Implementing the Mechanistic-Empirical Pavement Design Guide: Technical Report

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16. Abstract

With the release of the new Mechanistic-Empirical Pavement Design Guide (MEPDG), pavement design has taken a "quantum" leap forward. The current 1993 design guide is solidly based on the empirical interpretation of the results of the 1960 American Association of State Highway and Transportation Officials (AASHTO) Road Test.

This report seeks to outline the technical aspects of the new MEPDG. Full detail is essentially impossible and impractical, since the release of the MEPDG was accompanied by eighteen volumes of technical justification and background. Consequently, this report seeks only to provide a potential user with a practical understanding of the workings of the new guide, with only sufficient technical depth to aid in understanding.

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IMPLEMENTING THE MECHANISTIC-EMPIRICAL PAVEMENT DESIGN GUIDE: TECHNICAL REPORT

May 2005

Sponsored by the Iowa Highway Research Board
(IHRB Project TR-509)

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1.1 Overview

With the release of the new Mechanistic-Empirical Pavement Design Guide (MEPDG), pavement design has taken a "quantum" leap forward. The current 1993 design guide is solidly based on the empirical interpretation of the results of the 1960 American Association of State Highway Officials (AASHO) Road Test. This report seeks to outline the technical aspects of the new MEPDG. Full detail is essentially impossible and impractical, since the release of the MEPDG was accompanied by eighteen volumes of technical justification and background. Consequently, this report seeks only to provide a potential user with a practical understanding of the workings of the new guide, with only sufficient technical depth to aid in understanding.

1.2 What is the Mechanistic-Empirical Pavement Design Guide?

"The 1993 *AASHTO Guide for Design of Pavement Structures* was based on empirical equations derived from the AASHO Road Test. That test was conducted between 1958 and 1960, with limited structural sections at one location, Ottawa, Illinois, and with modest traffic levels compared to those of the present day. As such, designs accomplished with the 1993 AASHTO guide are projected far beyond the inference space of the original data. The AASHTO Joint Task Force on Pavements (JTFP) in the mid 1990s proposed a research program to develop a pavement design guide based on mechanistic-empirical principles with numerical models calibrated with pavement-performance data from the LTPP program. The decision was further made to use only validated state-of-the-art technologies in this development program. The research was conducted as NCHRP Project 1-37A under the oversight of an NCHRP technical panel with membership drawn from state DOT's representing the JTFP, the hot mix asphalt (HMA) and Portland cement concrete paving industries, academia, and FHWA.

This new M-E pavement design guide provides significant potential benefits over the 1993 AASHTO guide in achieving cost-effective pavement designs and rehabilitation strategies. Most importantly, its user-oriented computational software implements an integrated analysis approach for predicting pavement condition over time that accounts for the interaction of traffic, climate, and pavement structure; allows consideration of special loadings with multiple tires or axles; and provides a means for evaluating design variability and reliability. The M-E pavement design guide will allow pavement designers to make better-informed decisions and take cost-effective advantage of new materials and features. The software can also serve as a forensic tool for analyzing the condition of existing pavements and pinpointing deficiencies in past designs.

In the next several years, the task force will work with the FHWA to introduce the guide to the user community through workshops, conferences, and training courses. In this same time period, it will coordinate the continued technical development of the guide, for example, by incorporating reflection and top-down HMA cracking models as they become available through NCHRP research projects. The ultimate objective of these implementation activities is two-fold: (1) to prepare for approval of a provisional or interim mechanistic-empirical design guide as a future edition of the AASHTO design guide and (2) to advance the guide and software to a routine-use AASHTO Ware product.

It must be understood that because the software is a tool for pavement *analysis* it does not provide structural thickness as an output. Nor, in its present form, does the M-E pavement design guide lend itself directly to use as a tool for routine, day-to-day production work. The flexible design component does not specifically address recycled materials in HMA or special mix designs such as SMA, although the software does allow for analysis of a broad range of HMA mix design types. Similarly, the rigid design component considers only jointed plan concrete pavement (JPCP) and CRCP, but not jointed reinforced concrete pavement (JRCP). Neither the interlocking concrete pavements concept nor geosynthetic applications are specifically covered in the guide, and the M-E pavement design guide and software are available only in U.S. customary units at this time." *[Abstracted from AASHTO Memo, dated June 23, 2004]*

1.3 Comments

A number of observations need to be made with reference to the AASHTO memo quoted above.

- *"… based on mechanistic-empirical principles with numerical models calibrated with pavement-performance data from the LTPP program."* The software, as released, incorporates numerical models that have been calibrated using the national LTPP database; however, the value of these calibrations to a specific area such as Iowa is not known. This lack of precision (or confidence) results from three considerations; (1) it is known that the quality of the LTPP data is highly variable in quality and completeness from state-to-state, and (2) much of the data collected and reported in the LTPP database is not directly relevant to the models used in the MEPDG, or conversely, many factors used by the MEPDG were not collected or reported in the LTPP database, and (3) particularly in the case of Iowa, the calibrations performed in the development of the MEPDG relied on data from LTPP stations that were remote from Iowa, which while not invalidating the calibrations vis-à-vis Iowa, do raise a significant question as to their immediate validity.
- *"… to use only validated state-of-the-art technologies …"* This objective, however laudable, was not entirely achieved. A number of models, or sub-models are incorporated that are neither "state-of-the-art" nor validated. For example, the longitudinal cracking model in flexible pavement assumes that these cracks all initiate at the surface and propagate downward (top-down cracking); this assumption is not universally held, and has certainly not been validated. Further, the pavement roughness models for International Roughness Index (IRI) incorporated in the MEPDG pose significant difficulties and inconsistencies which, hopefully, will be improved over time. Other examples of "validated state-of-the-art" questions abound.
- *"… take cost-effective advantage of new materials and features."* The FHWA Life-Cycle Cost Analysis Program (LCCA) has been bundled with the MEPDG, but has not been incorporated into it, thus cost evaluation must be undertaken as an entirely separate operation. Certainly, it is possible to make separate runs of the MEPDG

program with “new materials and features” which will provide as output the projected performance over the design life of the pavement. The same information must be re-entered into the LCCA program with assumptions as to the future maintenance and rehabilitation options needed to address the projected condition history; and a separate analysis undertaken to make realistic comparisons of the relative cost-effectiveness of each case.

