitation
1	0.00	0.00	0.00	0.00
2	0.43	0.00	0.00	0.25
3	16.12	0.00	0.00	2.54
4	63.86	1.75	0.03	8.49
5	125.36	19.62	1.75	17.82
6	183.94	64.19	13.85	29.51
7	233.82	123.76	43.61	42.58
8	274.61	183.94	87.15	56.27
9	307.57	237.38	136.08	70.10
10	334.22	282.08	183.94	83.74
11	355.90	318.47	227.38	96.99
12	373.69	347.83	265.25	109.74
13	388.42	371.49	297.57	121.94
14	400.73	390.64	324.86	133.56
15	411.12	406.21	347.83	144.61
16	419.94	418.98	367.16	155.09
17	427.50	429.53	383.46	165.04
18	434.03	438.31	397.25	174.47
19	439.70	445.67	408.97	183.42
20	444.66	451.88	418.98	191.91
21	449.02	457.16	427.58	199.97
22	452.88	461.68	434.98	207.62
23	456.30	465.57	441.40	214.90
24	459.35	468.93	446.99	221.83
25	462.09	471.86	451.88	228.43
26	464.55	474.42	456.17	234.72
27	466.78	476.67	459.95	240.73
28	468.80	478.65	463.30	246.46
29	470.63	480.41	466.28	251.94
30	472.30	481.97	468.93	257.18
31	473.83	483.37	471.31	262.20
32	475.23	484.62	473.44	267.02
33	476.52	485.74	475.35	271.63
34	477.71	486.75	477.08	276.06
35	478.80	487.67	478.65	280.31
36	479.82	488.49	480.07	284.41
37	480.76	489.25	481.37	288.34
38	481.64	489.93	482.55	292.13
39	482.45	490.56	483.63	295.78
40	483.21	491.14	484.62	299.30

Table 208. Projected Condition for Transverse Cracking on Detailed Pavement Type: 10.

How Projected: Number per 100' station

Subgrade Factor: 1.00 __ Very Poor

Time, in years	Preventive Maintenance	Light Rehabilitation	Medium Rehabilitation	Heavy Rehabilitation
1	0.00	0.00	0.00	0.00
2	0.02	0.00	0.00	0.00
3	0.78	0.02	0.00	0.00
4	3.13	0.50	0.02	0.08
5	6.01	1.96	0.37	0.41
6	8.59	4.08	1.48	1.07
7	10.69	6.31	3.27	1.98
8	12.33	8.34	5.34	3.05
9	13.61	10.09	7.36	4.16
10	14.62	11.54	9.17	5.27
11	15.41	12.74	10.73	6.32
12	16.05	13.73	12.04	7.30
13	16.56	14.54	13.14	8.21
14	16.99	15.22	14.06	9.03
15	17.34	15.79	14.82	9.79
16	17.63	16.26	15.46	10.47
17	17.88	16.67	16.00	11.09
18	18.09	17.01	16.46	11.66
19	18.27	17.31	16.85	12.17
20	18.43	17.56	17.18	12.64
21	18.57	17.78	17.47	13.07
22	18.69	17.98	17.72	13.46
23	18.79	18.15	17.93	13.81
24	18.88	18.30	18.12	14.14
25	18.97	18.43	18.28	14.44
26	19.04	18.55	18.43	14.72
27	19.11	18.65	18.56	14.98
28	19.17	18.75	18.67	15.22
29	19.22	18.83	18.78	15.44
30	19.27	18.91	18.87	15.64
31	19.31	18.98	18.95	15.83
32	19.35	19.05	19.02	16.01
33	19.39	19.10	19.09	16.18
34	19.42	19.16	19.15	16.33
35	19.46	19.20	19.21	16.48
36	19.48	19.25	19.26	16.61
37	19.51	19.29	19.30	16.74
38	19.53	19.33	19.34	16.86
39	19.56	19.36	19.38	16.97
40	19.58	19.39	19.42	17.08

Table 209. Projected Condition for Ride Score on Detailed Pavement Type: 10.

How Projected: Percent of Ride Quality Lost (0-1)

Subgrade Factor: 1.00 __ Very Poor

Time, in years	Preventive Maintenance	Light Rehabilitation	Medium Rehabilitation	Heavy Rehabilitation
1	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00
3	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00
5	0.00	0.00	0.00	0.00
6	0.00	0.00	0.00	0.00
7	0.00	0.00	0.00	0.00
8	0.28	0.28	0.28	0.28
9	0.89	0.89	0.89	0.89
10	0.99	0.99	0.99	0.99
11	1.00	1.00	1.00	1.00
12	1.00	1.00	1.00	1.00
13	1.00	1.00	1.00	1.00
14	1.00	1.00	1.00	1.00
15	1.00	1.00	1.00	1.00
16	1.00	1.00	1.00	1.00
17	1.00	1.00	1.00	1.00
18	1.00	1.00	1.00	1.00
19	1.00	1.00	1.00	1.00
20	1.00	1.00	1.00	1.00
21	1.00	1.00	1.00	1.00
22	1.00	1.00	1.00	1.00
23	1.00	1.00	1.00	1.00
24	1.00	1.00	1.00	1.00
25	1.00	1.00	1.00	1.00
26	1.00	1.00	1.00	1.00
27	1.00	1.00	1.00	1.00
28	1.00	1.00	1.00	1.00
29	1.00	1.00	1.00	1.00
30	1.00	1.00	1.00	1.00
31	1.00	1.00	1.00	1.00
32	1.00	1.00	1.00	1.00
33	1.00	1.00	1.00	1.00
34	1.00	1.00	1.00	1.00
35	1.00	1.00	1.00	1.00
36	1.00	1.00	1.00	1.00
37	1.00	1.00	1.00	1.00
38	1.00	1.00	1.00	1.00
39	1.00	1.00	1.00	1.00
40	1.00	1.00	1.00	1.00

L	=	level of distress (for distress types) or ride quality lost (for ride quality); and
β	=	beta, a slope factor that controls how steeply condition is lost in the middle of the curve.

We propose that PMIS use this theoretical age equation when projecting future distress ratings and ride quality. As mentioned earlier, "actual" pavement age can be measured in terms of the number of months since the last resurfacing or reconstruction. Because pavement behavior and traffic levels can change unexpectedly, it is better to define pavement age in terms of the actually-observed distress and ride quality.

SUMMARY

The PMIS performance curve equations will help pavement managers "plan ahead," by giving them a consistent way to predict future pavement condition. Describing future pavement condition, though, is still not enough to truly practice effective pavement management. A pavement management system must be able to identify pavement sections which need to be treated and then suggest an effective treatment for each section. This "needs estimate" function will be described in Chapter 4.

IV — NEEDS ESTIMATE

Describing the current condition of pavement sections is helpful for tracking condition trends and for monitoring progress towards meeting pavement condition goals. Predicting future pavement condition is also helpful for planning ahead. But neither of these abilities gives any idea about what to actually do to specific pavements or how much repairing those sections will cost.

DESCRIPTION

TxDOT pavement managers continually evaluate pavements and recommend treatments. These treatments are usually meant to correct surface distress and ride quality problems (e.g., sealing cracks, patching potholes, or levelling up rough spots).

Traffic volume and highway function also influence proposed pavement treatments. High-traffic or major sections (such as Interstate or U.S. highways) tend to be maintained at a higher level, to provide the best possible service to the most number of users. Low-traffic or minor sections (such as State highways or Farm-to-Market roads) tend to be maintained at a lower level, especially when pavement funds are restricted.

It is almost impossible to separate total pavement needs from the reality of limited funding — pavement managers instinctively tend to think in terms of what can be done. But separating "what can be done" from "what needs to be done" is essential to providing the best possible pavement treatments, because what a pavement gets is not always what it needs.

Estimating total pavement needs can also help pavement managers assess the adequacy of current funding. This is more difficult than it seems! For example, consider the case of a District which receives $20 million in rehab each year. When asked if the District gets enough pavement funds each year, a District pavement manager will (almost) always reply "*No.*" But if this $20 million is not enough, then how much is enough? $30 million? $40 million? $50 million?

Comparing actual pavement funds with total needs can be an effective way to document prolonged under-funding. Funding restrictions may "force" the District to use lighter treatments just to get by until the next year — even the best seal coat will not last long on a pavement that needed a full reconstruction.

Some Districts also have trouble balancing preventive maintenance and rehabilitation needs. One year, the District may get an increase in preventive maintenance funds when they really need rehab money. Next year the reverse happens, and the District gets "too much" rehab money and "not enough" preventive maintenance. Pavement managers know that there is a place for both types of funding, but it is often difficult to get them both going in the "right" direction at the same time.

SECTIONS TO BE ANALYZED

We propose that the Needs Estimate program analyze Data Collection Sections and "Management Sections." These terms are defined later in this Chapter. When running the Needs Estimate program, we suggest that users begin with the Data Collection Sections to get the clearest view of exactly where the pavement needs are. The detailed list of Data Collection Section needs can then be used to cluster sections with similar needs. These "clusters" can be used to define Management Sections for use in additional Needs Estimate (or Optimization) runs.

Data Collection Sections

A "Data Collection Section" is an arbitrarily-defined section of highway, usually 0.8 km (0.5-mile) in length. PMIS stores inventory data, distress ratings, and Scores, by Data Collection Section. Data Collection Sections typically range from 0.16 km (0.1-mile) to 1.61 km (1.0-mile) in length.

Management Sections

A "Management Section" is a section of pavement, of similar structure, that the Engineer intends to maintain in a uniform manner. Management Sections are similar to candidate projects — the user enters PMIS, picks a county and highway, and then defines the section limits (beginning and ending Reference Marker and Displacement).

Because Management Sections are meant to simulate candidate projects, we propose that PMIS create the first Management Sections from each District's list of Control-Sections. We also propose that PMIS allow users to alter Management Sections, as needed, in the following ways:

1. Divide (specify a point in the middle of an existing Management Section and create two Management Sections from one);
2. Combine (identify two adjacent Management Sections and create one Management Section from two); and
3. Straddle (identify two adjacent Management Sections, specify a point in the middle of each, and create three Management Sections from two).

This capability is needed to allow users to reflect changes in candidate projects.

Calculating Ratings, Scores, and Treatments for Management Sections

Management Sections can be much longer than the standard 0.8 km (0.5-mile) PMIS Data Collection Section. A Management Section can cover two, ten, or even more Data Collection Sections, and each Data Collection Section can have a different set of PMIS ratings and scores. The pavement manager must somehow consolidate the ratings and scores for each Data Collection Section into a single set of values for the entire Management Section.

When running a Needs Estimate program for Management Sections, we propose that PMIS compute an average rating for each distress type and Ride Score, weighted by the length of the Data Collection Section. Having computed these "composite" ratings and scores, the Needs Estimate program can then analyze the Management Section using the same Needs Estimate process (described later in this Chapter) as that used for Data Collection Sections.

TREATMENT TYPES AND COSTS

To provide the greatest possible use to TxDOT pavement managers, we propose that the PMIS Needs Estimate program identify the type of treatment (if any) that each pavement section needs. However, as mentioned in Chapter 3, these treatment types should be broad because PMIS will not have all of the information necessary to propose a specific pavement or mix design.

The Needs Estimate treatment types should bear some resemblance to actual field treatments, as suggested in Table 210. These treatment types, of course, will change as new technologies and materials become available and as TxDOT "weeds out" less-effective treatments.

To reflect this process of continual improvement in treatment types, we propose that TxDOT annually review its Needs Estimate treatment types and update them, as needed, to reflect new or improved treatments. Table 210 also shows recommended unit costs, in dollars per lane mile (1.61 kilometer), for each treatment type. We recommend that PMIS use these unit costs for the statewide Needs Estimate program. We also recommend that future versions of PMIS use unit costs for each District, to reflect differences in local treatment costs.

Table 210. Examples of Proposed PMIS Treatment Types and Costs.

Pavement Type = 1-3

Treatment Type	Pavement Type		
	1 (CRCP)	2 (JCP, Reinforced)	3 (JCP, Unreinforced)
Preventive Maintenance (PM)	Crack (or Joint) Seal *$6,000 per lane mile* *$3,660 per lane kilometer*	Joint Seal *$6,000 per lane mile* *$3,660 per lane kilometer*	Joint Seal *$6,000 per lane mile* *$3,660 per lane kilometer*
Light Rehabilitation (LRhb)	CPR (Concrete Pavement Restoration) *$60,000 per lane mile* *$36,600 per lane kilometer*	CPR (Concrete Pavement Restoration) *$60,000 per lane mile* *$36,600 per lane kilometer*	CPR (Concrete Pavement Restoration) *$60,000 per lane mile* *$36,600 per lane kilometer*
Medium Rehabilitation (MRhb)	Patch and Asphalt Overlay *$125,000 per lane mile* *$76,250 per lane kilometer*	Patch and Asphalt Overlay *$125,000 per lane mile* *$76,250 per lane kilometer*	Patch and Asphalt Overlay *$125,000 per lane mile* *$76,250 per lane kilometer*
Heavy Rehabilitation or Reconstruction (HRhb)	Concrete Overlay *$400,000 per lane mile* *$244,000 per lane kilometer*	Concrete Overlay *$400,000 per lane mile* *$244,000 per lane kilometer*	Concrete Overlay *$400,000 per lane mile* *$244,000 per lane kilometer*

Note: Treatment costs for rigid pavements proposed by Design Division, Pavements Section.

Table 210 (Continued). Examples of Proposed PMIS Treatment Types and Costs.

Pavement Type = 4-6

Treatment Type	Pavement Type		
	4 (Thick Hot-Mix)	5 (Intermediate Hot-Mix)	6 (Thin Hot-Mix)
Preventive Maintenance (PM)	Crack Seal or Surface Seal *$10,000 per lane mile* *$6,100 per lane kilometer*	Crack Seal or Surface Seal *$10,000 per lane mile* *$6,100 per lane kilometer*	Crack Seal or Surface Seal *$8,000 per lane mile* *$4,880 lane kilometer*
Light Rehabilitation (LRhb)	Thin Asphalt Overlay *$35,000 per lane mile* *$21,350 lane kilometer*	Thin Asphalt Overlay *$35,000 per lane mile* *$21,350 lane kilometer*	Thin Asphalt Overlay *$35,000 per lane mile* *$21,350 per lane kilometer*
Medium Rehabilitation (MRhb)	Thick Asphalt Overlay *$75,000 per lane mile* *$45,750 lane kilometer*	Thick Asphalt Overlay *$75,000 per lane mile* *$45,750 per lane kilometer*	Mill and Asphalt Overlay *$60,000 per lane mile* *$36,600 per lane kilometer*
Heavy Rehabilitation or Reconstruction (HRhb)	Remove Asphalt Surface, Replace and Rework Base *$180,000 per lane mile* *$109,800 lane kilometer*	Remove Asphalt Surface, Replace and Rework Base *$180,000 per lane mile* *$109,800 per lane kilometer*	Reconstruct *$125,000 per lane mile* *$76,250 per lane kilometer*

Table 210 (Continued). Examples of Proposed PMIS Treatment Types and Costs.

Pavement Type = 7-8

Treatment Type	**Pavement Type**	
	7 (Composite, Unwidened)	**8 (Composite, Widened)**
Preventive Maintenance (PM)	Crack Seal or Surface Seal *\$11,000 per lane mile* *\$6,710 per lane kilometer*	Crack Seal or Surface Seal *\$11,000 per lane mile* *\$6,710 per lane kilometer*
Light Rehabilitation (LRhb)	Thin Asphalt Overlay *\$40,000 per lane mile* *\$24,400 per lane kilometer*	Thin Asphalt Overlay *\$40,000 per lane mile* *\$24,400 per lane kilometer*
Medium Rehabilitation (MRhb)	Mill and Asphalt Overlay *\$62,000 per lane mile* *\$37,820 per lane kilometer*	Mill and Asphalt Overlay *\$62,000 per lane mile* *\$37,820 per lane kilometer*
Heavy Rehabilitation or Reconstruction (HRhb)	Remove Asphalt Surface, Replace and Repair Concrete Base *\$175,000 per lane mile* *\$106,750 per lane kilometer*	Remove Asphalt Surface, Replace and Repair Concrete Base *\$175,000 per lane mile* *\$106,750 per lane kilometer*

Table 210 (Continued). Examples of Proposed PMIS Treatment Types and Costs.

Pavement Type = 9-10

Treatment Type	Pavement Type	
	9 (ACP, Overlaid and Widened)	**10 (Seal Coat)**
Preventive Maintenance (PM)	Crack Seal or Surface Seal *$11,000 per lane mile* *$6,710 per lane kilometer*	Surface Seal, No Patching *$6,000 per lane mile* *$3,660 per lane kilometer*
Light Rehabilitation (LRhb)	Thin Asphalt Overlay *$40,000 per lane mile* *$24,400 per lane kilometer*	Surface Seal, Light/Medium Patching *$11,000 per lane mile* *$6,710 per lane kilometer*
Medium Rehabilitation (MRhb)	Thick Asphalt Overlay *$62,000 per lane mile* *$37,820 per lane kilometer*	Surface Seal, Heavy Patching *$20,000 per lane mile* *$12,200 per lane kilometer*
Heavy Rehabilitation or Reconstruction (HRhb)	Remove Asphalt Surface, Replace and Rework Base *$175,000 per lane mile* *$106,750 per lane kilometer*	Rework Base and Surface Seal *$62,000 per lane mile* *$37,820 per lane kilometer*

SELECTING THE TREATMENT TYPE

As mentioned earlier, pavement treatments are usually meant to correct surface distress and ride quality problems. Traffic volume and highway function also play a part in determining the treatment that a particular pavement section needs.

We propose that PMIS use the following seven factors to propose treatments:

1. Pavement type,
2. Distress ratings,
3. Ride Score,
4. Average Daily Traffic (ADT) per lane,
5. Functional class,
6. Average County rainfall (in inches per year), and
7. Time since last surface (in years).