- *“… the continued technical development of the guide …”* and “… *to prepare for approval of a provisional or interim mechanistic-empirical design guide as a future edition of the AASHTO design guide …”* These statements clearly indicate that the MEPDG *in its current form* is not the final product – IT WILL CHANGE. The current AASHTO design guide (1993) is itself the result of a continuous evolution from the original 1962 Interim Guide. This factor should be borne in mind in the initial implementation phase of the new guide. Some areas where change is expected have been identified, however, it may be expected that some factors will be identified *by users during implementation* that will have to be addressed through research after the fact.
- *“… the software is a tool for pavement analysis it does not provide structural thickness as an output.”* and “… *Nor, in its present form, does the M-E pavement design guide lend itself directly to use as a tool for routine, day-to-day production work.”* While Iowa DOT may already have received this message, it must be emphasized. The MEPDG program software does NOT yield the “design thickness” of a pavement structure – it provides a projected performance history against which the designer must make a comparison with acceptable expectations. This is a far more demanding task.

1.4 Summary

The MEPDG provides the user with an integrated set of models (climate + traffic + materials), which through a set of empirical models projects future performance (cracking, rutting, faulting, etc.).

The current edition is only the “first draft” – AASHTO has yet to issue a provisional design guide. The edition currently available for evaluation will change: some areas of change are even now known, while others have yet to be identified and may only come to light as they are identified during general implementation.

Comparison of the cost-effectiveness of alternative materials, features or designs must be undertaken as a separate activity. This option is not integral to the MEPDG software.

2 HOW DOES IT WORK?

2.1 Overview of Process

The following description is necessarily somewhat generic and based primarily on the analysis of flexible pavement; however the "system" has been designed in a modular fashion which with the modular nature of the software allows overall the same elements of design with type-specific sub-modules.

The approach recognizes that pavements perform subject to three primary influences:

- Environment (Climate)
- Traffic
- Pavement (materials and thicknesses).

The program performs a *time-stepping* process, during which the following simplified sequence of operations are undertaken:

- At time = t
    - The temperature and moisture profiles through the pavement are generated for the conditions at time = t. (*Environment*)
    - The spectrum of traffic loadings in the next time increment (Δt) are defined. (*Traffic*)
    - The elastic properties and thickness of each layer (E, μ, h) are defined from the initial input, the age since construction, the temperature and moisture profiles, and the speed (duration or frequency) of each load. (*Materials*)
    - The structural analysis is performed to estimate critical stresses and strains within the structure. (*Mechanistic*)
    - An ancillary analysis is performed to determine the non-load-related stresses and strains (i.e., due to thermal and moisture gradients – curling and warping). (*Mechanistic*)
    - The load-related and non-load-related critical stresses and strains are combined. (*Mechanistic*)
    - The incremental distresses are computed based on the critical stresses and strains (or their increments). These include the basic set of distresses or "conditions", such as rutting, faulting, transverse cracking, roughness (IRI), etc. These may be computed based on calibrated deterministic or empirical models. (*Empirical*)
    - Changes in initial material parameters (E, μ) resulting from the computed incremental damage are estimated. For example, if a cement stabilized layer (e.g., E = 2,400,000 psi) is found to have been over-stressed and cracked during this time interval, its effective modulus may be reduced (say to 1,200,000 psi) for the ensuing time interval).
    - The time scale is incremented to $t = t_0 + \Delta t$, and the cycle repeated.

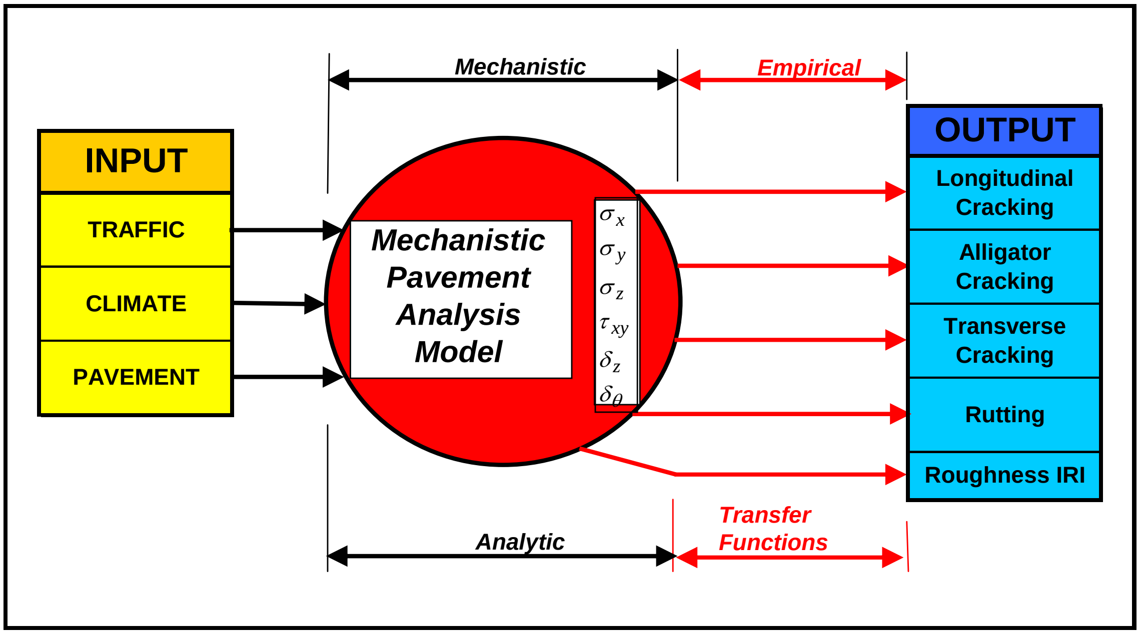

Figure 1. Outline process

2.2 Environment

It has long been recognized that environment plays a significant role in the performance of pavement. The MEPDG is the first approach that specifically addresses environmental effects on pavement in great detail. It recognizes that not only is temperature important (e.g., in defining the modulus (E*) of an HMA material), but that *temperature gradient* is perhaps more influential (e.g., in defining the warping/curling in PCC slabs, and stress/strain distribution in HMA structures). A similar observation can be made with regard to moisture and moisture gradients, and with moisture-temperature interaction (i.e., freezing and thawing).

Temperature and moisture conditions are not constants, but vary with time. Consider a pavement system at 9:00 am, which (for the sake of argument) has a constant temperature throughout, and which is equal to the ambient air temperature. At 9:30 am, the ambient air temperature has increased by, say 5º F. The effect of this change in air temperature may not be noted in the surface temperature of the pavement until say 9:45 am – but at one inch depth the pavement is still at its original temperature. At 10:00 am, the ambient temperature may have increased another 5º F (now 10º F above the original temperature). By this time the effect of the initial 5º F increment of temperature has penetrated deeper into the pavement, generating an increasing thermal gradient with depth. And so on …. (Other influences such as pavement color, solar radiation, etc., are involved, but are not discussed for clarity.)

Under this scenario, the temperature – depth gradient with cause (i) a modulus (E*) gradient with depth in HMA materials (so that the surface modulus (E^*_0) will be less than the modulus at 1" depth (E^*_1)), and (ii) a warping of a PCC slab – expanding at the top relative to the bottom. The continuous variations of air temperature, solar radiation, etc., therefore have a decisive influence on both the structural (load-related) and non-structural (non-load-related) states of stress and strain within pavement structures.

In order to incorporate environmental effects within the MEPDG software, three elements are required: (i) a site specific environmental data set (external), (ii) a material-specific set of thermal-related properties (heat capacity, thermal conductivity, etc.) (internal), and (iii) an algorithm to compute the transmission of heat (and moisture) within the pavement structure.

- The MEPDG software incorporates a set of environmental data sets for specific locations within the US. The software provided has environmental data for 15 locations in Iowa. These may be insufficient to derive full benefit from the site-specificity that the software can provide. Further, these data sets provide historical records for between 17 months and somewhat less than five years. Ideally, each data set should provide, at least, eleven years of historical data.
- The material-specific thermal-related properties required are entered as input with the materials selected for inclusion in the pavement.
- The driving algorithm for thermal transmission through the body of the pavement is based on the Enhanced Integrated Climatic Model (EICM) developed at the University of Illinois. This is a very powerful model.

Changing temperature and moisture profiles in the pavement structure and subgrade over the design life of a pavement are fully considered through EICM. The EICM is a one-dimensional coupled heat and moisture flow program that simulates changes in the behavior and characteristics of pavement and subgrade materials in conjunction with climatic conditions over several years of operation. In developing the EICM, data from the Long Term Pavement Performance (LTPP) Seasonal Monitoring Program (SMP) test sections were used. The major tasks (relevant to the Design Guide) undertaken in developing EICM are:

- Replacement of the soil-water characteristic curve (SWCC) Gardner equation with the equations proposed by Fredlund and Xing (???) to obtain a better functional fit.
- Development of improved estimates of SWCCs, saturated hydraulic conductivity (k_{sat}), and specific gravity of solids (G_s) given known soil index properties such as grain-size distribution (percent passing number 200 sieve, P_{200}, and effective grain size with 60 percent passing by weight, D_{60}) and Plasticity Index (PI).
- Incorporation into the EICM of an unsaturated hydraulic conductivity prediction based on the SWCC proposed by Fredlund, et al. in 1994.
- Addition of a climatic database containing hourly data from 800 weather stations from across the United States for sunshine, rainfall, wind speed, air temperature, and relative humidity. The data source was the National Climatic Data Center (NCDC).

2.3 Traffic

Traditionally, traffic has been treated by single numbers, such as the Average Annual Daily Traffic (AADT), or by the notional Equivalent Single Axle Load (ESAL). In developing the MEPDG, it was recognized that these parameters do not sufficiently recognize the differing effects of different axle loads and configurations on pavement. Consequently, the use of "Traffic Spectra" is now recommended. In this approach, the anticipated traffic must be classified by axle type (single, tandem, tridem, etc.), and within each type the distribution of axle weights prescribed. Further, daily, weekly, and seasonal volume distributions are possible. In other words, the traffic spectrum approach requires a more realistic knowledge of the actual distribution of axle types, weights and occurrence in time than has been traditional heretofore.

Traffic information, being site-specific must be provided and input by the designing agency.

2.4 Materials

As with any pavement design procedure, it is necessary to define the materials used in the structure, their properties, thicknesses and sequence. In the MEPDG this is somewhat more specific than has been traditional. In the simplest terms, the information required can be divided into two categories: structural and non-structural.

2.4.1 Structural

Each material must have its structural properties defined as input. These properties are typically the elastic (or resilient) modulus, E (or E*), and its Poisson's ratio, μ. These permit the structural analysis algorithms to estimate critical stresses and strains within the pavement under the applied loadings (traffic spectrum). The information needed is somewhat material-type specific:

- Hot-Mix Asphalt: Since HMA is visco-elastic, its properties depend on temperature and time (or frequency) of loading. Consequently, it is necessary to provide the "master curve" of the HMA response. This information is processed internally to the algorithm to yield the dynamic modulus, E*, specific to the temperature and duration of load at the point and time under consideration.
- Portland Cement Concrete: Simple elastic modulus, E, and Poisson's ratio, μ, are needed, in conjunction with the Modulus of Rupture, M_R. These properties do not materially change under the influence of temperature and duration of load.
- Stabilized Materials: These materials typically behave like weak concrete – rigid and brittle. For this it is necessary to define an elastic modulus, E, and Poisson's ratio, μ, as well as a default minimum elastic modulus for the material after it has been overstressed and cracked.
- Unbound Materials: An elastic modulus, E, and Poisson's ratio, μ, are required, as is an estimate of the unit weight, γ, and coefficient of earth pressure at rest, K_0.

These are the general structural input factors required by the computational algorithms. As will be explained below, the actual input may differ from these requirements, but whatever input is provided, the program must use that information to estimate the parameters given above.

2.4.2 *Non-Structural*

In conjunction with the structurally-related input, the program requires a number of non-structural input values. These variously relate to the transmission of thermal energy through the material (heat capacity and thermal conductivity), the rheological properties of the asphalt binder, the specific gravity, hydraulic conductivity and degree of saturation of unbound materials, etc.

Other factors, such as slab width and length, dowel bar diameter and spacing, pavement cross slope, etc are entered variously in the traffic and material input screens.

All these factors are used in various sub-modules to compute such things as the curling and warping of PCC slabs, the movement of moisture and freezing interfaces, etc.

2.5 Structural Analysis

Having defined the time-specific environmental conditions, which define the strength parameters of each layer material within the pavement model, the structures are modeled under the effects of the specific loadings expected during the time interval being modeled. This is dealt with differently for each pavement type.

2.5.1 *Rigid (PCC) Pavement*

Rigid pavements are modeled, based on Westergaard theory using finite element analysis based on the ILLISLAB suite developed at the University of Illinois. This analysis is performed very rapidly due to the use of Artificial Neural Network (ANN) technology. The overall technology used is relatively simple and has been well validated. The program computes and sums the load-related and load-independent stresses and strains at each time increment.

2.5.2 *Flexible (HMA) Pavement*

Flexible pavements are modeled, based on Burmister multi-layer elastic theory, using a custom program (*JULEA*) developed by J. Uzan (Technion, Israel). In order to reflect the effects of temperature and moisture gradients within the pavement structure, the various layers are further subdivided, so that for example a physical 5-layer structure may be analyzed as a 20-layer structure. Since in most cases, the traffic speed considered is such that the rise-time of a load pulse will be of the order of tens of milliseconds, the response of each layer is considered to be linear elastic. Note: the consideration of plastic response in fine-grained soils using finite elements is incorporated within the software, but due to a lack of validation is not accessible to the user at this time.