We propose that PMIS use a series of "decision tree" statements to "pick" the treatment type for each pavement section. For example, a decision tree statement might be:

ACP005 RECONST

TYPE OF TREATMENT: Heavy Rehabilitation or Reconstruction (HRhb).

CAUSE: ADT per lane greater than 5,000 **and**
Ride Score less than 2.5.

We propose that PMIS use a "Reason Code" (**ACP005 RECONST** in the example) for each decision tree statement. The "Reason Code" will help the pavement manager identify why PMIS picked the treatment that it did. This is important because there are many combinations of factors which can require the same treatment — PMIS should be able to tell the pavement manager what the specific problem is, instead of just picking a treatment "out of the blue."

As shown above, each Reason Code includes a number that identifies the type and cause of the recommended Needs Estimate treatment. Although the numbers are not specifically significant, the numbers for the ACP Reason Codes have been grouped into similar categories, as shown in Table 211.

Table 211. Grouping of ACP Reason Code Numbers.

Reason Code Number...		Needs Estimate Treatment Type...	When Used...
From	To		
000	099	HRhb	Regardless of Traffic
100	199	MRhb	Regardless of Traffic
200	299	LRhb	Regardless of Traffic
300	399		"HIGH" Traffic
400	499		"LOW" Traffic
500	599	PM	"HIGH" Traffic
600	699		"LOW" Traffic
700	799		Regardless of Traffic
900	999		Time-based Treatments

Note: Similar groupings for CRCP and JCP Reason Codes have not been defined.

The actual proposed decision tree statements and Reason Codes are listed at the end of this Chapter.

Although decision tree statements give a simple way to select treatment types, there are three potential problems which can limit how well they work.

1. Decision tree statements of the "If-Then" variety tend to be "hard-coded" into the needs estimate computer program. If the pavement manager disagrees with the reasoning behind a specific treatment, there is no easy way to change the treatment to make it more "reasonable."

We propose that TxDOT should go ahead and use "hard-coded" decision tree statements, but we also propose that TxDOT should design the PMIS Needs Estimate program with enough flexibility to support "soft-coded" user-defined statements.

2. It is very difficult for a single decision tree statement to cover everything wrong with a particular pavement section. For example, a section could "need" reconstruction because of poor ride quality, but it could also "need" preventive maintenance because of Shallow Rutting — which treatment should be applied?

   We propose that PMIS use a "hierarchical" scheme, with the decision tree statements arranged in the following order: HRhb, MRhb, LRhb, and PM. The Needs Estimate program should begin with the first of the HRhb statements and check each statement until a treatment is selected. If the Needs Estimate program is unable to pick a treatment (i.e., if it runs through all of the decision tree statements), then the section should receive a "Needs Nothing" treatment.

3. It is difficult to write decision tree statements to cover every possible combination of factors on any pavement section. This lack of "closure" can mean that some pavement sections which need to be treated will "fall through the cracks" and not be treated.

   Although we have reviewed the decision tree statements for closure, we propose that TxDOT verify the closure of these statements.

NEEDS ESTIMATE PROCESS

To provide the greatest use to TxDOT pavement managers, the PMIS Needs Estimate program must be able to serve two major functions:

1. It must be able to estimate current and future pavement needs; and
2. It must be able to estimate needs for every pavement section, even though TxDOT only rates 50 percent of the sections in any Fiscal Year.

To serve these major functions, we propose that the PMIS Needs Estimate program run using the following six-step process:

Step 1. User selects run/report parameters;

Step 2. Program selects records which can be analyzed;

Step 3. Program ages all records to the first Fiscal Year selected by the user;

Step 4. Program selects treatments (using the decision tree statements) and costs;

Step 5. Program lists results for each report which the user has requested in Step 1; and

Step 6. Program returns back to Step 3 if a multi-year Needs Estimate was requested.

We also propose that Steps 1-4 be used to start the PMIS Optimization program. Chapter 5 will describe the Optimization program in greater detail.

Step 1. User selects run/report parameters

PMIS should allow users to run the Needs Estimate program for the current Fiscal Year and up to 10 years in the future. Users should also be able to run the Needs Estimate program by District, County, Maintenance Section, Highway System, Roadbed, and specific Reference Marker limits.

Ability to run the Needs Estimate program for future years is especially important because Districts have to estimate pavement needs one year in advance when answering pavement program calls.

Step 2. Program selects records which can be analyzed

The Needs Estimate program should then run through the data one time and identify those pavement sections that cannot be analyzed. This step will reduce run time spent trying to analyze sections with insufficient data. Table 212 shows the data items which should be specifically required for analysis.

Table 212. Proposed Data Items Required for Analysis.

Data Item	Reason Needed
Pavement Type	for decision tree statements
Distress Ratings	for decision tree statements
Ride Score	for decision tree statements
ADT	for decision tree statements
Number of Lanes	for decision tree statements (ADT per lane), and to compute treatment cost in terms of lane miles
Functional Class	for decision tree statements, and for Executive Summary report
County	for decision tree statements, and for computing future needs (supplies average county subgrade support factor to performance curves)
Date of Last Surface	for decision tree statements, and for scheduling preventive maintenance seal coats (in Optimization program)
18-k ESAL	for computing future needs (supplies traffic factor to performance curves)
Section Length	for computing treatment cost in terms of lane miles

We propose that PMIS include a page on the Needs Estimate printout that summarizes the amount of "un-analyzable" data found.

Step 3. Program ages all records to the first Fiscal Year selected by the user

The Needs Estimate program should then use the PMIS performance equations to age all "analyzable" records to the first Fiscal Year selected by the user. This approach would allow PMIS to estimate needs for every pavement section, even though TxDOT only rates 50 percent of the sections in any year. Ideally, PMIS should have to go back no further than one year to find data (because of the proposed alternating 50 percent sample) for every section.

To use the performance equations, PMIS must input the age of the pavement section (as described in Chapter 3). Given the absence of reliable pavement history information, we propose that PMIS back-calculate the pavement's age using the

Theoretical Age equation shown at the end of Chapter 3. We also propose that PMIS use the HRhb performance curve coefficients. For example, consider a 0.8 km (0.5-mile) Data Collection Section (Pavement Type = 6) with the FY 1993 distress ratings shown below in Table 213.

Table 213. Example Needs Estimate (Distress Ratings).

Distress Type	Rating	Distress Type	Rating
Shallow Rutting	15 percent	Block Cracking	12 percent
Deep Rutting	6 percent	Alligator Cracking	7 percent
Patching	13 percent	Longitudinal Cracking	35 feet/station
Failures	2 failures	Transverse Cracking	2 per station

To age the section for a report beginning in FY 1995, the Needs Estimate program must calculate the FY 1993 theoretical age for each distress type (and ride quality), and then add two to get the FY 1995 value. This process is shown below in Table 214.

Table 214. Example Needs Estimate (Theoretical Ages).

Distress Type	Rating	L_i	Theoretical Age, in years	
			FY 1993	FY 1995
Shallow Rutting	15	15 percent	4.51	6.51
Deep Rutting	6	6 percent	4.78	6.78
Failures	2	1 per mile	4.00	6.00
Block Cracking	12	12 percent	6.76	7.86
Alligator Cracking	7	7 percent	4.54	6.54
Longitudinal Cracking	35	35 ft./sta.	6.43	8.43
Transverse Cracking	2	2 per sta.	7.02	9.02

Patching is not projected because no performance curves are defined. The theoretical age for Ride Score is not shown, but it is calculated in a similar fashion.

The calculated FY 1995 theoretical ages can then be used to determine the distress ratings and utility factors, as shown below in Table 215.

Table 215. Example Needs Estimate (Distress Ratings and Utility Factors).

Distress Type	FY 1995 Theoretical Age, in years	L_i	Rating	Utility Factor
Shallow Rutting	6.51	47.48 percent	47	0.7954
Deep Rutting	6.78	13.75 percent	14	0.7887
Failures	6.00	3.55 per mile	2	0.7339
Block Cracking	8.76	23.16 percent	23	0.6788
Alligator Cracking	6.54	23.80 percent	24	0.6215
Longitudinal Cracking	8.43	62.23 ft./sta.	62	0.9548
Transverse Cracking	9.02	4.19 per sta.	4	0.9422

"Rating" is integer value shown on reports. Internal decimal values are used for utility calculation and treatment selection.

With the newly-calculated "current" distress ratings, the program can go to the next step.

Step 4. Program selects treatments (using the decision tree statements) and costs

The PMIS Needs Estimate program should then select treatments and costs using the decision tree statements.

Step 5. Program lists results for each report which the user has requested in Step 1

Having selected treatments and costs for all of the "analyzable" sections, the program should list out the results for those reports that the user requested. The printouts will only be for the "current" Fiscal Year.

Step 6. Program returns to Step 3 if a multi-year Needs Estimate was requested

If the user has only asked for a single-year Needs Estimate, the program ends at Step 5. If the user has asked for a multi-year Needs Estimate, the program must age the sections by one year and return to Step 3. For the example section described above, the calculation of theoretical ages is shown below in Table 216.

Table 216. Example Needs Estimate (Theoretical Ages, After Treatment).

Distress Type	Theoretical Age, in years		
	FY 1995	FY 1996 (if treated)	FY 1996 (if not treated)
Shallow Rutting	6.51	1.001	7.51
Deep Rutting	6.78	1.001	7.78
Failures	6.00	1.001	7.00
Block Cracking	8.76	1.001	9.76
Alligator Cracking	6.54	1.001	7.54
Longitudinal Cracking	8.43	1.001	9.43
Transverse Cracking	9.02	1.001	10.02

Theoretical age is set equal to 0.001 if a section is treated (0.001 eliminates "divide by zero" errors). The "treated" section is then aged to the next Fiscal Year.

NEEDS ESTIMATE REPORTS

A PMIS Needs Estimate list of each Data Collection Section for an entire District would produce about 150 pages of printout. Although such a list would be useful for locating specific pavements and treatments, it would hardly be useful for managing pavements across the entire District. A Needs Estimate report for Management Sections would reduce the size of the printout, but it still would not help with the problem of managing pavements across the entire District. Upper-level pavement managers need summary reports which give an overall view of the District's total pavement needs.

Therefore, we propose that PMIS include the following types of Needs Estimate reports:

1. Detail List of Sections Which Need to be Treated;
2. Statewide Pavement Needs, by District;
3. Statewide Pavement Needs, by Highway System;
4. Statewide Pavement Needs, Executive Summary;
5. District Pavement Needs, by Highway System; and
6. District Pavement Needs, Executive Summary.

Detail List of Sections Which Need to be Treated

We propose that the Needs Estimate program have a report which lists each section and its "needed" treatment (if any). The report should include basic location information (District, County, Highway, Reference Marker limits, and Roadbed), PMIS Scores, and the Needs Estimate treatment and cost.

The report should also include a "treatment code," derived from the decision tree statements, which describes why the treatment was selected. Such a code will make it easier for District users to understand how the Needs Estimate program works. It will also help TxDOT calibrate the Needs Estimate program by allowing users to identify disagreements with specific sections, treatment types, and costs. This "detail report" will also help District users to create Management Sections by locating clusters of Data Collection Sections with similar treatments.

Statewide Pavement Needs, by District

We propose that the Needs Estimate program have a report that summarizes the total Statewide lane miles and dollars needed, by District. Tables 217 and 218 illustrate the proposed report format for lane miles and dollars, respectively.

Statewide Pavement Needs, by Highway System

We propose that the Needs Estimate program also have a report that summarizes the total Statewide lane miles and dollars needed, by Highway System. Tables 219 and 220 illustrate the proposed report format for lane miles and dollars, respectively.

Statewide Pavement Needs, Executive Summary

We also propose that PMIS provide a Statewide summary Needs Estimate report for use in TxDOT's Executive Information System. This report should summarize total statewide lane miles and dollars needed, as shown in Tables 221 and 222. This report should also print one page for each District. The Statewide Executive Summary report should only be accessible to Austin Division users. A District version of this report is described later in this Chapter.

District Pavement Needs, by Highway System

We propose that the Needs Estimate program also have a report that summarizes the total District lane miles and dollars needed, by Highway System. Tables 223 and 224 illustrate the proposed report format for lane miles and dollars, respectively.

District Pavement Needs, Executive Summary

As with the Statewide analysis, we propose that PMIS provide a District summary Needs Estimate report for use in TxDOT's Executive Information System. This report should summarize total lane miles and dollars needed, for each District, as shown in Tables 225 and 226. These District reports should be accessible to any District user.

Table 217. Proposed Statewide Pavement Needs (Lane Miles), by District, Report.

Notes: Miles are in Lane Miles
Fiscal Year: 1995 Dollar Values are in Thousands Funding = Unlimited

District	Needs Nothing Miles	Needs Nothing Pct.	Prev. Maint. Miles	Prev. Maint. Pct.	Light Rehab Miles	Light Rehab Pct.	Medium Rehab Miles	Medium Rehab Pct.	Heavy Rehab/ Reconstruction Miles	Heavy Rehab/ Reconstruction Pct.	TOTAL Miles	TOTAL Pct.
01												
02												
.												
.												
24												
25												
STATEWIDE												

Table 218. Proposed Statewide Pavement Needs (Dollars), by District, Report.

Notes: Miles are in Lane Miles
Fiscal Year: 1995 Dollar Values are in Thousands Funding = Unlimited

District	Needs Nothing Dollars	Needs Nothing Pct.	Prev. Maint. Dollars	Prev. Maint. Pct.	Light Rehab Dollars	Light Rehab Pct.	Medium Rehab Dollars	Medium Rehab Pct.	Heavy Rehab/ Reconstruction Dollars	Heavy Rehab/ Reconstruction Pct.	TOTAL Dollars	TOTAL Pct.
01												
02												
.												
.												
24												
25												
STATEWIDE												

Table 219. Proposed Statewide Pavement Needs (Lane Miles), by Highway System, Report.

Notes: Miles are in Lane Miles
Fiscal Year: 1995 **Dollar Values are in Thousands** **Funding = Unlimited**

PMIS Highway System	Needs Nothing		Prev. Maint.		Light Rehab		Medium Rehab		Heavy Rehab/ Reconstruction		TOTAL	
	Miles	Pct.	Miles	Pct.	Miles	Pct.	Miles	Pct.	Miles	Pct.	Miles	Pct.
IH												
US												
SH												
FM												
PR												
BR												
STATEWIDE												

Table 220. Proposed Statewide Pavement Needs (Dollars), by Highway System, Report.

Notes: Miles are in Lane Miles
Fiscal Year: 1995 **Dollar Values are in Thousands** **Funding = Unlimited**

PMIS Highway System	Needs Nothing		Prev. Maint.		Light Rehab		Medium Rehab		Heavy Rehab/ Reconstruction		TOTAL	
	Dollars	Pct.	Dollars	Pct.	Dollars	Pct.	Dollars	Pct.	Dollars	Pct.	Dollars	Pct.
IH												
US												
SH												
FM												
PR												
BR												
STATEWIDE												

Table 221. Proposed Statewide Pavement Needs (Lane Miles), Executive Summary, Report.

Fiscal Year: 1995
Statewide

PMIS Functional Class	Needs Nothing		Prev. Maint./ Light Rehab		Medium Rehab/ Heavy Rehab		TOTAL	
	Miles	Pct.	Miles	Pct.	Miles	Pct.	Miles	Pct.
IH & Other Fwy/Expwy								
US Non-Fwy/Expwy								
Secondary								
STATEWIDE								

Fiscal Year: 1995
District: 17 Bryan

PMIS Functional Class	Needs Nothing		Prev. Maint./ Light Rehab		Medium Rehab/ Heavy Rehab		TOTAL	
	Miles	Pct.	Miles	Pct.	Miles	Pct.	Miles	Pct.
IH & Other Fwy/Expwy								
US Non-Fwy/Expwy								
Secondary								
DISTRICT 17								

Table 222. Proposed Statewide Pavement Needs (Dollars), Executive Summary, Report.

Fiscal Year: 1995
Statewide

PMIS Functional Class	Prev. Maint./ Light Rehab		Medium Rehab/ Heavy Rehab		TOTAL	
	Dollars	Pct.	Dollars	Pct.	Dollars	Pct.
IH & Other Fwy/Expwy						
US Non-Fwy/Expwy						
Secondary						
STATEWIDE						

Fiscal Year: 1995
District: 17 Bryan

PMIS Functional Class	Prev. Maint./ Light Rehab		Medium Rehab/ Heavy Rehab		TOTAL	
	Dollars	Pct.	Dollars	Pct.	Dollars	Pct.
IH & Other Fwy/Expwy						
US Non-Fwy/Expwy						
Secondary						
DISTRICT 17						

Table 223. Proposed District Pavement Needs (Lane Miles), by Highway System, Report.

Fiscal Year: 1995 Notes: Miles are in Lane Miles
District: 08 Abilene Dollar Values are in Thousands Funding = Unlimited

PMIS Highway System	Needs Nothing Miles	Needs Nothing Pct.	Prev. Maint. Miles	Prev. Maint. Pct.	Light Rehab Miles	Light Rehab Pct.	Medium Rehab Miles	Medium Rehab Pct.	Heavy Rehab/ Reconstruction Miles	Heavy Rehab/ Reconstruction Pct.	TOTAL Miles	TOTAL Pct.
IH												
US												
SH												
FM												
PR												
BR												
DISTRICT 08												

Table 224. Proposed District Pavement Needs (Dollars), by Highway System, Report.

Fiscal Year: 1995 Notes: Miles are in Lane Miles
District: 08 Abilene Dollar Values are in Thousands Funding = Unlimited

PMIS Highway System	Needs Nothing Dollars	Needs Nothing Pct.	Prev. Maint. Dollars	Prev. Maint. Pct.	Light Rehab Dollars	Light Rehab Pct.	Medium Rehab Dollars	Medium Rehab Pct.	Heavy Rehab/ Reconstruction Dollars	Heavy Rehab/ Reconstruction Pct.	TOTAL Dollars	TOTAL Pct.
IH												
US												
SH												
FM												
PR												
BR												
DISTRICT 08												

Table 225. Proposed District Pavement Needs (Lane Miles), Executive Summary, Report.

Fiscal Year: 1995
District: 17 Bryan

PMIS Functional Class	Needs Nothing		Prev. Maint./ Light Rehab		Medium Rehab/ Heavy Rehab		TOTAL	
	Miles	Pct.	Miles	Pct.	Miles	Pct.	Miles	Pct.
IH & Other Fwy/Expwy								
US Non-Fwy/Expwy								
Secondary								
DISTRICT 01								

Fiscal Year: 1995
District: 17 Bryan **County:** 026 Burleson

PMIS Functional Class	Needs Nothing		Prev. Maint./ Light Rehab		Medium Rehab/ Heavy Rehab		TOTAL	
	Miles	Pct.	Miles	Pct.	Miles	Pct.	Miles	Pct.
IH & Other Fwy/Expwy								
US Non-Fwy/Expwy								
Secondary								
COUNTY 026								

Fiscal Year: 1995
District: 17 Bryan **Maintenance Section:** 04 Caldwell

PMIS Functional Class	Needs Nothing		Prev. Maint./ Light Rehab		Medium Rehab/ Heavy Rehab		TOTAL	
	Miles	Pct.	Miles	Pct.	Miles	Pct.	Miles	Pct.
IH & Other Fwy/Expwy								
US Non-Fwy/Expwy								
Secondary								
MAINTENANCE SECTION 04								

Table 226. Proposed District Pavement Needs (Dollars), Executive Summary, Report.

Fiscal Year: 1995
District: 17 Bryan

PMIS Functional Class	Prev. Maint./ Light Rehab		Medium Rehab/ Heavy Rehab		TOTAL	
	Dollars	Pct.	Dollars	Pct.	Dollars	Pct.
IH & Other Fwy/Expwy						
US Non-Fwy/Expwy						
Secondary						
DISTRICT 17						

Fiscal Year: 1995
District: 17 Bryan County: 026 Burleson

PMIS Functional Class	Prev. Maint./ Light Rehab		Medium Rehab/ Heavy Rehab		TOTAL	
	Dollars	Pct.	Dollars	Pct.	Dollars	Pct.
IH & Other Fwy/Expwy						
US Non-Fwy/Expwy						
Secondary						
COUNTY 026						

Fiscal Year: 1995
District: 17 Bryan Maintenance Section: 04 Caldwell

PMIS Functional Class	Prev. Maint./ Light Rehab		Medium Rehab/ Heavy Rehab		TOTAL	
	Dollars	Pct.	Dollars	Pct.	Dollars	Pct.
IH & Other Fwy/Expwy						
US Non-Fwy/Expwy						
Secondary						
MAINTENANCE SECTION 04						

This report is a duplicate of the District-by-District pages printed in the Statewide Executive Summary report. This duplication will give District pavement managers the same information that the TxDOT Administration has, and thus allow the Districts to proactively anticipate and correct pavement problems before they become serious enough to warrant "Administrative" attention.

We also propose that the District Executive Summary report print one page for each County and one page for each Maintenance Section, to help the District allocate enough of its available pavement funds to each Area Office and Maintenance Section.

PROPOSED PMIS NEEDS ESTIMATE DECISION TREE STATEMENTS

Selecting a Needs Estimate treatment begins with a classification of the pavement section's traffic level, as shown in Table 227.

Table 227. "Low" and "High" ADT per Lane Values.

If Functional Class is...	then 'Low' ADT per Lane is...	and 'High' ADT per Lane is
1 Rural Interstate	1 to 7,499	7,500 to 999,999
2 Rural Principal Arterial (Other)	1 to 7,499	7,500 to 999,999
6 Rural Minor Arterial	1 to 2,999	3,000 to 999,999
7 Rural Major Collector	1 to 1,999	2,000 to 999,999
8 Rural Minor Collector	1 to 1,999	2,000 to 999,999
9 Rural Local	1 to 1,999	2,000 to 999,999
11 Urban Principal Arterial (Interstate)	1 to 7,499	7,500 to 999,999
12 Urban Principal Arterial (Other Freeway)	1 to 7,499	7,500 to 999,999
14 Urban Principal Arterial (Other)	1 to 7,499	7,500 to 999,999
16 Urban Minor Arterial	1 to 2,999	3,000 to 999,999
17 Urban Collector	1 to 1,999	2,000 to 999,999
19 Urban Local	1 to 1,999	2,000 to 999,999

Note: PMIS does not use Functional Class values of 3, 4, 5, 10, 13, 15, or 18. ADT per lane values are in vehicles per day, by roadbed.

These values are the same for all pavement types. However, we propose that TxDOT review the values for each Pavement Type and change them, if necessary. After classifying the section's traffic level, PMIS can select the Needs Estimate treatment by using the decision tree statements. We propose that PMIS assign Reason Codes to each decision tree statement, as shown in Table 228 (for CRCP), Table 229 (for JCP), and Table 230 (for ACP).

SUMMARY

The PMIS Needs Estimate program will give pavement managers a consistent way to identify "problem" pavement sections. It will also give a way to estimate the total amount of work (in terms of lane miles and dollars) necessary to fix all of the problem sections. Tracking these total needs over time will help the pavement manager monitor progress made in improving overall pavement condition.

However, the Needs Estimate program assumes that resources (especially funding) are unlimited — and this is obviously not the case. The pavement manager also needs a way to deal with the reality of limited resources, and some way to get the best possible use out of those resources. The PMIS approach to these problems is through its Optimization program, which will be described in Chapter 5.

Table 228. Needs Estimate Reason Codes for CRCP (Pavement Type = 1).

CRC010 RECONST

TYPE OF TREATMENT: Heavy Rehabilitation or Reconstruction (HRhb).

CAUSE: Average Crack Spacing less than 4 feet **and**
Average County Rainfall greater than 40 inches per year.

CRC015 RECONST

TYPE OF TREATMENT: Heavy Rehabilitation or Reconstruction (HRhb).

CAUSE: ADT per lane equal to 'HIGH' **and**
The sum of (Punchouts + Asphalt Patches + Concrete Patches)
greater than 8 per mile.

CRC016 RECONST

TYPE OF TREATMENT: Heavy Rehabilitation or Reconstruction (HRhb).

CAUSE: ADT per lane equal to 'HIGH' **and**
Average Crack Spacing less than or equal to 2 feet **and**
The sum of (Punchouts + Asphalt Patches + Concrete Patches)
greater than 6 per mile.

CRC020 RECONST

TYPE OF TREATMENT: Heavy Rehabilitation or Reconstruction (HRhb).

CAUSE: ADT per lane equal to 'HIGH' **and**
Average Crack Spacing less than 6 feet **and**
Ride Score less than 2.5

CRC021 MED REHAB

TYPE OF TREATMENT: Medium Rehabilitation (MRhb).

CAUSE: ADT per lane equal to 'HIGH' **and**
Average Crack Spacing less than or equal to 2 feet **and**
The sum of (Punchouts + Asphalt Patches + Concrete Patches)
greater than 3 per mile.

Table 228 (Continued). Needs Estimate Reason Codes for CRCP (Pavement Type = 1).

CRC025 MED REHAB

TYPE OF TREATMENT: Medium Rehabilitation (MRhb).

CAUSE: ADT per lane equal to 'HIGH' **and**
Spalled Cracks greater than 20 percent.

CRC030 MED REHAB

TYPE OF TREATMENT: Medium Rehabilitation (MRhb).

CAUSE: ADT per lane equal to 'HIGH' **and**
Ride Score less than 3.0

CRC035 LIGHT REHAB

TYPE OF TREATMENT: Light Rehabilitation (LRhb).

CAUSE: ADT per lane equal to 'HIGH' **and**
Punchouts greater than 0 per mile.

CRC040 RECONST

TYPE OF TREATMENT: Heavy Rehabilitation or Reconstruction (HRhb).

CAUSE: ADT per lane equal to 'LOW' **and**
The sum of (Punchouts + Asphalt Patches + Concrete Patches) greater than 10 per mile.

CRC041 RECONST

TYPE OF TREATMENT: Heavy Rehabilitation or Reconstruction (HRhb).

CAUSE: ADT per lane equal to 'LOW' **and**
Average Crack Spacing less than or equal to 2 feet **and**
The sum of (Punchouts + Asphalt Patches + Concrete Patches) greater than 8 per mile.

Table 228 (Continued). Needs Estimate Reason Codes for CRCP (Pavement Type = 1).

CRC045 MED REHAB

TYPE OF TREATMENT: Medium Rehabilitation (MRhb).

CAUSE: ADT per lane equal to 'LOW' **and**
Spalled Cracks greater than 33 percent.

CRC046 MED REHAB

TYPE OF TREATMENT: Medium Rehabilitation (MRhb).

CAUSE: ADT per lane equal to 'LOW' **and**
Average Crack Spacing less than or equal to 2 feet **and**
The sum of (Punchouts + Asphalt Patches + Concrete Patches) greater than 4 per mile.

CRC050 MED REHAB

TYPE OF TREATMENT: Medium Rehabilitation (MRhb).

CAUSE: ADT per lane equal to 'LOW' **and**
Ride Score less than 2.5

CRC055 LIGHT REHAB

TYPE OF TREATMENT: Light Rehabilitation (LRhb).

CAUSE: ADT per lane equal to 'LOW' **and**
Punchouts greater than 0 per mile.

Table 229. Reason Codes for JCP (Pavement Type = 2-3).

JCP005 RECONST

TYPE OF TREATMENT: Heavy Rehabilitation or Reconstruction (HRhb).

CAUSE: ADT per lane equal to 'HIGH' **and**
Failed Joints and Cracks greaterh than 33 percent.

JCP010 RECONST

TYPE OF TREATMENT: Heavy Rehabilitation or Reconstruction (HRhb).

CAUSE: ADT per lane equal to 'HIGH' **and**
Shattered Slabs greater than 10 per mile.

JCP015 RECONST

TYPE OF TREATMENT: Heavy Rehabilitation or Reconstruction (HRhb).

CAUSE: ADT per lane equal to 'HIGH' **and**
Failures greater than 50 per mile.

JCP020 RECONST

TYPE OF TREATMENT: Heavy Rehabilitation or Reconstruction (HRhb).

CAUSE: ADT per lane equal to 'HIGH' **and**
Slabs With Longitudinal Cracks greater than 20 percent.

JCP025 RECONST

TYPE OF TREATMENT: Heavy Rehabilitation or Reconstruction (HRhb).

CAUSE: ADT per lane equal to 'HIGH' **and**
Concrete Patches greater than 10 per mile.

Table 229 (Continued). Reason Codes for JCP (Pavement Type = 2-3).

JCP030 RECONST

TYPE OF TREATMENT: Heavy Rehabilitation or Reconstruction (HRhb).

CAUSE: ADT per lane equal to 'HIGH' **and**
Shattered Slabs greater than 5 per mile **and**
Ride Score less than 3.5

JCP035 RECONST

TYPE OF TREATMENT: Heavy Rehabilitation or Reconstruction (HRhb).

CAUSE: ADT per lane equal to 'HIGH' **and**
Failed Joints and Cracks greater than 15 percent **and**
Ride Score less than 3.5

JCP040 RECONST

TYPE OF TREATMENT: Heavy Rehabilitation or Reconstruction (HRhb).

CAUSE: ADT per lane equal to 'HIGH' **and**
Failures greater than 25 per mile **and**
Ride Score less than 3.5

JCP045 MED REHAB

TYPE OF TREATMENT: Medium Rehabilitation (MRhb).

CAUSE: ADT per lane equal to 'HIGH' **and**
Ride Score less than 3.0

JCP050 LIGHT REHAB

TYPE OF TREATMENT: Light Rehabilitation (LRhb).

CAUSE: ADT per lane equal to 'HIGH' **and**
Failed Joints and Cracks greater than 0 percent.

Table 229 (Continued). Reason Codes for JCP (Pavement Type = 2-3).

JCP055 LIGHT REHAB

TYPE OF TREATMENT: Light Rehabilitation (LRhb).

CAUSE: ADT per lane equal to 'HIGH' **and**
Shattered Slabs greater than 0 per mile.

JCP060 PREV MAINT

TYPE OF TREATMENT: Preventive Maintenance (PM).

CAUSE: ADT per lane equal to 'HIGH' **and**
Slabs With Longitudinal Cracks greater than 0 percent.

JCP065 MED REHAB

TYPE OF TREATMENT: Medium Rehabilitation (MRhb).

CAUSE: ADT per lane equal to 'LOW' **and**
Ride Score less than 2.5

JCP070 MED REHAB

TYPE OF TREATMENT: Medium Rehabilitation (MRhb).

CAUSE: ADT per lane equal to 'LOW' **and**
Shattered Slab greater than 10 per mile.

JCP075 MED REHAB

TYPE OF TREATMENT: Medium Rehabilitation (MRhb).

CAUSE: ADT per lane equal to 'LOW' **and**
Failures greater than 50 per mile.

Table 229 (Continued). Reason Codes for JCP (Pavement Type = 2-3).

JCP080 MED REHAB

TYPE OF TREATMENT: Medium Rehabilitation (MRhb).

CAUSE: ADT per lane equal to 'LOW' **and**
Failed Joints and Cracks greater than 50 percent.

JCP085 LIGHT REHAB

TYPE OF TREATMENT: Light Rehabilitation (LRhb).

CAUSE: ADT per lane equal to 'LOW' **and**
Failed Joints and Cracks greater than 0 percent.

JCP090 LIGHT REHAB

TYPE OF TREATMENT: Light Rehabilitation (LRhb).

CAUSE: ADT per lane equal to 'LOW' **and**
Shattered Slabs greater than 0 per mile.

JCP095 PREV MAINT

TYPE OF TREATMENT: Preventive Maintenance (PM).

CAUSE: ADT per lane equal to 'LOW' **and**
Slabs With Longitudinal Cracks greater than 0 percent.

Table 230. Reason Codes for ACP (Pavement Type = 4-10).

ACP005 RECONST

TYPE OF TREATMENT: Heavy Rehabilitation or Reconstruction (HRhb).

CAUSE: ADT per lane greater than 5,000 **and**
Ride Score less than 2.5

ACP010 RECONST

TYPE OF TREATMENT: Heavy Rehabilitation or Reconstruction (HRhb).

CAUSE: ADT per lane greater than 750 **and**
Ride Score less than 2.0

ACP015 RECONST

TYPE OF TREATMENT: Heavy Rehabilitation or Reconstruction (HRhb).

CAUSE: Ride Score less than 1.5

ACP020 RECONST

TYPE OF TREATMENT: Heavy Rehabilitation or Reconstruction (HRhb).

CAUSE: Deep Rutting greater than 50 percent.

ACP025 RECONST

TYPE OF TREATMENT: Heavy Rehabilitation or Reconstruction (HRhb).

CAUSE: ADT per lane greater than 750 **and**
Alligator Cracking greater than 50 percent **and**
Ride Score less than 3.0

Table 230 (Continued). Reason Codes for ACP (Pavement Type = 4-10).

ACP030 RECONST

TYPE OF TREATMENT: Heavy Rehabilitation or Reconstruction (HRhb).

CAUSE: Alligator Cracking greater than 50 percent **and**
Ride Score less than 2.5

ACP100 MED REHAB

TYPE OF TREATMENT: Medium Rehabilitation (MRhb).

CAUSE: ADT per lane greater than 5,000 **and**
Ride Score less than 3.0

ACP105 MED REHAB

TYPE OF TREATMENT: Medium Rehabilitation (MRhb).

CAUSE: ADT per lane greater than 750 **and**
Ride Score less than 2.5

ACP110 MED REHAB

TYPE OF TREATMENT: Medium Rehabilitation (MRhb).

CAUSE: Ride Score less than 2.0

ACP115 MED REHAB

TYPE OF TREATMENT: Medium Rehabilitation (MRhb).

CAUSE: ADT per lane greater than 750 **and**
Deep Rutting greater than 25 percent.

Table 230 (Continued). Reason Codes for ACP (Pavement Type = 4-10).

ACP120 MED REHAB

TYPE OF TREATMENT: Medium Rehabilitation (MRhb).

CAUSE: Alligator Cracking greater than 50 percent.

ACP125 MED REHAB

TYPE OF TREATMENT: Medium Rehabilitation (MRhb).

CAUSE: ADT per lane greater than 5,000 **and**
Alligator Cracking greater than 10 percent.

ACP130 MED REHAB

TYPE OF TREATMENT: Medium Rehabilitation (MRhb).

CAUSE: Failures greater than or equal to 10 per mile.

ACP135 MED REHAB

TYPE OF TREATMENT: Medium Rehabilitation (MRhb).

CAUSE: ADT per lane greater than 750 **and**
Failures greater than or equal to 5 per mile.

ACP140 MED REHAB

TYPE OF TREATMENT: Medium Rehabilitation (MRhb).

CAUSE: ADT per lane greater than 750 **and**
Block Cracking greater than 50 percent.

Table 230 (Continued). Reason Codes for ACP (Pavement Type = 4-10).

ACP200 LIGHT REHAB

TYPE OF TREATMENT: Medium Rehabilitation (MRhb).

CAUSE: Ride Score less than 2.5

ACP300 LIGHT REHAB

TYPE OF TREATMENT: Light Rehabilitation (LRhb).

CAUSE: ADT per lane equal to 'HIGH' **and**
Shallow Rutting greater than 25 percent.

ACP305 LIGHT REHAB

TYPE OF TREATMENT: Light Rehabilitation (LRhb).

CAUSE: ADT per lane equal to 'HIGH' **and**
Deep Rutting greater than 10 percent.

ACP310 LIGHT REHAB

TYPE OF TREATMENT: Light Rehabilitation (LRhb).