The multi-layer elastic analysis, considering as many as 20 layers, has not proven to be amenable to reduction by Artificial Neural Network (ANN) technology due to the very many possible combinations of parameter values. Consequently, a typical “run’ for a flexible pavement analysis may take about 40 to 45 minutes.

In similar fashion to the rigid pavement structural analysis, the flexible analysis computes and sums the load-related and load-independent stresses and strains at each time increment.

2.6 Incremental Distress

Having computed the "instantaneous" state of stress and strain within the pavement structure, the next step is to use these results in combination with "calibrated" distress models to estimate any incremental damage to the pavement. These incremental amounts of damage are ultimately summed, or integrated, over each successive increment of time.

The distress models used are based in theory, for example, fracture mechanics. While theory dictates the "form" of the relationships, most of them will have been "calibrated" to some form of reality in order, for example, to relate laboratory results to observed results. It can be expected that many of these models will be improved over the next ten to fifteen years as further and specific studies are conducted.

However, the laboratory calibrated distress models, usually conducted under artificial and controlled conditions cannot possibly reflect all the possible conditions observed in highways. Consequently, the projections of distress made by the "pure" MEPDG program will have to be calibrated to national, regional or local conditions. The preliminary calibrations built into the program rely heavily on a set of "national" calibrations based on the LTPP data set. *It must be realized that this "default" calibration may not accurately reflect local reality.* A major recommendation of the NCHRP 1-37A panel is that states validate the default calibrations and, if necessary, undertake their own specific calibrations.

2.7 Levels of Input

The MEPDG software permits three levels of input quality: Levels 1 through 3, where Level 1 is the highest level of input and Level 3 the lowest.

It is important to understand that the technology behind the MEPDG program is based on Level 1 input. The other levels (2 and 3) should only be used when Level 1 data is unavailable. While the program may yield the same output at each level, the level of confidence in the output degrades as the quality of the input is reduced.

The following example is given for discussion purposes only:-

A soil may be tested in the laboratory and its Resilient Modulus determined to be 7,500 psi. This represents a Level 1 input obtained by direct measurement on the material in question.

Absent direct measurement of the required resilient modulus on the soil, a measurement (or confident estimate) of the CBR (i.e., *not* the required resilient modulus) of 5% is available. Using the built-in formula relating CBR to Resilient Modulus, $MR = 2555(CBR)^{.64}$, an estimate may be had: MR ~ 7,150 psi. This constitutes a Level 2 input; i.e., an estimate based on a measurement of a different parameter through a calibrated transfer function.

With neither a direct nor indirect measurement being available, it may be known that the soil in the area generally classifies as a CL soil using the Unified Classification System. Using this “generic” knowledge, the Resilient Modulus can be expected to lie in the range: 7,000 to 15,000 psi. In this case the most conservative value would be 7,000 psi. This constitutes a Level 3 estimate, not being derived from a direct measurement of any type, but from a generic description.

In these examples, the results do not vary from each other by a large margin (numerically): 7,500 – 7,150 – 7,000 psi. However, they differ significantly in terms of the confidence which can be attributed to them.

As far as possible, it should be the objective of the DOT to strive to be able to input Level 1 data into the MEPDG program. In this way, the greatest confidence can be placed in the projected output.

2.8 Output

It has been stated that the MEPDG is not a design program insofar as it will not yield a “design thickness” of any type. It provides the user with a “projected history” of distresses and smoothness (IRI) over the design period. It is the function of the user to evaluate whether the various projected levels of distress are acceptable or not, and having deemed that they are not, to make an adjustment and to re-run the program.

This evaluation requires two things: (i) a set of criteria for each distress type, and (ii) a knowledge and understanding of what adjustment(s) may be appropriate.

As will be stated later, the agency (DOT) should establish a set of performance criteria against which design evaluations can be measured. These criteria may be stratified to reflect different levels of traffic, different levels of functional class, etc.

Using the existing AASHTO design guide, the user would simply increase the thickness of a component layer until the needed Structural Number is matched or exceeded. ***It is not so simple with the MEPDG***. Indeed, merely increasing the thickness of a layer may not lead to a reduction in a given distress, and may actually increase it. The user will have to have a more detailed understanding of the relationships between materials, material properties and distress mechanisms in order to make a reasoned adjustment. This will require training.

3 COMPONENT INPUT MODULES

The MEPDG comprises a number of modules or components, which are more-or-less independent. These include the General Information Module, Traffic Module, the Environmental (Climate) Module, and the Materials Module. A final module set includes the Analysis Module and the Output Module. The status of each module (or sub-module) is indicated using colors (red, yellow, and green) indicating respectively: the inputs that have not been visited, the inputs with default values, and the inputs completed.