CAUSE: ADT per lane equal to 'HIGH' **and**
Ride Score less than 3.0

ACP400 PREV MAINT

TYPE OF TREATMENT: Preventive Maintenance (PM).

CAUSE: ADT per lane equal to 'LOW' **and**
Shallow Rutting greater than 50 percent.

Table 230 (Continued). Reason Codes for ACP (Pavement Type = 4-10).

ACP405 PREV MAINT

TYPE OF TREATMENT: Preventive Maintenance (PM).

CAUSE: ADT per lane equal to 'LOW' **and**
Deep Rutting greater than 10 percent.

ACP500 PREV MAINT

TYPE OF TREATMENT: Preventive Maintenance (PM).

CAUSE: ADT per lane equal to 'HIGH' **and**
Block Cracking greater than 5 percent.

ACP505 PREV MAINT

TYPE OF TREATMENT: Preventive Maintenance (PM).

CAUSE: ADT per lane equal to 'HIGH' **and**
Failures greater than 1 per mile.

ACP510 PREV MAINT

TYPE OF TREATMENT: Preventive Maintenance (PM).

CAUSE: ADT per lane equal to 'HIGH' **and**
Alligator Cracking greater than 5 percent.

ACP515 PREV MAINT

TYPE OF TREATMENT: Preventive Maintenance (PM).

CAUSE: ADT per lane equal to 'HIGH' **and**
Longitudinal Cracking greater than 50 feet per station.

Table 230 (Continued). Reason Codes for ACP (Pavement Type = 4-10).

ACP520 PREV MAINT

TYPE OF TREATMENT: Preventive Maintenance (PM).

CAUSE: ADT per lane equal to 'HIGH' **and**
Transverse Cracking greater than 2 per station.

ACP600 PREV MAINT

TYPE OF TREATMENT: Preventive Maintenance (PM).

CAUSE: ADT per lane equal to 'LOW' **and**
Alligator Cracking greater than 5 percent.

ACP605 PREV MAINT

TYPE OF TREATMENT: Preventive Maintenance (PM).

CAUSE: ADT per lane equal to 'LOW' **and**
Block Cracking greater than 5 percent.

ACP610 PREV MAINT

TYPE OF TREATMENT: Preventive Maintenance (PM).

CAUSE: ADT per lane equal to 'LOW' **and**
Failures greater than 1 per mile.

Table 230 (Continued). Reason Codes for ACP (Pavement Type = 4-10).

ACP615 PREV MAINT

TYPE OF TREATMENT: Preventive Maintenance (PM).

CAUSE: ADT per lane equal to 'LOW' **and**
Longitudinal Cracking greater than 50 feet per station.

ACP620 PREV MAINT

TYPE OF TREATMENT: Preventive Maintenance (PM).

CAUSE: ADT per lane equal to 'LOW' **and**
Transverse Cracking greater than 2 per station.

ACP700 PREV MAINT

TYPE OF TREATMENT: Preventive Maintenance (PM).

CAUSE: Shallow Rutting greater than 25 percent.

ACP705 PREV MAINT

TYPE OF TREATMENT: Preventive Maintenance (PM).

CAUSE: Deep Rutting greater than 0 percent.

ACP900 PREV MAINT

TYPE OF TREATMENT: Preventive Maintenance (PM).

CAUSE: Time since last surface greater than 7 years.

Author's Note: This treatment has not been used in the current version of PMIS, pending availability of current pavement layer and work history information.

V — OPTIMIZATION

Identifying total pavement needs is helpful for locating problem sections and balancing preventive maintenance and rehabilitation funding requirements, but it assumes that funding is unlimited. The reality is that pavement funding is limited. Pavement managers must pick the right section, the right treatment, and the right time to get the most effectiveness out of their limited funds.

DESCRIPTION

Limited funding forces the pavement manager to choose between giving a section the treatment that it needs and giving a section some lesser treatment. Sometimes, the pavement manager must forego treating the section altogether, and rely upon routine maintenance to keep the section together until it can be treated. It is also possible that a section might be treated earlier, to take advantage of other work being done at the same time (e.g., pavement rehab done during a widening project).

Limited funding sometimes forces pavement managers to adopt a "worst first" strategy towards treating pavements. Although this strategy fixes the worst roads, it is not able to fix very many — "worst first" involves many reconstruction treatments, which are expensive. As a result, the pavement manager spends most of the time (and money) fixing a few roads, while the majority of the roads (which are in "good" to "fair" condition) get worse. After a few years, the amount of mileage needing reconstruction increases. The net effect to the pavement manager is the sense of getting "further and further behind."

In an attempt to treat the most mileage possible, pavement managers sometimes adopt a "least cost" strategy instead of "worst first." Although this strategy gives the appearance of aggressive maintenance, it can encourage the pavement manager to select superficial or "band-aid" treatments which, while inexpensive, do not last very long. Heavier rehab-type treatments tend to be overlooked because of their high initial cost, even though they last much longer. Ultimately, "least cost" can be dangerously misleading, especially in areas where pavement structural problems are common — the roads "look" good, but they are capable of failing rapidly with little warning. Neither of these strategies — "worst first" nor "least cost" — ensures that the pavement manager is getting the most effectiveness out of the pavement treatments.

Some Districts respond to limited funding by establishing an annual seal coat program to resurface lower-volume roads on a pre-specified interval (e.g., every 7 years). Even then, there is often not enough preventive maintenance funding to support such a program, and the untreated sections are left for routine maintenance. Complicating the issue is the fact that traffic, especially truck traffic, is increasing. The establishment of the North American Free Trade Agreement (NAFTA) will significantly increase future truck volumes on Texas highways. Pavements will have to carry the extra traffic loading, regardless of how much funding is available.

SECTIONS TO BE ANALYZED

As with the Needs Estimate program, we propose that the Optimization program let the user analyze either Data Collection Sections or Management Sections. This approach provides greater consistency of analysis between the two programs.

TREATMENT TYPES AND COSTS

We also propose that the Optimization program use the broad treatment types defined in the Needs Estimate program, with one exception. We propose that the Optimization program include a "Stopgap" treatment type for those sections which do not have enough money to fund their "needed" treatment.

The Stopgap treatment simulates ongoing repair maintenance that a section must receive to preserve its condition over the next fiscal year. Funding for such treatments should be taken from the existing maintenance budget — it should not be taken from the user-specified Optimization budget. In extreme cases, it is possible for Stopgap treatment costs to exceed the existing maintenance budget.

We propose that the Optimization program use the same treatment costs defined in the Needs Estimate program, with the Stopgap treatment cost set equal to the Preventive Maintenance treatment cost.

SELECTING THE TREATMENT TYPE

We propose that the Optimization program also use the Needs Estimate decision tree statements, in their proposed "hierarchical" scheme (as described in Chapter 4), to select treatment type.

This proposal is extremely important. Although PMIS must work within the reality of limited funding, it must also focus on providing treatments which "need to be done" as opposed to only those treatments which "can be done." The Needs Estimate and Optimization programs should not analyze the same pavement section and get two different treatments, unless the difference is caused by limited funding.

OPTIMIZATION PROCESS

As with the Needs Estimate, the PMIS Optimization program must be able to:

1. Prioritize current and future pavement sections; and
2. Prioritize all pavement sections, even though TxDOT only rates 50 percent of the sections in any Fiscal Year.

To meet these requirements, we propose that the PMIS Optimization program run using the following ten-step process:

Step 1. User selects run/report parameters;

Step 2. Program selects records which can be analyzed;

Step 3. Program ages all records to the first Fiscal Year selected by the user;

Step 4. Program selects treatments (using the decision tree statements) and costs;

Step 5. Program computes "after treatment" distress ratings and ride quality ("gain in rating");

Step 6. Program computes "Benefit" and "Effective Life" of the Needs Estimate treatment for each section;

Step 7. Program computes "Cost Effectiveness Ratio" for each section;

Step 8. Program determines sections to be funded;

Step 9. Program lists results for each report which the user has requested in Step 1;

Step 10. Program returns to Step 3 if a multi-year Optimization was requested.

The first four steps are the same as those used in the Needs Estimate program.

Although the proposed Optimization program is not inherently complicated, it does contain many parts. The easiest way to explain the Optimization program is to go through it step by step.

Step 1. User selects run/report parameters

PMIS should allow users to run the Optimization program for the current Fiscal Year and up to 10 years in the future. Users should also be able to run the Optimization program by District, County, Maintenance Section, Highway System, and Roadbed.

Ability to run the Optimization program for future years is especially important because Districts have to identify and prioritize candidate projects one year in advance when answering pavement program calls. This ability will also help the pavement manager proactively solve problems before they become serious enough to warrant review by upper management.

We propose that the Optimization program allow the user to enter a base funding level for the first analysis year, along with a specified percentage increase or decrease, which the program can use to compute funding for future analysis years. This feature would allow PMIS to simulate legislative appropriations proposals, which usually involve current funding plus or minus a constant percent per year (e.g., "current funding minus one percent per year, for the next five years").

We also propose that the Optimization program allow the user to enter a percent increase or decrease in the 20-year projected 18-k ESAL. This feature will be especially useful for NAFTA-related studies of specific highway corridors. It would have the effect of changing the rate of pavement deterioration by changing the Chi factor in the section's performance equations (described in Chapter 3).

We finally propose that the Optimization program allow the user to enter a value for the number of years between regularly-scheduled preventive maintenance seal coats.

This feature, when used with the Date of Last Surface, would simulate the scheduling of a preventive maintenance seal coats on any section which is otherwise in good condition (i.e., has a Needs Estimate treatment of "Needs Nothing") but has not been resurfaced in several years. This proposal has not been implemented in the current version of PMIS, and is pending availability of current pavement layer and work history information.

Step 2. Program selects records which can be analyzed

The Optimization program should then run through the data one time and identify those pavement sections which cannot be analyzed. This step will reduce run time spent trying to analyze and prioritize sections with insufficient data. The criteria used to identify sections as "analyzable" should be the same as those used for the Needs Estimate (described in Chapter 4). We propose that PMIS include a page on the Optimization printout which summarizes the amount of "un-analyzable" data found.

Step 3. Program ages all records to the first Fiscal Year selected by the user

We propose that the Optimization program then use the PMIS performance equations to age all "analyzable" records to the first Fiscal Year selected by the user. This approach would allow PMIS to prioritize every section, even though TxDOT only rates 50 percent of the sections in any year. Ideally, PMIS should have to go back no further than one year to find data (because of the proposed alternating 50 percent sample) for every section.

This step is also the same as that performed by the Needs Estimate program. We propose that the PMIS Optimization program use the theoretical age equation (shown in Chapter 3) to project "old" rating data to the first Fiscal Year selected by the user. These theoretical ages provide the basis for computing distress ratings and ride quality to be used in the next step.

Step 4. Program selects treatments (using the decision tree statements) and costs

We propose that the PMIS Optimization program then select treatments and costs using the same decision tree statements as those used in the Needs Estimate program.

This step is important because it ensures that both of the PMIS analysis programs will get the same answer ("needed treatment") when analyzing the same section.

This step is also important because we propose that the Optimization program limit its analysis to calculating the Cost Effectiveness ratio of the Needs Estimate treatment, as opposed to comparing the effectiveness of lighter or heavier treatments.

For example, consider a section with a Needs Estimate treatment of "Medium Rehabilitation." It would be possible to consider the effectiveness of a heavier "HRhb" treatment, or of a lighter "LRhb" or "PM" treatment. Considering these additional treatments would greatly increase the run time of the program. Thus, we recommend that the Optimization program only consider the effectiveness of the "needed" MRhb treatment — if the treatment is effective enough (given the user-specified funding) then it should be funded, otherwise, the section should receive a "Stopgap" treatment.

Step 5. Program computes "after treatment" distress ratings and ride quality ("gain in rating")

Here is where the Optimization program first distinguishes itself from the Needs Estimate.

The purpose of the Optimization program is to get as much effectiveness as possible from each pavement treatment. "Effectiveness" is defined in terms of:

1. How much the treatment improves the section's distress **and** ride quality (Step 5); and
2. How long that improvement lasts (Step 6).

Not every treatment (especially the lighter PMs and LRhbs) is effective at removing all distress types. For example, a preventive maintenance seal coat will not remove Deep Rutting by itself; nor will it necessarily improve the section's ride quality. For this reason, we propose that TxDOT define a "gain of rating" value for each distress type and ride quality. These values should describe the treatment's ability to improve distress and ride quality utility, as shown in Table 231.

Table 231. Proposed Gain of Rating Values for PMIS Optimization Program.

Treatment Type	Gain in Distress Utility	Gain in Ride Quality Utility
Sgap	No change in distress ratings (None)	No change in Ride Score (None)
PM	Reset distress ratings to zero (1.0 max)	Increase Ride Score by 0.5 (1.0 max)
LRhb	Reset distress ratings to zero (1.0 max)	Increase Ride Score by 1.5 (1.0 max)
MRhb	Reset distress ratings to zero (1.0 max)	Reset Ride Score to 4.8 (1.0 max)
HRhb	Reset distress ratings to zero (1.0 max)	Reset Ride Score to 4.8 (1.0 max)

It should be noted that the Stopgap treatment results in no improvement because the section receives no actual Optimization-funded treatment.

Having selected a treatment (Step 4) and improved the section's distress and ride quality (Step 5), the Optimization program can then address the issue of how long the improvement will last.

Step 6. Program computes "Benefit" and "Effective Life" of the Needs Estimate treatment for each section

By applying a treatment, the pavement manager hopes to improve the section's overall condition (distress and ride quality), not just for the current Fiscal Year, but for many years to come. Each year that the newly-treated section's condition is better than its original "untreated" condition represents "Benefit" to the agency and its customers.

This concept of "Benefit" can be represented as the area between two performance curves, as shown in Figure 6. The bottom curve is the section's original "untreated" condition over time. We propose that this curve be based on the HRhb performance curve coefficients. The upper curve is the section's "treated" condition over time. We propose that this curve be based on the performance curve coefficients for the Needs

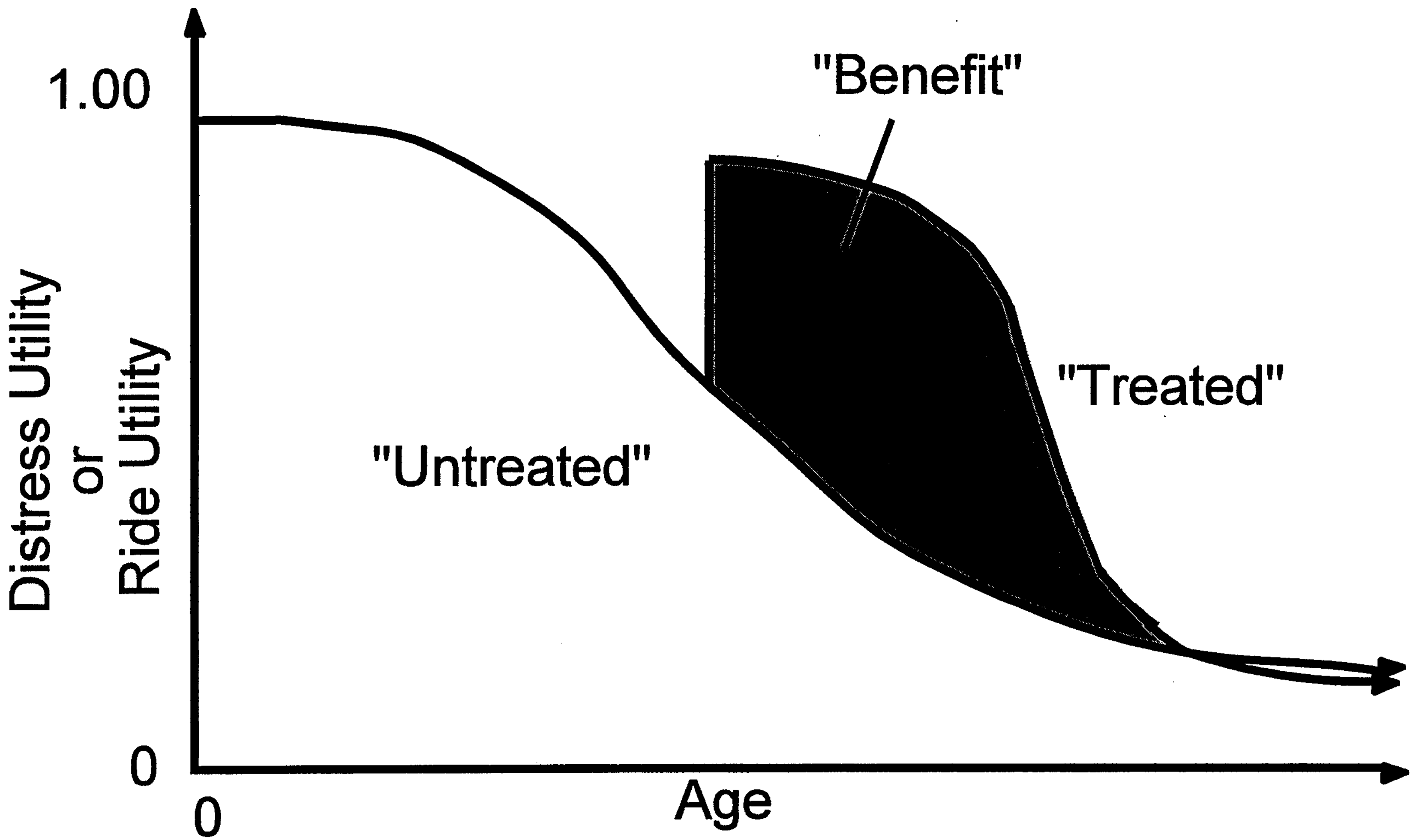

Figure 6. Proposed Definition of “Benefit” for PMIS Optimization Program.

Estimate treatment. We also propose that the Optimization program use a trapezoidal approximation to calculate the area between the two curves.