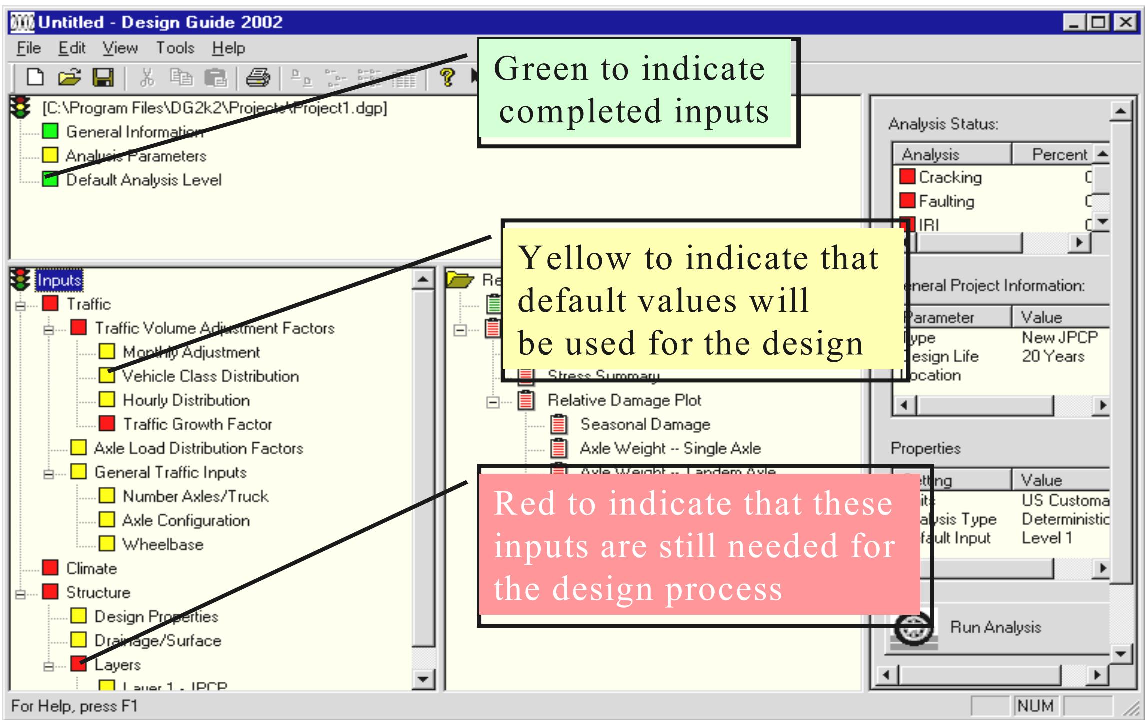

Figure 2. User screen layout

3.1 General Information

3.1.1 Initial screen

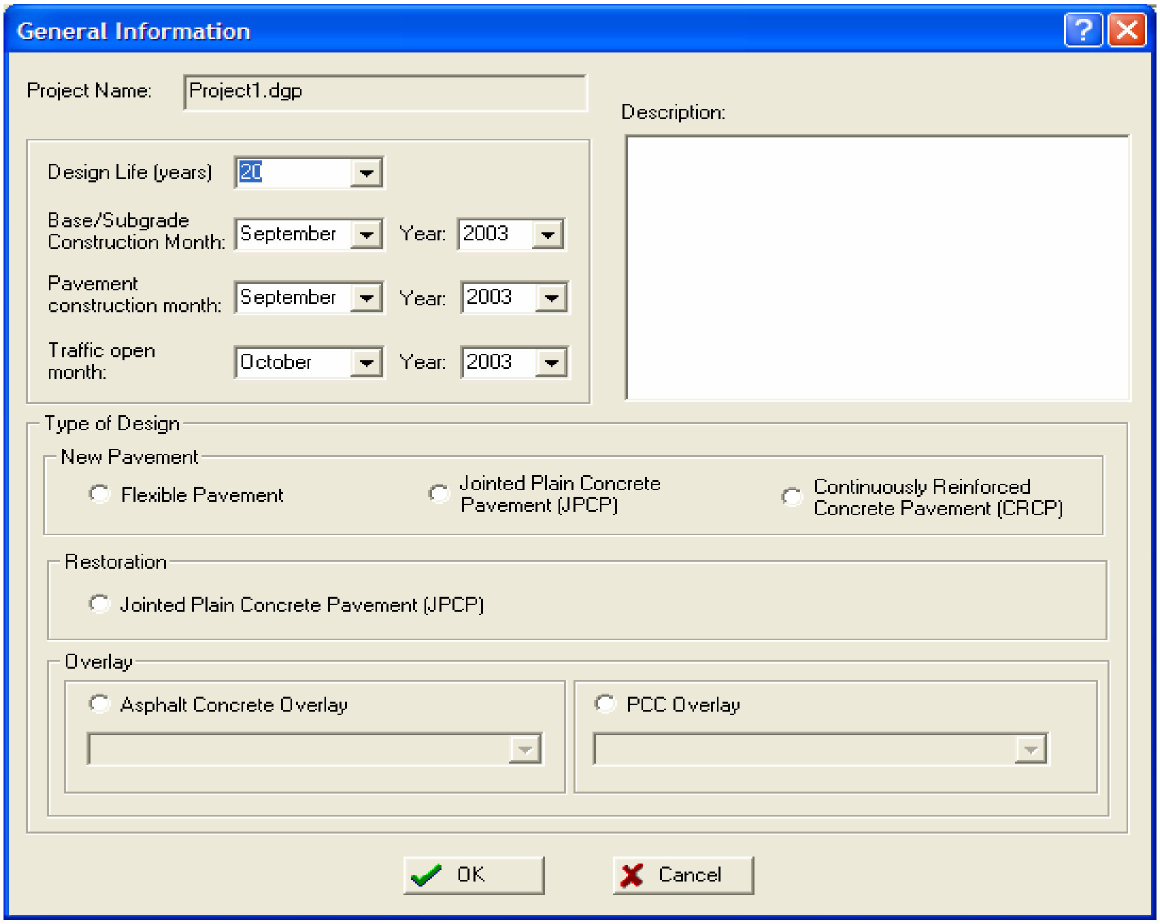

Figure 3. Input – general information

The general information component requires the input of the expected design life, various critical dates, the type of design and the type of overlay (where appropriate).

The critical activity dates are important for two particular reasons:

- To ensure that the environmental (climate) module is correctly coordinated with actual time, and
- To ensure that traffic and climate are properly coordinated.

While it may not always be possible to predict accurately the critical dates a number of years ahead of letting and construction, a reasonable estimate may be used based on typical construction histories.

The selection of a design-type ensures that the software uses the appropriate structural and damage analysis procedures, i.e., multi-layer linear elastic analysis using JULEA (flexible) and neural network simplified finite element analysis (rigid).

A number of overlay types are anticipated. This represents a major advantage over the previous 1993 design guide. The selection of a particular overlay option not only assures the correct analytical approach, but initiates a (later) questionnaire by which the condition of the existing pavement may be quantified. The overlay options are:

Table 1. Design options

HMA (AC) Overlay	PCC Overlay
AC over AC	PCC over CRCP (bonded)
AC over JPCP	PCC over JPCP (bonded)
AC over CRCP	JPCP over JPCP (unbonded)
AC over fractured JPCP	JPCP over CRCP (unbonded)
AC over fractured CRCP	CRCP over JPCP (unbonded)
	CRCP over CRCP (unbonded)
	JPCP over AC
	CRCP over AC

Note the following terminology:

HMA	Hotmix Asphalt
AC	Hotmix Asphalt (previously Asphaltic Concrete)
JPCP	Jointed Plain Concrete Pavement
CRCP	Continuously Reinforced Concrete Pavement
X over Y	Implies a new X material placed over an old (existing) Y material

3.1.2 Site/Project Identification

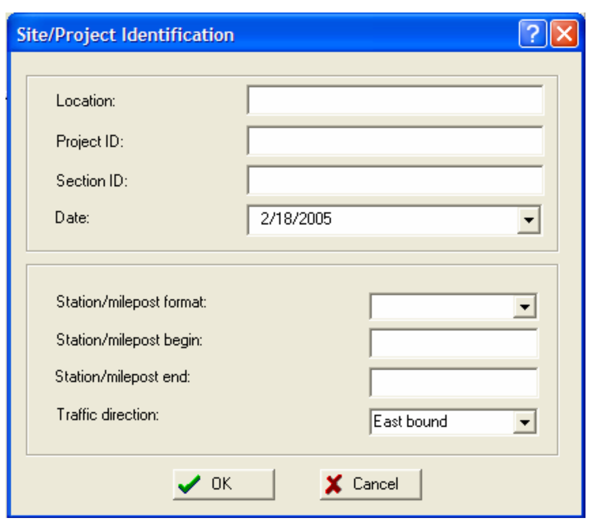

Figure 4. Input – site/project identification

This screen allows normal project identification: location, project and section ID, milepost and direction to be identified.

3.1.3 Performance Criteria Input

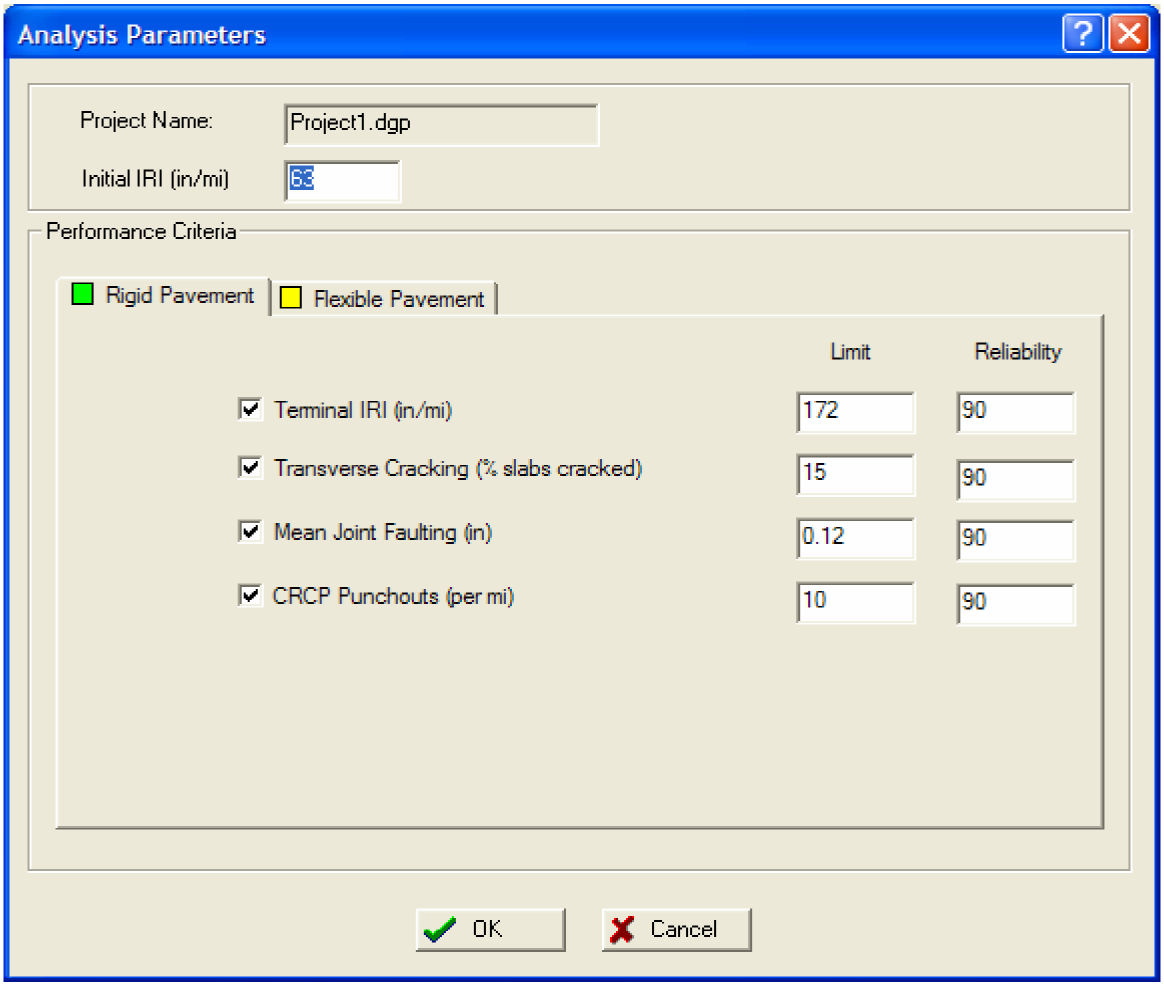

Figure 5. Input – analysis parameters

This screen allows the designer to input the anticipated initial pavement condition at the time of opening to traffic through an initial International Roughness Index (IRI, in/mile), and to set limiting, or threshold performance criteria for the appropriate pavement type. <u>The limiting values must be set by the designing agency</u>, and have no influence on the analysis or distress prediction components of the program.

The initial IRI value should reflect typical construction practice. A typical value would be 63 in/mile (approximately corresponding to 1 mm per meter or 1 meter per kilometer.)

The Reliability input (currently set at 90% by default) should be ignored during the initial implementation of the MEPDG.

The performance-related items for which criteria should be entered are:

Table 2. Performance criteria

Flexible (HMA)	Rigid (PCC)
Terminal IRI (in/mi)	Terminal IRI (in/mi)
AC Surface-down (Longitudinal) Cracking (ft/mi)	Transverse Cracking (% slabs cracked)
AC Bottom-up (Alligator) Cracking (%)	Mean Joint Faulting (in)
AC Thermal (Transverse) Cracking (ft/mi)	CRCP Punchouts (per mile)
Chem. Stabilized Layer Fatigue Fracture (%)	
Permanent Deformation (Rutting) – Total (in)	
Permanent Deformation (Rutting) – HMA only (in)	

3.2 Traffic Module

The Traffic Module stands apart from the rest of the MEPDG program insofar as it is a combination of the simple (Level 3) and the completely detailed (Level 1). An opening input screen requires the input of "traditional" traffic parameters:

- Initial two-way AADTT (Average Annual Daily Truck Traffic)
- Number of lanes in the design direction
- Percent Trucks in the design direction
- Percent Trucks in the design lane
- Operational Speed.
- Traffic Growth.