Finally, we propose that Benefit be defined as the sum of the distress and ride quality areas, each weighted equally, as shown in the equation below:

$$B = 2\left[\frac{W_D}{100}A_D + \frac{W_R}{100}A_R\right]$$

where:

B	=	Benefit of the "Needed" treatment (from the Needs Estimate program);
A_D	=	Area between the "before" and "after" Distress Score performance curves; and
A_R	=	Area between the "before" and "after" Ride Score performance curves.

W_D and W_R are weighting factors for Distress and Ride areas, respectively. Currently both are set to 50.

The current 50/100 terms in the equation indicate that distress and ride quality should be considered of equal importance. We propose that TxDOT use the above equation, with the weighting factors, to account for possible changes in the relative importance of distress and ride quality.

If the upper curve is an HRhb curve (i.e., if the Needs Estimate program selected an HRhb treatment), the two curves will parallel each other. Thus, the HRhb treatment will appear to provide Benefit "forever." Because "Benefit" is defined as the (closed) area between two performance curves, it is necessary to define boundary conditions that close the area between the two curves and thus permit the calculation of the treatment's Benefit.

We propose that the PMIS Optimization program use the following four boundary conditions when computing Benefit:

1. **Curves (Distress and Ride) intersecting**

   There comes a point in the life of every treatment when the pavement's condition is just as bad as it would have been without a treatment. In this case, the section's distress utility "before" and "after" treatment is the same **and** the section's ride quality utility "before" and "after" treatment is also the same. Figure 7 illustrates this boundary condition. This boundary condition is mainly expected on PM, LRhb, and MRhb treatments because they deteriorate more rapidly than the baseline "untreated" HRhb treatment.

2. **20-year treatment life**

   Ideally, the pavement's condition "after" treatment will always be better than its condition "before" treatment. To reduce computer time spent in calculating Benefit "forever," we propose that PMIS stop calculating Benefit after 20 years. Figure 8 illustrates this boundary condition. This boundary condition is expected on HRhb treatments because its performance curve is used as the baseline "untreated" curve (i.e., the two curves parallel each other and, theoretically, never intersect).

3. **No gain in year 1 for distress and ride**

   In some cases, the PMIS Needs Estimate will select a treatment to correct distress problems on a section with "good" ride quality. As described in Chapter 2, low-traffic or low-speed sections can have a Ride Score below 3.0 without reducing the ride utility value. In such a case, the treatment will increase the Ride Score, but the ride utility will not change (i.e., it will remain equal to 1.0000). The ride quality Benefit for such a section will thus be zero. In other cases, the PMIS Needs Estimate will select a treatment to correct a ride quality problem (e.g., an ACP005 HRhb treatment) on a section with little or no distress. In such a case, the distress utility will not change and the distress Benefit will be zero. Figure 9 illustrates this boundary condition.

4. **Failure Criterion (Distress or Ride) reached**

   In most cases, it is not appropriate to wait for the performance curves to intersect, because by then the pavement condition will have become "too bad."

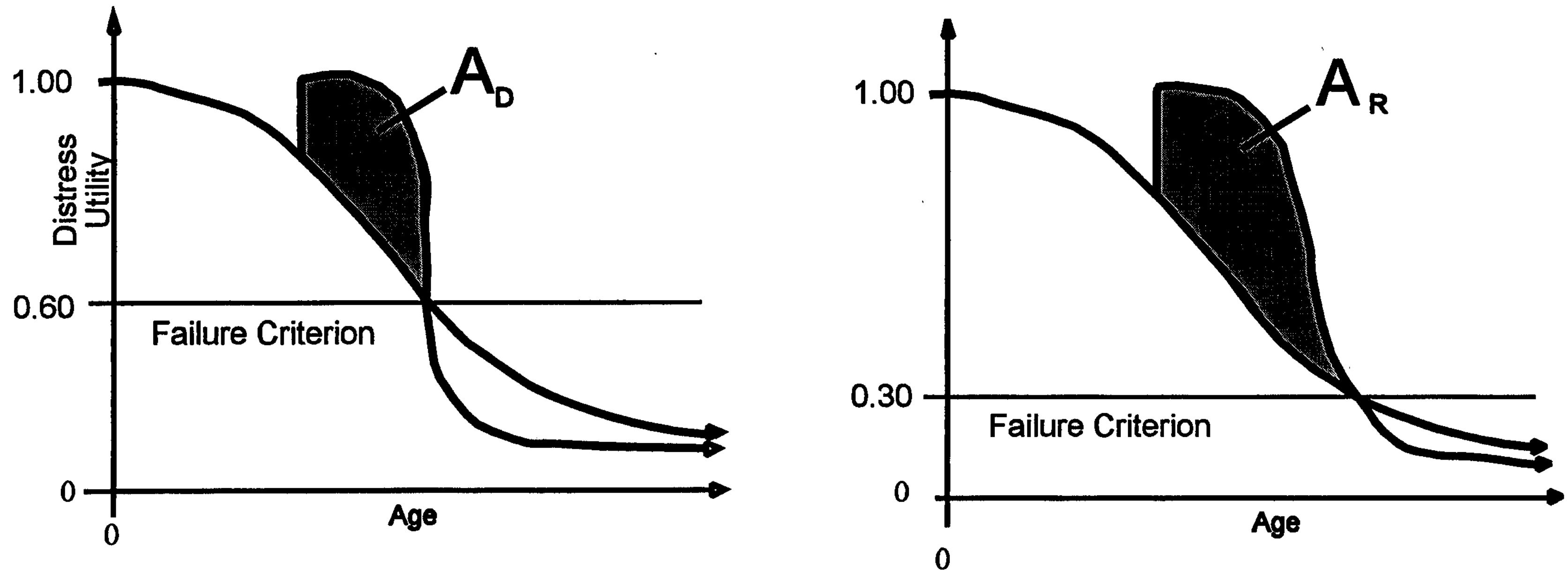

Figure 7. Boundary Condition for Curves (Distress and Ride) Intersecting.

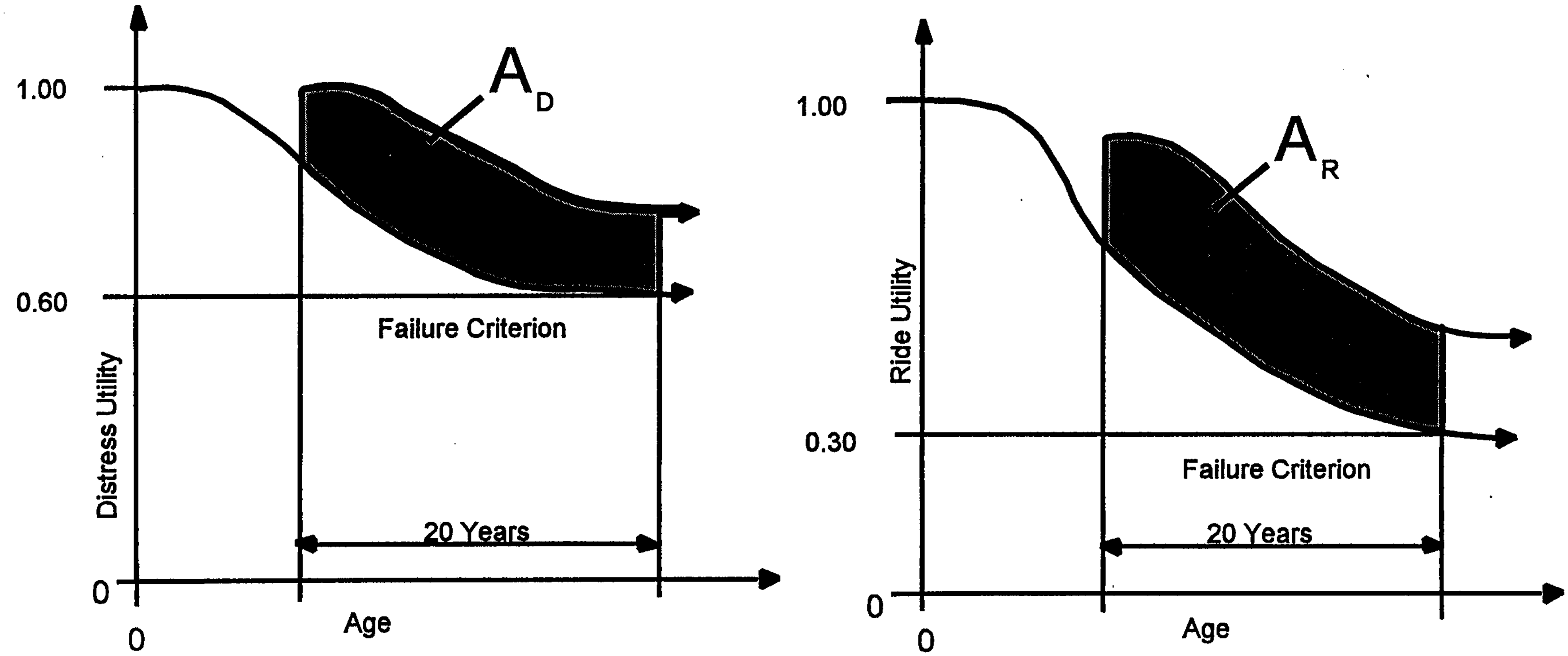

Figure 8. Boundary Condition for 20-year Treatment Life.

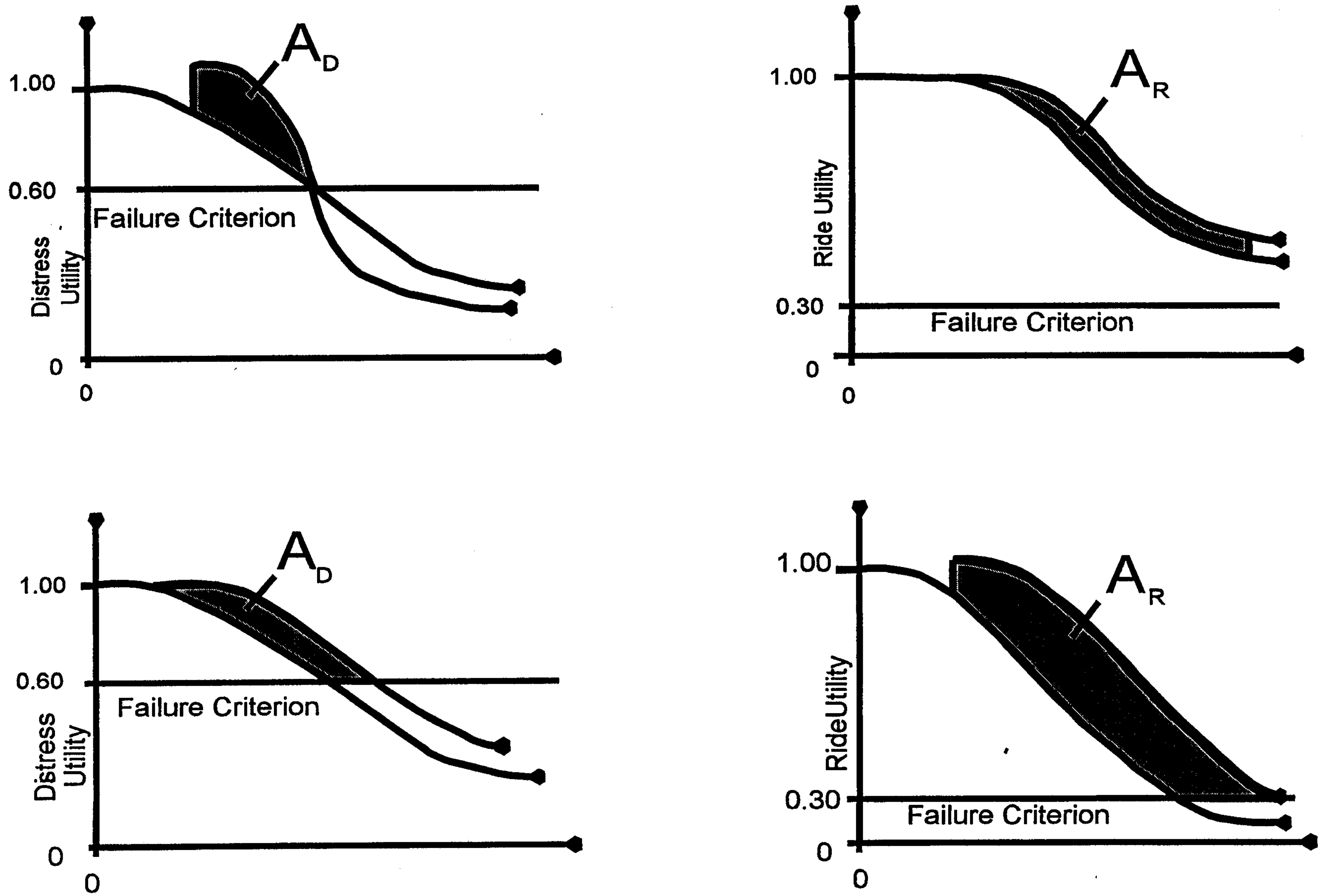

Figure 9. Boundary Condition for No Gain in Year 1 for Distress or Ride.

To address this concern, we propose that the PMIS Optimization program define a "Failure Criterion" below which the pavement section is assumed to provide no benefit. We also propose that the Failure Criterion be set at 0.6000 for distress utility and at 0.3000 for ride utility. Figure 10 illustrates this boundary condition. To give an idea of the pavement conditions represented by the Failure Criterion, Tables 232-234 list distress ratings and Ride Scores which fall below the proposed Failure Criterion.

Use of the Failure Criterion as a boundary condition provides the possibility that a Needs Estimate treatment will provide "no Benefit." For example, a PM treatment on a high-volume or high-speed section will increase the Ride Score by 0.5, as proposed earlier in this chapter. However, if the original Ride Score is 1.4 or below, the PM treatment will not improve the ride quality enough to meet the Failure Criterion (ride utility = 0.3000). Thus the treatment will "fail" Boundary Condition #3 ("No gain in year 1 for distress and ride"). Of course, such a section should receive an HRhb (ACP015) treatment, for Ride Score less than 1.5, as shown in Chapter 4.

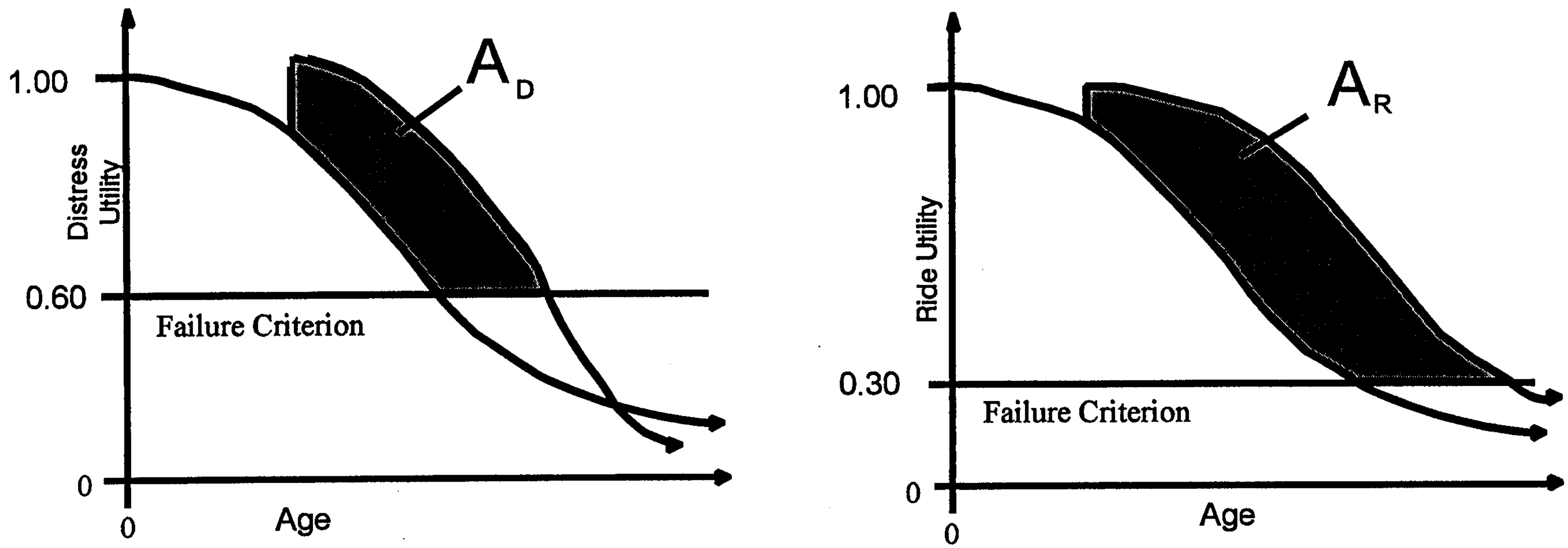

Figure 10. Boundary Condition for Failure Criterion (Distress or Ride) Reached.

Table 232. CRCP and JCP L Values Which Fall Below the Proposed Failure Criterion (0.6000).

CRCP Distress Type	L	JCP Distress Type	L
Spalled Cracks	74 percent	Failed Joints and Cracks	77 percent
Punchouts	6 per mile	Failures	18 per mile
Asphalt Patches	6 per mile	Shattered (Failed) Slabs	16 percent
Concrete Patches	11 per mile	Slabs With Longitudinal Cracks	52 percent
		Concrete Patches	25 per mile

Note: Please refer to Chapter 2 for a description of the L values. Any one of these distress L values will cause "Failure."

Table 233. ACP L Values Which Fall Below the Proposed Failure Criterion (0.6000).

ACP Distress Type	L Values, by Pavement Type	
	Flexible (PMIS Pavement Types 4-6 and 9-10)	Composite (PMIS Pavement Types 7 and 8)
Shallow Rutting	none	none
Deep Rutting	30 percent	none
Patching	87 percent	none
Failures	6 per mile	6 per mile
Block Cracking	49 percent	none
Alligator Cracking	29 percent	none
Longitudinal Cracking	240 feet per station	none
Transverse Cracking	20 per station	none
Raveling	none	
Flushing	none	

Note: Please refer to Chapter 2 for a description of the L values. Any one of these distress L values will cause "Failure."