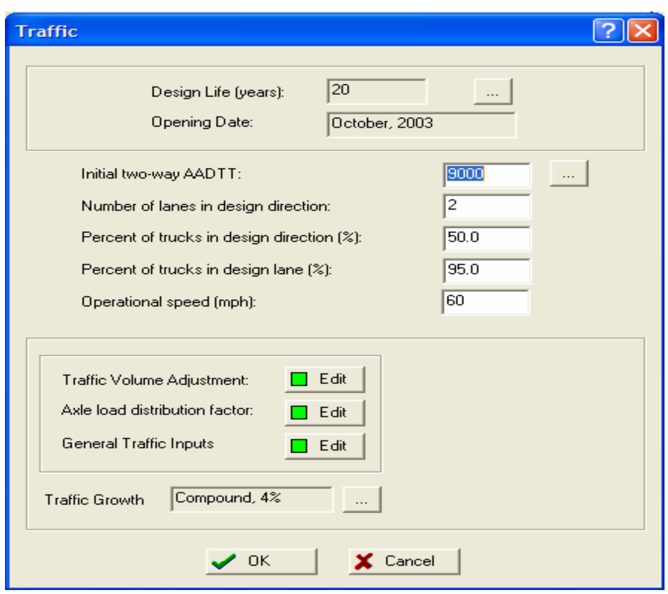

Figure 6. Input – traffic

With the exception of the operational speed, all other factors are currently provided on every pavement project, with the traffic growth being expressed using initial year and final year AADTT estimates.

Behind the Traffic Input screen are a number of more detailed tables, each with a specific data requirement. The following sequence of screen shots discusses the input requirements for each screen.

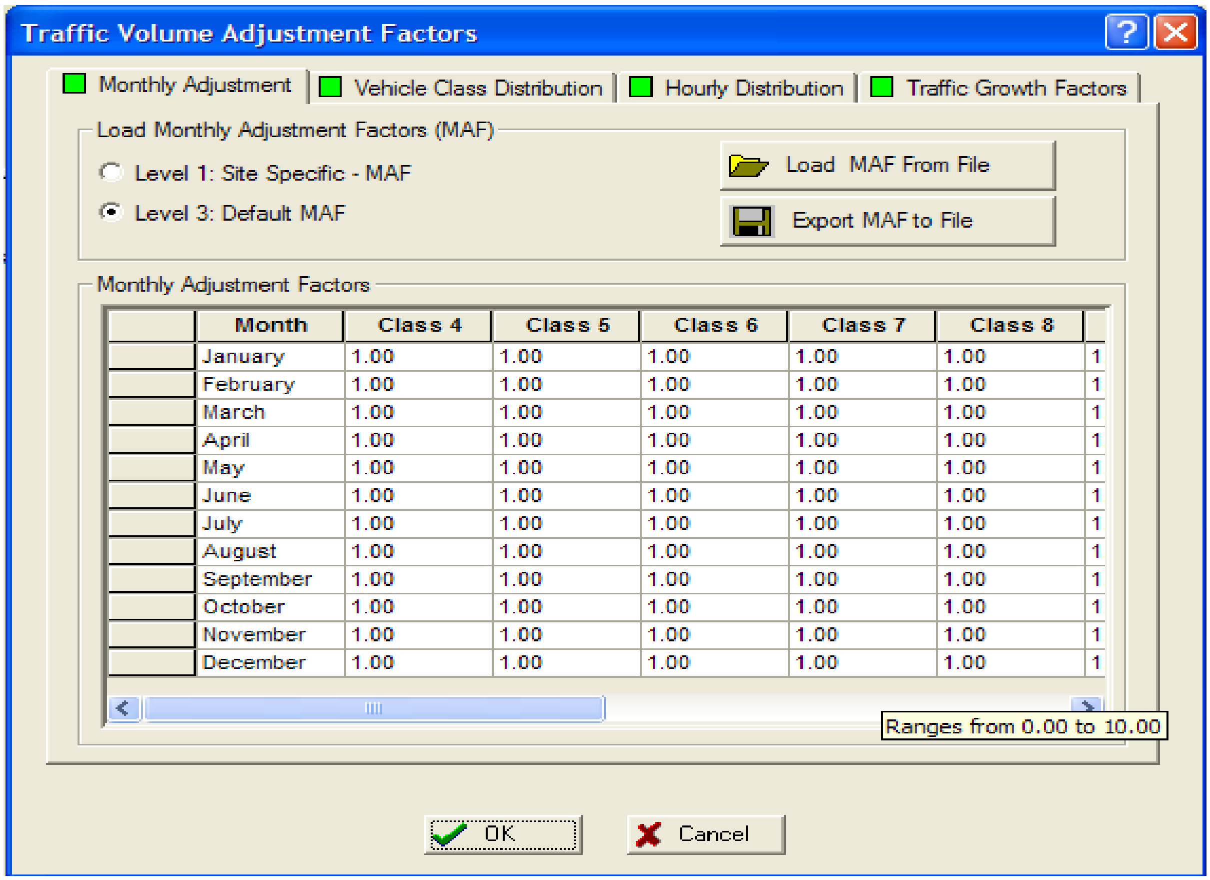

Figure 7. Input – traffic volume adjustment parameters – monthly adjustment

In this table, the traffic volumes *by FHWA vehicle class* are weighted by month. In the example shown, each month of the year is weighted equally. However, for example, a rural highway leading to a grain elevator might have the September, October and November weights increased on Classes 8, 9 and 10 to reflect the significant increase in grain haulage specific to those months and vehicle types. The input allows a Type 3 input, which would be appropriate for the general highway type, and a Type 1 input which would be entirely appropriate for a highway with local access to a grain elevator or other industrial enterprise with significant truck traffic.