Table 234. Ride Scores Which Fall Below the Proposed Failure Criterion (0.3000).

PMIS Traffic Class	Product of ADT and Speed Limit	Ride Score
Low	1 to 27,500	0.9
Medium	27,501 to 165,000	1.4
High	165,001 to 999,999	1.9

Note: Please refer to Chapter 2 for a description of the L values.

As mentioned earlier, the Needs Estimate treatment will be providing distress Benefit, ride Benefit, or both, as it ages. Eventually, one of the two Benefit areas (rarely both at the same time!) will trigger a boundary condition.

We propose that the PMIS Optimization program stop computing Benefit for both areas when either area triggers a boundary condition. We propose that PMIS define this point as the "Effective Life" of the treatment, in years, and use this value to compute the "Cost-Effectiveness Ratio" (defined in Step 7).

As suggested in Step 5, a treatment can correct distress problems or ride quality problems. However, its "Effective Life" must be considered in terms of the section's overall condition; that is, in terms of its newly-treated distress **and** ride quality.

Use of the "Effective Life" value will help the pavement manager identify which treatments "work best" for distress and which treatments "work best" for ride quality. It also gives a basic concept to use when describing how long specific treatments last. Finally, when used with the Theoretical Age, it provides a way to estimate the remaining life of an existing pavement.

Step 7. Program computes "Cost Effectiveness Ratio" for each section

The purpose of computing the Benefit and Effective Life for each section is to develop a measure which can be used to rank the sections in order of increasing "Effectiveness." As suggested in Chapter 4, the Needs Estimate program does not have such a measure because it assumes that funding is unlimited. The Optimization program, however, deals with the "reality" of limited funding; and when funding is limited, the pavement manager needs a way to determine which sections will provide the greatest overall effectiveness.

To address this requirement, we propose that the PMIS Optimization program define a "Cost-Effectiveness Ratio" for each section, as shown in the following equation:

$$CERatio = 10000 * \left[\frac{LM * B}{EffLife * UACost}\right] * \log_{10}VMT$$

where:

CERatio	=	Cost-Effectiveness Ratio
LM	=	Lane Miles
B	=	Benefit (distress and ride quality)
EffLife	=	Effective Life of the Needs Estimate treatment, in years
UACost	=	Uniform Annual Cost of the Needs Estimate treatment, in dollars
VMT	=	Vehicle Miles Traveled.

The "10000" term in the equation converts the Cost-Effectiveness Ratio values into one- to four-digit integers (instead of small decimal values) which can be easily printed in a report.

As shown above, we propose that the Cost-Effectiveness Ratio include a weighting factor for Vehicle Miles Traveled. In cases where identically Effective sections are competing to be the last funded project, this factor gives preference to the section with the higher traffic.

We also propose that the Cost-Effectiveness Ratio annualize cost over the Effective Life of the Needs Estimate treatment, as shown in the equation below:

$$UACost = TCost * \left[\frac{DRate\ (1+DRate)^{EffLife}}{(1+DRate)^{EffLife}-1}\right]$$

where:

UACost	=	Uniform Annual Cost of the Needs Estimate treatment, in dollars;
TCost	=	Treatment Cost (current or future) of the Needs Estimate treatment, in dollars;
DRate	=	Discount Rate, in percent per year; and
EffLife	=	Effective Life of the Needs Estimate treatment, in years.

The equation uses a Discount Rate, which is the expected return on investment if TxDOT chooses not to fund the Needs Estimate treatment. **We propose that the PMIS Optimization program use a DRate of 0.065 (6.5 percent per year).**

Multi-year Optimization analyses pose a special problem for the Cost-Effectiveness Ratio because not all treatments are funded in Year One of the analysis, and the unit cost of the "typical" Needs Estimate treatment often increases over time. Thus we propose that PMIS include yet another equation, shown below, to adjust the unit costs to the year of the actual treatment:

$$TCost = UCost * (1 + InfRate)^n$$

where:

TCost	=	Treatment Cost of the Needs Estimate treatment, in dollars;
UCost	=	Unit Cost of the Needs Estimate treatment (from Chapter 4), in dollars;
InfRate	=	Inflation Rate, in percent per year; and
n	=	Number of years that the Unit Cost has been projected.

This equation uses an Inflation Rate, which is the expected increase (or decrease) in price over time. **We propose that the PMIS Optimization program use an InfRate of 0.065 (6.5 percent per year).** We also propose that PMIS allow users to change the InfRate, when necessary.

Step 8. Program determines sections to be funded

Having computed the Cost-Effectiveness Ratio for each section, the PMIS Optimization can then rank the sections in order of decreasing "effectiveness" and determine which sections will be funded.

This is not simply a matter of picking the "top ten" or "top twenty-five" from the list. For example, consider the sections shown in Table 235 which have been given a $50,000 budget.

Table 235. Example Optimization (Ranked List of Sections).

Section	Cost-Effectiveness Ratio	Treatment Cost	Funded?	Remaining Budget
A	1,500	$20,000	Yes	$30,000
C	1,225	$40,000	No	$30,000
F	900	$50,000	No	$30,000
B	750	$4,500	Yes	$25,500
E	700	$15,000	Yes	$10,500
D	675	$12,000	No	$10,500
etc.	etc.	etc.	etc.	etc.

There are several things to note about this example:

1. The Optimization program sorts the sections in order of decreasing Cost-Effectiveness Ratio, so they are not listed in their original alphabetical order.
2. Section A is the top-ranked project. Its treatment cost ($20,000) is less than the current budget, so it receives its needed treatment. The remaining budget drops to $30,000.
3. Section C is the second-ranked project. It also has a high Cost-Effectiveness Ratio, but there is not enough money left to fund its $40,000 treatment cost. Thus, it is not funded. Section C is listed as receiving a Stopgap treatment.

4. Section F is the third-ranked project. Its treatment cost ($50,000) is also greater than the remaining budget, so it receives a Stopgap treatment.
5. Section B is the fourth-ranked project. There is enough money to fund its $4,500 treatment cost. Thus, Section B receives its needed treatment and the remaining budget drops to $25,500.
6. Section E is the fifth-ranked project. There is enough money to fund its $15,000 treatment cost. Thus, Section E receives its needed treatment and the remaining budget drops to $10,500.
7. Section D is the sixth-ranked project. There is not enough money to fund its $12,000 treatment cost. Thus, it receives a Stopgap treatment.

The Optimization program continues in this fashion until it either runs out of sections or runs out of money. It is possible for a small amount of money to be "left on the table," unspent by the program, depending on the treatment costs of the sections analyzed.

One "unusual" result of this approach is that the Optimization program will tend to "stock up" on the less-expensive PM treatments. This is a good approach in one sense because it realizes the benefit of an aggressive preventive maintenance program in preserving pavements in the best possible condition. However, we propose that TxDOT review the approach to see if it really is the most effective approach to limited funding.

Step 9. Program lists results for each report which the user has requested in Step 1

Having analyzed all of the "analyzable" pavement sections, the program should list out the results for those reports that the user requested. The printouts will only be for the "current" Fiscal Year.

Step 10. Program returns to Step 3 if a multi-year Optimization was requested

If the user has only asked for a single-year Optimization, the program ends at Step 9. If the user has asked for a multi-year Optimization, the program must age the sections by one year and return to Step 3. This aging process involves use of the

Theoretical Age equation described in Chapter 3.

For sections funded by the Optimization program, we propose that PMIS recalculate the Theoretical Age for the "after treatment" distress ratings and ride quality, based on the "gain of rating" values shown in Table 231. To eliminate "divide by zero" errors, we propose that the Optimization program use a minimum Theoretical Age of 0.001 years. Otherwise, the program should use the Theoretical Age calculated by the equation.

For sections not funded by the Optimization program (i.e., for "Stopgap" and "Needs Nothing" treatment types), we propose that PMIS add 1.0 years to the Theoretical Age of each distress type and ride quality before looping back to Step 3.

One drawback to using Theoretical Age with the PMIS distress ratings is that there is an inherent conflict between the "maximum allowable" distress rating in PMIS and the "maximum expected" distress rating in the performance equations. For example, the "maximum allowable" distress rating for Deep Rutting is 100 percent, but the "maximum expected" rating in the LRhb performance equation is around 80 percent. When a pavement rater stores a rating of 80 percent or greater for Deep Rutting, the performance equation calculates an "infinite" Theoretical Age!

To get around this problem, we propose that PMIS define a Maximum Theoretical Age of 40 years. We also propose that TxDOT carefully review the performance curve equations and coefficients to determine if there truly needs to be a difference between "maximum allowable" distress ratings and "maximum expected" distress occurrence.

To give an idea of the pavement conditions represented by the Maximum Theoretical Age, Tables 236 - 245 list distress ratings which exceed the proposed Maximum Theoretical Age of 40 years. There is no corresponding Table for Ride Score because the proposed performance equations exhaust all possible ride quality (i.e., L = 100 percent ride quality lost) before the proposed 40 year maximum.

Table 236. Distress L Values Which Exceed Proposed Maximum Theoretical Age (40 years). Pavement Type = 1

Distress Type	L Values for PMIS Treatment Type...			
	PM	LRhb	MRhb	HRhb
Spalled Cracks, percent	1.69	1.69	1.69	1.69
Punchouts, per mile	4.47	4.47	4.47	4.47
Asphalt Patches, per mile	4.30	4.30	4.30	4.30
Concrete Patches, per mile	53.18	53.18	53.18	53.18
Average Crack Spacing, number per 100' station	35.24	35.24	35.24	35.24

Note: Please refer to Chapter 2 for a description of the L values. Any one of these distress L values will exceed the proposed maximum Theoretical Age. The table assumes that Chi (traffic), Epsilon (climate), and Sigma (subgrade support) factors are equal to 1.0000.

Table 237. Distress L Values Which Exceed Proposed Maximum Theoretical Age (40 years). Pavement Type = 2

Distress Type	L Values for PMIS Treatment Type...			
	PM	LRhb	MRhb	HRhb
Failed Joints and Cracks, percent	37.01	37.01	37.01	37.01
Failures, per mile	16.40	16.40	16.40	16.40
Shattered (Failed) Slabs, percent	37.79	37.79	37.79	37.79
Slabs With Longitudinal Cracks, percent	2.71	2.71	2.71	2.71
Concrete Patches, per mile	37.20	37.20	37.20	37.20

Note: Please refer to Chapter 2 for a description of the L values. Any one of these distress L values will exceed the proposed maximum Theoretical Age. Table assumes that Chi (traffic), Epsilon (climate), and Sigma (subgrade support) factors are equal to 1.0000.

Table 238. Distress L Values Which Exceed Proposed Maximum Theoretical Age (40 years). Pavement Type = 3

Distress Type	L Values for PMIS Treatment Type...			
	PM	LRhb	MRhb	HRhb
Failed Joints and Cracks, percent	37.01	37.01	37.01	37.01
Failures, per mile	16.40	16.40	16.40	16.40
Shattered (Failed) Slabs, percent	37.79	37.79	37.79	37.79
Slabs With Longitudinal Cracks, percent	2.71	2.71	2.71	2.71
Concrete Patches, per mile	37.20	37.20	37.20	37.20

Note: Please refer to Chapter 2 for a description of the L values. Any one of these distress L values will exceed the proposed maximum Theoretical Age. Table assumes that Chi (traffic), Epsilon (climate), and Sigma (subgrade support) factors are equal to 1.0000.

Table 239. Distress L Values Which Exceed Proposed Maximum Theoretical Age (40 years). Pavement Type = 4

Distress Type	L Values for PMIS Treatment Type...			
	PM	LRhb	MRhb	HRhb
Shallow Rutting, percent	99.99	98.99	98.85	99.28
Deep Rutting, percent	98.76	82.68	81.59	71.44
Patching, percent	Performance curve not defined			
Failures, per mile	19.73	19.76	17.63	17.55
Block Cracking, percent	98.71	90.05	86.35	84.64
Alligator Cracking, percent	99.77	94.36	92.00	93.49
Longitudinal Cracking, feet per 100' station	483.21	491.14	484.62	299.30
Transverse Cracking, number per 100' station	19.58	19.39	19.42	17.08

Note: Please refer to Chapter 2 for a description of the L values. Any one of these distress L values will exceed the proposed maximum Theoretical Age. Table assumes that Chi (traffic), Epsilon (climate), and Sigma (subgrade support) factors are equal to 1.0000.

Table 240. Distress L Values Which Exceed Proposed Maximum Theoretical Age (40 years). Pavement Type = 5

Distress Type	L Values for PMIS Treatment Type...			
	PM	LRhb	MRhb	HRhb
Shallow Rutting, percent	99.99	98.99	98.85	98.99
Deep Rutting, percent	98.76	82.68	81.59	71.44
Patching, percent	Performance curve not defined			
Failures, per mile	19.73	19.76	17.63	17.55
Block Cracking, percent	98.71	90.05	86.35	84.64
Alligator Cracking, percent	99.77	94.36	92.00	93.10
Longitudinal Cracking, feet per 100' station	483.21	491.14	484.62	299.30
Transverse Cracking, number per 100' station	19.58	19.39	19.42	17.08

Note: Please refer to Chapter 2 for a description of the L values. Any one of these distress L values will exceed the proposed maximum Theoretical Age. Table assumes that Chi (traffic), Epsilon (climate), and Sigma (subgrade support) factors are equal to 1.0000.

Table 241. Distress L Values Which Exceed Proposed Maximum Theoretical Age (40 years). Pavement Type = 6

Distress Type	L Values for PMIS Treatment Type...			
	PM	LRhb	MRhb	HRhb
Shallow Rutting, percent	99.99	98.99	98.85	97.86
Deep Rutting, percent	98.76	82.68	81.59	71.44
Patching, percent	Performance curve not defined			
Failures, per mile	19.73	19.76	17.63	17.55
Block Cracking, percent	98.71	90.05	86.35	84.64
Alligator Cracking, percent	99.77	94.36	92.00	87.58
Longitudinal Cracking, feet per 100' station	483.21	491.14	484.62	299.30
Transverse Cracking, number per 100' station	19.58	19.39	19.42	17.08

Note: Please refer to Chapter 2 for a description of the L values. Any one of these distress L values will exceed the proposed maximum Theoretical Age. Table assumes that Chi (traffic), Epsilon (climate), and Sigma (subgrade support) factors are equal to 1.0000.

Table 242. Distress L Values Which Exceed Proposed Maximum Theoretical Age (40 years). Pavement Type = 7

Distress Type	L Values for PMIS Treatment Type...			
	PM	LRhb	MRhb	HRhb
Shallow Rutting, percent	99.99	98.99	98.85	98.93
Deep Rutting, percent	98.76	82.68	81.59	71.44
Patching, percent	Performance curve not defined			
Failures, per mile	19.73	19.76	17.63	17.55
Block Cracking, percent	98.71	90.05	86.35	84.64
Alligator Cracking, percent	99.77	94.36	92.00	87.91
Longitudinal Cracking, feet per 100' station	483.21	491.14	484.62	299.30
Transverse Cracking, number per 100' station	19.58	19.39	19.42	17.08

Note: Please refer to Chapter 2 for a description of the L values. Any one of these distress L values will exceed the proposed maximum Theoretical Age. Table assumes that Chi (traffic), Epsilon (climate), and Sigma (subgrade support) factors are equal to 1.0000.

Table 243. Distress L Values Which Exceed Proposed Maximum Theoretical Age (40 years). Pavement Type = 8

Distress Type	**L Values for PMIS Treatment Type...**			
	PM	**LRhb**	**MRhb**	**HRhb**
Shallow Rutting, percent	99.99	98.99	98.85	98.46
Deep Rutting, percent	98.76	82.68	81.59	71.44
Patching, percent	Performance curve not defined			
Failures, per mile	19.73	19.76	17.63	17.55
Block Cracking, percent	98.71	90.05	86.35	84.64
Alligator Cracking, percent	99.77	94.36	92.00	87.91
Longitudinal Cracking, feet per 100' station	500.00	442.12	479.54	299.30
Transverse Cracking, number per 100' station	19.57	19.69	19.72	17.08

Note: Please refer to Chapter 2 for a description of the L values. Any one of these distress L values will exceed the proposed maximum Theoretical Age. Table assumes that Chi (traffic), Epsilon (climate), and Sigma (subgrade support) factors are equal to 1.0000.

Table 244. Distress L Values Which Exceed Proposed Maximum Theoretical Age (40 years). Pavement Type = 9

Distress Type	L Values for PMIS Treatment Type...			
	PM	LRhb	MRhb	HRhb
Shallow Rutting, percent	99.99	98.99	98.85	98.46
Deep Rutting, percent	98.76	82.68	81.59	71.44
Patching, percent	Performance curve not defined			
Failures, per mile	19.73	19.76	17.63	17.55
Block Cracking, percent	98.71	90.05	86.35	84.64
Alligator Cracking, percent	99.77	94.36	92.00	87.91
Longitudinal Cracking, feet per 100' station	483.21	491.14	484.62	299.30
Transverse Cracking, number per 100' station	19.58	19.39	19.42	17.08

Note: Please refer to Chapter 2 for a description of the L values. Any one of these distress L values will exceed the proposed maximum Theoretical Age. Table assumes that Chi (traffic), Epsilon (climate), and Sigma (subgrade support) factors are equal to 1.0000.

Table 245. Distress L Values Which Exceed Proposed Maximum Theoretical Age (40 years). Pavement Type = 10

Distress Type	L Values for PMIS Treatment Type...			
	PM	LRhb	MRhb	HRhb
Shallow Rutting, percent	99.99	98.99	98.85	98.79
Deep Rutting, percent	98.76	82.68	81.59	71.44
Patching, percent	Performance curve not defined			
Failures, per mile	19.73	19.76	17.63	17.55
Block Cracking, percent	98.71	90.05	86.35	84.64
Alligator Cracking, percent	99.77	94.36	92.00	88.86
Longitudinal Cracking, feet per 100' station	483.21	491.14	484.62	299.30
Transverse Cracking, number per 100' station	19.58	19.39	19.42	17.08

Note: Please refer to Chapter 2 for a description of the L values. Any one of these distress L values will exceed the proposed maximum Theoretical Age. Table assumes that Chi (traffic), Epsilon (climate), and Sigma (subgrade support) factors are equal to 1.0000.

"FORCED" TREATMENTS

If it were possible to develop the "perfect" Optimization program, the pavement manager would be able to take the list of ranked projects, design the selected treatments, and perform the work. But there is no such thing as the "perfect" program (of any kind). The pavement manager must deal with local conditions, "political decisions," and many other such factors which are far beyond the scope of any computer program.

To address these needs, we propose that the PMIS Optimization program include a feature which lets the user "force" treatments on specific sections. We also propose that such "forced" treatments be allowed only on Management Sections, to most closely support local use on candidate projects.

The "forced" treatment part of the PMIS Optimization program would let users "force"

1. sections to be treated,
2. sections not to be treated,
3. type of treatment (lighter or heavier than the Needs Estimate treatment), and
4. time of treatment (earlier or later than suggested by the Needs Estimate).

Because these are user-selected sections and treatments, we propose that the Optimization program cluster all "forced" treatments together in Step 8 ("*Program determines sections to be funded*") and fund them in order of decreasing Cost-Effectiveness Ratio, **before funding any other sections.**

Of course, it is possible for a pavement manager to "force" treatments on more sections than can be funded. In such a case, the Optimization program would fund only the "forced" sections with the highest Cost-Effectiveness Ratios. The other "forced" sections — and all of the other sections — would be unfunded. It is also possible for a pavement manager to use "forced" treatments to "circumvent" the entire PMIS Optimization process. In some cases, such an approach would be the only proper way to address local needs, but we propose that TxDOT continually review the Optimization results to ensure that such drastic approaches are needed as rarely as possible.

OPTIMIZATION REPORTS

A PMIS Optimization list of each Data Collection Section for an entire District would produce about 150 pages of printout. Although such a list would be useful for locating specific pavements and treatments, it would hardly be useful for managing pavements across the entire District. An Optimization report for Management Sections would reduce the size of the printout, but it still would not help with the problem of managing pavements across the entire District. Upper-level pavement managers need summary reports which give an overall view of the District's total pavement needs.

Therefore, we propose that PMIS include the following types of Optimization reports:

1. Detail List of Sections Which Can be Treated;
2. Statewide Optimization, by District;
3. Statewide Optimization, by Highway System; and
4. District Optimization, by Highway System.

We also propose that the PMIS Optimization program allow users to select various Impact Analysis reports, without having to run a separate program. Chapter 6 will describe these reports in greater detail.

Detail List of Sections Which Can be Treated

We propose that the Optimization program have a detailed report which lists each section. The report should include basic location information (District, County, Highway, Reference Marker limits, and Roadbed), PMIS Scores, the Needs Estimate treatment and cost, Cost-Effectiveness Ratio, and funding status (Funded or Stopgap).

We also propose that this report allow users to sort the sections by decreasing Cost-Effectiveness Ratio, to help identify those sections which provide the most "effective" treatments. This proposal has not been used in the current version of PMIS, although we expect it to be added later. Use of this detail report will help pavement managers identify Management Sections. It will also help users select sections for possible "forced treatments," as described earlier.

Statewide Optimization, by District

We propose that the Optimization program have a report which summarizes the total Statewide lane miles and dollars which were treated with the available funding, by District. Tables 246 and 247, illustrate the proposed report format for lane miles and dollars, respectively.

Table 246. Proposed Statewide Optimization Report (Lane Miles), by District.

Notes: Miles are in Lane Miles
Fiscal Year: 1995 Dollar Values are in Thousands Funding = $15,000,000

	Needs Nothing		Prev. Maint.		Light Rehab		Medium Rehab		Heavy Rehab/ Reconstruction		Stopgap		TOTAL	
District	Miles	Pct.	Miles	Pct.	Miles	Pct.	Miles	Pct.	Miles	Pct.	Miles	Pct.	Miles	Pct.
1														
2														
.														
.														
.														
25														
STATEWIDE														

Table 247. Proposed Statewide Optimization Report (Dollars), by District.

Notes: Miles are in Lane Miles
Fiscal Year: 1995 Dollar Values are in Thousands Funding = $15,000,000

	Prev. Maint.		Light Rehab		Medium Rehab		Heavy Rehab/ Reconstruction		TOTAL	
District	Dollars	Pct.	Dollars	Pct.	Dollars	Pct.	Dollars	Pct.	Dollars	Pct.
1										
2										
.										
.										
.										
25										
STATEWIDE										

Statewide Optimization, by Highway System

We propose that the Optimization program have a report which summarizes the total Statewide lane miles and dollars which were treated with the available funding, by Highway System. Tables 248 and 249, illustrate the proposed report format for lane miles and dollars, respectively.

District Optimization, by Highway System

We propose that the Optimization program have a report which summarizes the total District lane miles and dollars which were treated with the available funding, by Highway System. Tables 250 and 251, illustrate the proposed report format for lane miles and dollars, respectively.

SUMMARY

The PMIS Optimization program will give pavement managers one way to deal with the reality of limited funding. The program is meant to be run iteratively, to give an idea of the relationship between total benefit and total funding. In this way, the Optimization program can help the pavement manager determine the adequacy of existing funding. Of course, the pavement manager could simply compare existing funding to the Needs Estimate funding, but the Optimization program allows comparison to all "reasonable" funding levels.

The Optimization program also gives a way to identify which projects will be "cut" if funding is reduced. Such considerations are important in the final stages of project selection.

With all of its capabilities, the PMIS Optimization program does not describe the results of its recommendations on overall pavement condition. Thus, the pavement manager has no clear idea if pavement condition is improving or not, especially in multi-year studies.

The PMIS approach to these problems is through its Impact Analysis program, which will be described in Chapter 6.

Table 248. Proposed Statewide Optimization Report (Lane Miles), by Highway System.

Notes: Miles are in Lane Miles
Fiscal Year: 1995 Dollar Values are in Thousands Funding = $15,000,000

PMIS Highway System	Needs Nothing		Prev. Maint.		Light Rehab		Medium Rehab		Heavy Rehab/ Reconstruction		Stopgap		TOTAL	
	Miles	Pct.	Miles	Pct.	Miles	Pct.	Miles	Pct.	Miles	Pct.	Miles	Pct.	Miles	Pct.
IH														
US														
SH														
FM														
PR														
BR														
STATEWIDE														

Table 249. Proposed Statewide Optimization Report (Dollars), by Highway System.

Notes: Miles are in Lane Miles
Fiscal Year: 1995 Dollar Values are in Thousands Funding = $15,000,000

PMIS Highway System	Prev. Maint.		Light Rehab		Medium Rehab		Heavy Rehab/ Reconstruction		TOTAL	
	Dollars	Pct.	Dollars	Pct.	Dollars	Pct.	Dollars	Pct.	Dollars	Pct.
IH										
US										
SH										
FM										
PR										
BR										
STATEWIDE										

Table 250. Proposed District Optimization Report (Lane Miles), by Highway System.

Fiscal Year: 1995 Notes: Miles are in Lane Miles
District: 08 Abilene Dollar Values are in Thousands Funding = $15,000,000

PMIS Highway System	Needs Nothing Miles	Needs Nothing Pct.	Prev. Maint. Miles	Prev. Maint. Pct.	Light Rehab Miles	Light Rehab Pct.	Medium Rehab Miles	Medium Rehab Pct.	Heavy Rehab/ Reconstruction Miles	Heavy Rehab/ Reconstruction Pct.	Stopgap Miles	Stopgap Pct.	TOTAL Miles	TOTAL Pct.
IH														
US														
SH														
FM														
PR														
BR														
District 08														

Table 251. Proposed District Optimization Report (Dollars), by Highway System.

Fiscal Year: 1995 Notes: Miles are in Lane Miles
District: 08 Abilene Dollar Values are in Thousands Funding = $15,000,000

PMIS Highway System	Prev. Maint. Dollars	Prev. Maint. Pct.	Light Rehab Dollars	Light Rehab Pct.	Medium Rehab Dollars	Medium Rehab Pct.	Heavy Rehab/ Reconstruction Dollars	Heavy Rehab/ Reconstruction Pct.	TOTAL Dollars	TOTAL Pct.
IH										
US										
SH										
FM										
PR										
BR										
District 08										

VI — IMPACT ANALYSIS

The most important part of any pavement management system is its ability to identify a pavement problem while it is still minor. In this way, the pavement manager can use preventive maintenance or light rehabilitation treatments, without having to resort to more expensive heavy rehabilitation or reconstruction. By treating pavements while they are still in good condition, the pavement manager can treat more miles with existing funding, reduce traffic delays caused by road work, and preserve overall pavement condition at a higher level.

DESCRIPTION

Despite increasing traffic demands being placed on Texas pavements, total pavement funding is being dispersed to meet additional, multi-modal transportation needs. TxDOT pavement managers are having to come up with innovative ways to preserve pavement condition in an environment of decreasing or, at best, stable funding.

There are many approaches to this problem. One approach is to emphasize surface condition and resurface as many miles each year as possible. Another approach is to emphasize structural rehabilitation; the idea being that the additional pavement life will offset the smaller number of miles treated. Yet another approach is to emphasize a particular class (or classes) of highway; for example, Interstate highways, metropolitan areas, etc.

Any of these approaches may work. The problem for the pavement manager is to determine which approach is the most appropriate, given agency and customer expectations. To do this, the pavement manager must have clearly-stated goals and objectives, and — most importantly — one or more condition measures which describe how closely the pavements are meeting these goals and objectives.

It is obviously not the purpose of PMIS to establish agency goals and objectives. However, PMIS does provide many condition measures which are suitable for monitoring how well the pavement manager is meeting the goals and objectives.

PURPOSE OF THE IMPACT ANALYSIS

The purpose of the PMIS Impact Analysis is to estimate the effects of pavement decisions, policies, and other external factors on overall pavement condition. To do this, we propose that the Impact Analysis show the effects of

1. Funding,
2. Section limits,
3. Section treatments (especially "forced" treatments),
4. Truck traffic (18-k ESAL), and
5. Preventive maintenance (seal coat) policy.

at the following three points in time:

1. Current,
2. After Needs Estimate treatments, and
3. After Optimization treatments.

Funding, Section Limits, and Section Treatments

The first three items — funding, section limits, and section treatments — are the natural complements to the Optimization program. By including these items in its reports, the Impact Analysis helps the pavement manager determine the effects of "what can be done," as compared to "what needs to be done."

Truck Traffic (18-k ESAL) and Preventive Maintenance (seal coat) Policy

As mentioned in Chapter 5, we propose that the PMIS Optimization program include procedures for changing the levels of truck traffic and for changing the number of years between regularly-scheduled preventive maintenance seal coats. Impact Analysis reports run under such conditions will describe the effects of these changes, especially over time.

Impact Analysis at Different Points in Time

Impact Analysis usually deals with only two points in time: "before" and "after" some expected action. The "before" case summarizes the current value of the condition measure (maintenance levels of service or average PMIS Scores), while the "after" case summarizes the value of the condition measure after the expected action. As mentioned earlier, we have suggested that the expected actions be limited to funding, section limits, section treatments, truck traffic, and preventive maintenance (seal coat) policy.

One would expect to use the Optimization program results in the "after" case of the Impact Analysis, because it deals with the "reality" of limited funding. But PMIS also allows consideration of a "best case" scenario, through use of its Needs Estimate program. Even though the Needs Estimate program "unrealistically" assumes that funding is unlimited, it does give yet another way to gauge the adequacy of pavement funding.

Thus, we have proposed that the PMIS Impact Analysis program summarize its condition measures at three points in time: currently, after the Needs Estimate treatments, and after the Optimization treatments. The pavement manager will then be able to consider "current case," "best case," and "expected case" scenarios, respectively.

For example, suppose the Needs Estimate program indicates that $50 million is needed for pavement rehabilitation, but the pavement manager only expects to receive $30 million. If the current Condition Score is 87.5, the PMIS Impact Analysis program could be run for various budget levels, to give the results shown in Table 252.

Table 252. Example Impact Analysis (Effect of Rehab Budget on Average Condition Score).

Expected Rehab Budget	Average Condition Score	
$20 million	80.2	
$30 million	83.7	"Expected Case"
$40 million	86.1	
$50 million	90.3	"Best Case"
$60 million	90.3	(no change — all sections treated)

In this example, the pavement manager can suggest that at least $40 million is needed to maintain pavement condition at approximately its current level (87.5).

CONDITION MEASURES FOR IMPACT ANALYSIS

As mentioned earlier, just about every item in PMIS could be used as a condition measure for the Impact Analysis: distress ratings, utility values, scores, treatment types and costs, and many others. To reduce potential confusion and to provide easily-interpreted executive-level information, we propose that PMIS use only the following two condition measures:

1. Pavement maintenance levels of service, and
2. Average PMIS Scores.

Pavement Maintenance Levels of Service

To meet increasing customer expectations, TxDOT has developed guidelines which describe the overall level of service provided by its maintenance operations. TxDOT reports these levels of service to the Legislature for use in preparing the biennial agency budget.

Although many of these levels of service pertain to roadside maintenance (e.g., rest areas, mowing, litter pickup, etc.), there are three which pertain to pavements:

1. Rutting,
2. Alligator Cracking, and
3. Ride quality.

TxDOT Administrative Circular 5-92 (dated 2/13/92) defined the pavement levels of service in terms of the original PES data. We propose that TxDOT redefine these levels of service using the new PMIS distress ratings and Ride Score, as shown in Tables 253 - 255, and incorporate them into the PMIS Impact Analysis program.

Table 253. Pavement Maintenance Level of Service Definitions for Rutting.

Level of Service	Traffic (ADT)	Shallow Rutting (percent)		Deep Rutting (percent)	
"Desirable"	1-500	0	**and**	0	
	501-10,000	0	**and**	0	
	Over 10,000	0	**and**	0	
"Acceptable"	1-500	1-50	**and**	0	
	501-10,000	1-50	**and**	0	
	Over 10,000	1-25	**and**	0	
"Tolerable"	1-500	51-100	**and**	0	**or**
		0-50	**and**	1-25	
	501-10,000	51-100	**and**	0	**or**
		0-50	**and**	1-25	
	Over 10,000	26-50	**and**	0	
"Intolerable"	1-500	51-100	**and**	1-25	**or**
		0-100	**and**	26-100	
	501-10,000	51-100	**and**	1-25	**or**
		0-100	**and**	26-100	
	Over 10,000	51-100	**and**	0	**or**
		0-100	**and**	1-100	

Note: Pavement Maintenance Level of Service defined for ACP (Pavement Types 4-10) only.

Table 254. Pavement Maintenance Level of Service Definitions for Alligator Cracking.

Level of Service	Traffic (ADT)	Alligator Cracking (percent)
"Desirable"	1-500	0
	501-10,000	0
	Over 10,000	0
"Acceptable"	1-500	1-10
	501-10,000	1-10
	Over 10,000	1-10
"Tolerable"	1-500	11-50
	501-10,000	11-50
	Over 10,000	11-50
"Intolerable"	1-500	51-100
	501-10,000	51-100
	Over 10,000	51-100

Note: Pavement Maintenance Level of Service defined for ACP (Pavement Types 4-10) only.

Table 255. Pavement Maintenance Level of Service Definitions for Ride Quality.

Level of Service	Traffic (ADT)	Ride Score
"Desirable"	1-500	2.6-5.0
	501-10,000	3.1-5.0
	Over 10,000	3.6-5.0
"Acceptable"	1-500	2.1-2.5
	501-10,000	2.6-3.0
	Over 10,000	3.1-3.5
"Tolerable"	1-500	1.6-2.0
	501-10,000	2.1-2.5
	Over 10,000	2.6-3.0
"Intolerable"	1-500	0.1-1.5
	501-10,000	0.1-2.0
	Over 10,000	0.1-2.5

Note: Pavement Maintenance Level of Service defined for ACP (Pavement Types 4-10) only.

Average PMIS Scores

We also propose that PMIS include average PMIS Scores (Distress, Ride, and Condition) as another condition measure for the Impact Analysis program. These Scores will be especially suited for making multi-year bar charts of pavement condition over time.

OTHER CONDITION MEASURES

Although the maintenance levels of service and average PMIS Scores give a quick way to estimate the impact of pavement funding, decisions, and policy on overall condition, the PMIS Optimization program provides additional measures which can be used for impact analyses. We propose that TxDOT also use the following three items as condition measures for impact analyses:

1. Stopgap mileage,
2. Stopgap cost, and
3. Funding backlog.

Stopgap Mileage

As mentioned in Chapter 5, the Optimization program applies a "Stopgap" treatment to any section which does not receive its Needs Estimate treatment. The Optimization program includes a report which summarizes the total lane miles receiving "Stopgap" treatment. This "Stopgap Mileage" can be compared to the total mileage and used as an impact analysis condition measure.

Stopgap Mileage is an especially accurate measure of prolonged under-funding, even in areas where the maintenance levels of service and average PMIS Scores are stable. Increases in Stopgap Mileage require greater maintenance activity which, while creating quick improvements in surface conditions (i.e., distress and ride quality), tend to "destabilize" long-term pavement condition.

Stopgap Cost

Closely related to Stopgap Mileage is "Stopgap Cost," which is the total cost of

Stopgap treatments. As proposed in Chapter 5, the Stopgap treatment cost is equal to the unit cost for Preventive Maintenance. Stopgap Cost is accumulated separately from the Optimization budget as a measure of "increased" maintenance burden. It is possible in extreme cases for the Stopgap Cost to exceed a District's total maintenance budget (pavement and roadside). Pavement managers may find it useful to compute the ratio of Stopgap Cost to Preventive Maintenance budget as yet another Impact Analysis condition measure.

Funding Backlog

A common task for any pavement management system is to assess the adequacy of existing funding. An easy way to do this is to define a condition measure called "Backlog," which is the difference between total funds needed and total funds available:

$$Backlog = F_{Needs} - F_{Optim}$$

where:

Backlog	=	Funding backlog,
F_{Needs}	=	Funding needed (from Needs Estimate), and
F_{Optim}	=	Funding available (from Optimization).

Backlog is a measure of unmet pavement needs, expressed in dollar terms.

In some cases it is possible for overall pavement condition to get worse, despite increases in funding. For example, if a District's funding increases by $10 million but total needs increase by $20 million, it is likely that the overall pavement condition will get worse instead of better.

IMPACT ANALYSIS REPORTS

Unlike the Needs Estimate and Optimization programs, the Impact Analysis program is meant to generate only summary tables. These summary tables can be converted to pie charts, bar charts, and other such graphics which upper-level managers can use to make strategic pavement decisions.

To meet these upper-level requirements, we propose that PMIS include the following three types of Impact Analysis reports:

1. District Impact, by Highway System;
2. Statewide Impact, by District; and
3. Statewide Impact, by Highway System.

As mentioned in Chapter 5, we propose that users be able to select these Impact Analysis reports when running the Optimization program. We do not expect that Impact Analysis reports will be run during the Needs Estimate.

District Impact, by Highway System

We propose that PMIS include an Impact Analysis report which summarizes the three maintenance levels of service and the three average PMIS Scores for a single District, by Highway System, as shown in Table 256. As mentioned earlier, the report should print tables for the "current," "after Needs Estimate," and "after Optimization" cases. We also propose that all TxDOT PMIS users be able to run this report.

Statewide Impact, by District

We propose that PMIS include an Impact Analysis report which summarizes the three maintenance levels of service and the three average PMIS Scores statewide, by District, as shown in Table 257. As mentioned earlier, the report should print tables for the "current," "after Needs Estimate," and "after Optimization" cases. We also propose that all TxDOT PMIS users be able to run this report.

Table 256. Proposed District Impact Analysis Report, by Highway System.

Fiscal Year: 1995
District 14 – Current Condition **Funding = $15,000,000**

Rutting Level of Service

PMIS Highway System	"Desirable" Lane Miles	"Desirable" Percent	"Acceptable" Lane Miles	"Acceptable" Percent	"Tolerable" Lane Miles	"Tolerable" Percent	"Intolerable" Lane Miles	"Intolerable" Percent	TOTAL Lane Miles
IH									
US									
SH									
FM									
PR									
BR									
District 14									

Fiscal Year: 1995
District 14 – Current Condition **Funding = $15,000,000**

Alligator Cracking Level of Service

PMIS Highway System	"Desirable" Lane Miles	"Desirable" Percent	"Acceptable" Lane Miles	"Acceptable" Percent	"Tolerable" Lane Miles	"Tolerable" Percent	"Intolerable" Lane Miles	"Intolerable" Percent	TOTAL Lane Miles
IH									
US									
SH									
FM									
PR									
BR									
District 14									

Table 256 (Continued). Proposed District Impact Analysis Report, by Highway System.

Fiscal Year: 1995
District 14 – Current Condition Funding = $15,000,000

PMIS Highway System	"Desirable" Lane Miles	"Desirable" Percent	"Acceptable" Lane Miles	"Acceptable" Percent	"Tolerable" Lane Miles	"Tolerable" Percent	"Intolerable" Lane Miles	"Intolerable" Percent	TOTAL Lane Miles
	Ride Quality Level of Service								
IH									
US									
SH									
FM									
PR									
BR									
District 14									

Fiscal Year: 1995
District 14 – After Needs Estimate Funding = $15,000,000

PMIS Highway System	"Desirable" Lane Miles	"Desirable" Percent	"Acceptable" Lane Miles	"Acceptable" Percent	"Tolerable" Lane Miles	"Tolerable" Percent	"Intolerable" Lane Miles	"Intolerable" Percent	TOTAL Lane Miles
	Rutting Level of Service								
IH									
US									
SH									
FM									
PR									
BR									
District 14									

Table 256 (Continued). Proposed District Impact Analysis Report, by Highway System.

Fiscal Year: 1995
District 14 – After Needs Estimate **Funding = $15,000,000**

	Alligator Cracking Level of Service								
PMIS Highway System	"Desirable"		"Acceptable"		"Tolerable"		"Intolerable"		TOTAL
	Lane Miles	Percent	Lane Miles	Percent	Lane Miles	Percent	Lane Miles	Percent	Lane Miles
IH									
US									
SH									
FM									
PR									
BR									
District 14									

Fiscal Year: 1995
District 14 – After Needs Estimate **Funding = $15,000,000**

	Ride Quality Level of Service								
PMIS Highway System	"Desirable"		"Acceptable"		"Tolerable"		"Intolerable"		TOTAL
	Lane Miles	Percent	Lane Miles	Percent	Lane Miles	Percent	Lane Miles	Percent	Lane Miles
IH									
US									
SH									
FM									
PR									
BR									
District 14									

Table 256 (Continued). Proposed District Impact Analysis Report, by Highway System.

Fiscal Year: 1995
District 14 – After Optimization **Funding = $15,000,000**

PMIS Highway System	Rutting Level of Service: "Desirable" Lane Miles	"Desirable" Percent	"Acceptable" Lane Miles	"Acceptable" Percent	"Tolerable" Lane Miles	"Tolerable" Percent	"Intolerable" Lane Miles	"Intolerable" Percent	TOTAL Lane Miles
IH									
US									
SH									
FM									
PR									
BR									
District 14									

Fiscal Year: 1995
District 14 – After Optimization **Funding = $15,000,000**

PMIS Highway System	Alligator Cracking Level of Service: "Desirable" Lane Miles	"Desirable" Percent	"Acceptable" Lane Miles	"Acceptable" Percent	"Tolerable" Lane Miles	"Tolerable" Percent	"Intolerable" Lane Miles	"Intolerable" Percent	TOTAL Lane Miles
IH									
US									
SH									
FM									
PR									
BR									
District 14									

Table 256 (Continued). Proposed District Impact Analysis Report, by Highway System.

Fiscal Year: 1995
District 14 – After Optimization Funding = $15,000,000

PMIS Highway System	"Desirable" Lane Miles	"Desirable" Percent	"Acceptable" Lane Miles	"Acceptable" Percent	"Tolerable" Lane Miles	"Tolerable" Percent	"Intolerable" Lane Miles	"Intolerable" Percent	TOTAL Lane Miles
	Ride Quality Level of Service								
IH									
US									
SH									
FM									
PR									
BR									
District 14									

Fiscal Year: 1995
District 14 Funding = $15,000,000

PMIS Highway System	Current Scores Distress Average	Current Scores Ride Average	Current Scores Condition Average	After Needs Estimate Distress Average	After Needs Estimate Ride Average	After Needs Estimate Condition Average	After Optimization Distress Average	After Optimization Ride Average	After Optimization Condition Average
IH									
US									
SH									
FM									
PR									
BR									
District 14									

Table 257. Proposed Statewide Impact Analysis Report, by District.

Fiscal Year: 1995
Statewide – Current Condition — **Funding = $15,000,000**

	Rutting Level of Service								
	"Desirable"		"Acceptable"		"Tolerable"		"Intolerable"		TOTAL
District	Lane Miles	Percent	Lane Miles	Percent	Lane Miles	Percent	Lane Miles	Percent	Lane Miles
1									
2									
.									
.									
.									
25									
STATEWIDE									

Fiscal Year: 1995
Statewide – Current Condition — **Funding = $15,000,000**

	Alligator Cracking Level of Service								
	"Desirable"		"Acceptable"		"Tolerable"		"Intolerable"		TOTAL
District	Lane Miles	Percent	Lane Miles	Percent	Lane Miles	Percent	Lane Miles	Percent	Lane Miles
1									
2									
.									
.									
.									
25									
STATEWIDE									

Table 257 (Continued). Proposed Statewide Impact Analysis Report, by District.

Fiscal Year: 1995
Statewide – Current Condition **Funding = $15,000,000**

	Ride Quality Level of Service								
	"Desirable"		"Acceptable"		"Tolerable"		"Intolerable"		TOTAL
District	Lane Miles	Percent	Lane Miles	Percent	Lane Miles	Percent	Lane Miles	Percent	Lane Miles
1									
2									
.									
.									
.									
25									
STATEWIDE									

Fiscal Year: 1995
Statewide – After Needs Estimate **Funding = $15,000,000**

	Rutting Level of Service								
	"Desirable"		"Acceptable"		"Tolerable"		"Intolerable"		TOTAL
District	Lane Miles	Percent	Lane Miles	Percent	Lane Miles	Percent	Lane Miles	Percent	Lane Miles
1									
2									
.									
.									
.									
25									
STATEWIDE									

Fiscal Year: 1995

Table 257 (Continued). Proposed Statewide Impact Analysis Report, by District.

Statewide – After Needs Estimate — Funding = $15,000,000

	Alligator Cracking Level of Service								
	"Desirable"		"Acceptable"		"Tolerable"		"Intolerable"		TOTAL
District	Lane Miles	Percent	Lane Miles	Percent	Lane Miles	Percent	Lane Miles	Percent	Lane Miles
1									
2									
.									
.									
.									
25									
STATEWIDE									

Fiscal Year: 1995

Statewide – After Needs Estimate — Funding = $15,000,000

	Ride Quality Level of Service								
	"Desirable"		"Acceptable"		"Tolerable"		"Intolerable"		TOTAL
District	Lane Miles	Percent	Lane Miles	Percent	Lane Miles	Percent	Lane Miles	Percent	Lane Miles
1									
2									
.									
.									
.									
25									
STATEWIDE									

Table 257 (Continued). Proposed Statewide Impact Analysis Report, by District.

Fiscal Year: 1995
Statewide – After Optimization **Funding = $15,000,000**

Rutting Level of Service

District	"Desirable" Lane Miles	"Desirable" Percent	"Acceptable" Lane Miles	"Acceptable" Percent	"Tolerable" Lane Miles	"Tolerable" Percent	"Intolerable" Lane Miles	"Intolerable" Percent	TOTAL Lane Miles
1									
2									
.									
.									
.									
25									
STATEWIDE									

Fiscal Year: 1995
Statewide – After Optimization **Funding = $15,000,000**

Alligator Cracking Level of Service

District	"Desirable" Lane Miles	"Desirable" Percent	"Acceptable" Lane Miles	"Acceptable" Percent	"Tolerable" Lane Miles	"Tolerable" Percent	"Intolerable" Lane Miles	"Intolerable" Percent	TOTAL Lane Miles
1									
2									
.									
.									
.									
25									
STATEWIDE									

Table 257 (Continued). Proposed Statewide Impact Analysis Report, by District.

Fiscal Year: 1995
Statewide – After Optimization Funding = $15,000,000

	Ride Quality Level of Service								
	"Desirable"		"Acceptable"		"Tolerable"		"Intolerable"		TOTAL
District	Lane Miles	Percent	Lane Miles	Percent	Lane Miles	Percent	Lane Miles	Percent	Lane Miles
1									
2									
.									
.									
.									
25									
STATEWIDE									

Fiscal Year: 1995
Statewide Funding = $15,000,000

	Current Scores			After Needs Estimate			After Optimization		
District	Distress Average	Ride Average	Condition Average	Distress Average	Ride Average	Condition Average	Distress Average	Ride Average	Condition Average
1									
2									
.									
.									
.									
25									
STATEWIDE									

Statewide Impact, by Highway System

We propose that PMIS include an Impact Analysis report which summarizes the three maintenance levels of service and the three average PMIS Scores statewide, by Highway System, as shown in Table 258. As mentioned earlier, the report should print tables for the "current," "after Needs Estimate," and "after Optimization" cases. We also propose that all TxDOT PMIS users be able to run this report.

SUMMARY

The PMIS Impact Analysis reports give the pavement manager the ability to anticipate future pavement problems. TxDOT will thus be able to simulate the effects of funding, policy, and truck traffic on future pavement condition. District users will also be able to fine-tune specific section- and treatment-related decisions to give the best possible overall pavement condition.

Table 258. Proposed Statewide Impact Analysis Report, by Highway System.

Fiscal Year: 1995
Statewide – Current Condition **Funding = $15,000,000**

Rutting Level of Service

PMIS Highway System	"Desirable" Lane Miles	"Desirable" Percent	"Acceptable" Lane Miles	"Acceptable" Percent	"Tolerable" Lane Miles	"Tolerable" Percent	"Intolerable" Lane Miles	"Intolerable" Percent	TOTAL Lane Miles
IH									
US									
SH									
FM									
PR									
BR									
STATEWIDE									

Fiscal Year: 1995
Statewide – Current Condition **Funding = $15,000,000**

Alligator Cracking Level of Service

PMIS Highway System	"Desirable" Lane Miles	"Desirable" Percent	"Acceptable" Lane Miles	"Acceptable" Percent	"Tolerable" Lane Miles	"Tolerable" Percent	"Intolerable" Lane Miles	"Intolerable" Percent	TOTAL Lane Miles
IH									
US									
SH									
FM									
PR									
BR									
STATEWIDE									

Table 258 (Continued). Proposed Statewide Impact Analysis Report, by Highway System.

Fiscal Year: 1995
Statewide – Current Condition | **Funding = $15,000,000**

PMIS Highway System	"Desirable" Lane Miles	"Desirable" Percent	"Acceptable" Lane Miles	"Acceptable" Percent	"Tolerable" Lane Miles	"Tolerable" Percent	"Intolerable" Lane Miles	"Intolerable" Percent	TOTAL Lane Miles
	Ride Quality Level of Service								
IH									
US									
SH									
FM									
PR									
BR									
STATEWIDE									

Fiscal Year: 1995
Statewide – After Needs Estimate | **Funding = $15,000,000**

PMIS Highway System	"Desirable" Lane Miles	"Desirable" Percent	"Acceptable" Lane Miles	"Acceptable" Percent	"Tolerable" Lane Miles	"Tolerable" Percent	"Intolerable" Lane Miles	"Intolerable" Percent	TOTAL Lane Miles
	Rutting Level of Service								
IH									
US									
SH									
FM									
PR									
BR									
STATEWIDE									

Table 258 (Continued). Proposed Statewide Impact Analysis Report, by Highway System.

Fiscal Year: 1995
Statewide – After Needs Estimate — **Funding = $15,000,000**

Alligator Cracking Level of Service

PMIS Highway System	"Desirable" Lane Miles	"Desirable" Percent	"Acceptable" Lane Miles	"Acceptable" Percent	"Tolerable" Lane Miles	"Tolerable" Percent	"Intolerable" Lane Miles	"Intolerable" Percent	TOTAL Lane Miles
IH									
US									
SH									
FM									
PR									
BR									
STATEWIDE									

Fiscal Year: 1995
Statewide – After Needs Estimate — **Funding = $15,000,000**

Ride Quality Level of Service

PMIS Highway System	"Desirable" Lane Miles	"Desirable" Percent	"Acceptable" Lane Miles	"Acceptable" Percent	"Tolerable" Lane Miles	"Tolerable" Percent	"Intolerable" Lane Miles	"Intolerable" Percent	TOTAL Lane Miles
IH									
US									
SH									
FM									
PR									
BR									
STATEWIDE									

Table 258 (Continued). Proposed Statewide Impact Analysis Report, by Highway System.

Fiscal Year: 1995
Statewide – After Optimization **Funding = $15,000,000**

Rutting Level of Service

PMIS Highway System	"Desirable" Lane Miles	"Desirable" Percent	"Acceptable" Lane Miles	"Acceptable" Percent	"Tolerable" Lane Miles	"Tolerable" Percent	"Intolerable" Lane Miles	"Intolerable" Percent	TOTAL Lane Miles
IH									
US									
SH									
FM									
PR									
BR									
STATEWIDE									

Fiscal Year: 1995
Statewide – After Optimization **Funding = $15,000,000**

Alligator Cracking Level of Service

PMIS Highway System	"Desirable" Lane Miles	"Desirable" Percent	"Acceptable" Lane Miles	"Acceptable" Percent	"Tolerable" Lane Miles	"Tolerable" Percent	"Intolerable" Lane Miles	"Intolerable" Percent	TOTAL Lane Miles
IH									
US									
SH									
FM									
PR									
BR									
STATEWIDE									

Table 258 (Continued). Proposed Statewide Impact Analysis Report, by Highway System.

Fiscal Year: 1995
Statewide – After Optimization **Funding = $15,000,000**

	Ride Quality Level of Service								
PMIS Highway System	"Desirable"		"Acceptable"		"Tolerable"		"Intolerable"		TOTAL
	Lane Miles	Percent	Lane Miles	Percent	Lane Miles	Percent	Lane Miles	Percent	Lane Miles
IH									
US									
SH									
FM									
PR									
BR									
STATEWIDE									

Fiscal Year: 1995 **Funding = $15,000,000**

PMIS Highway System	Current Scores			After Needs Estimate			After Optimization		
	Distress Average	Ride Average	Condition Average	Distress Average	Ride Average	Condition Average	Distress Average	Ride Average	Condition Average
IH									
US									
SH									
FM									
PR									
BR									
STATEWIDE									

VII — SUMMARY

This report has described TxDOT's new Pavement Management Information System (PMIS). It is current as of the time of publication, however TxDOT is installing the last few programs onto its mainframe computer and some minor changes may still be made before the expected completion date (December, 1995).

This report has included specific proposals for each of the major PMIS components: pavement utility curves, pavement performance curves, the Needs Estimate program, the Optimization program, and the Impact Analysis program.

We expect that TxDOT will continually evaluate PMIS and make changes, as necessary, to improve the reliability of the results. This process is essential if PMIS is to remain an integral part of TxDOT's overall pavement management system.