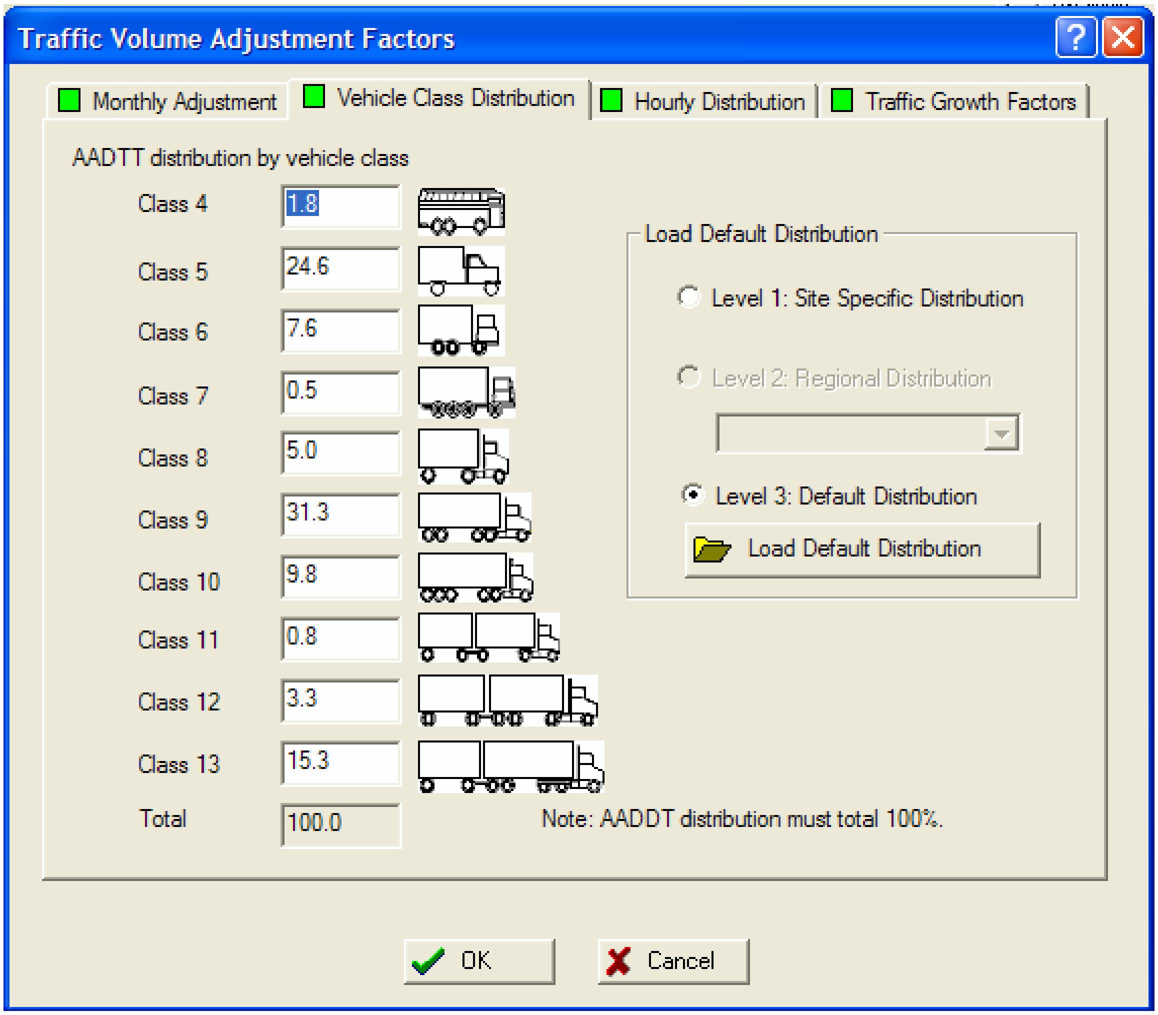

Figure 8. Input – traffic volume adjustment factors – vehicle class distribution

This screen allows the user to proportion the AADTT to each of the FHWA Truck classes (4 thru 13). This is somewhat generic and refers to the overall expected traffic distribution by truck type over the design period. Again, this may be entered generically (Type 3) for a specific highway functional type and traffic volume class, or more specifically (Type 1) for a given project.

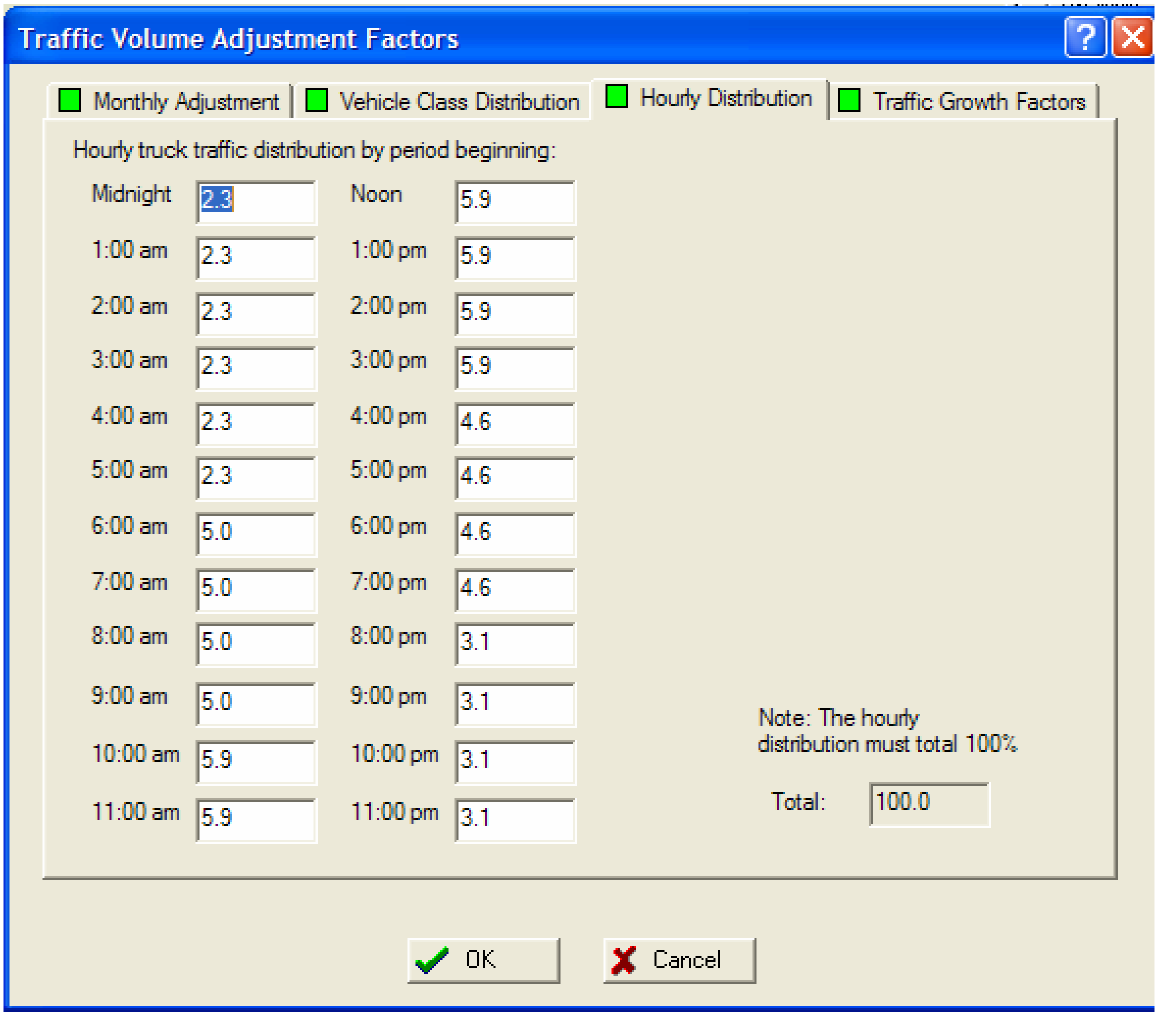

Figure 9. Input – traffic volume adjustment factors – hourly distribution

Since traffic is not normally uniform in volume throughout the 24-hour day, this screen permits the user to define the daily traffic volume hourly distribution. This becomes important when combined with the environmental (climatic) information of temperature distribution throughout the day.

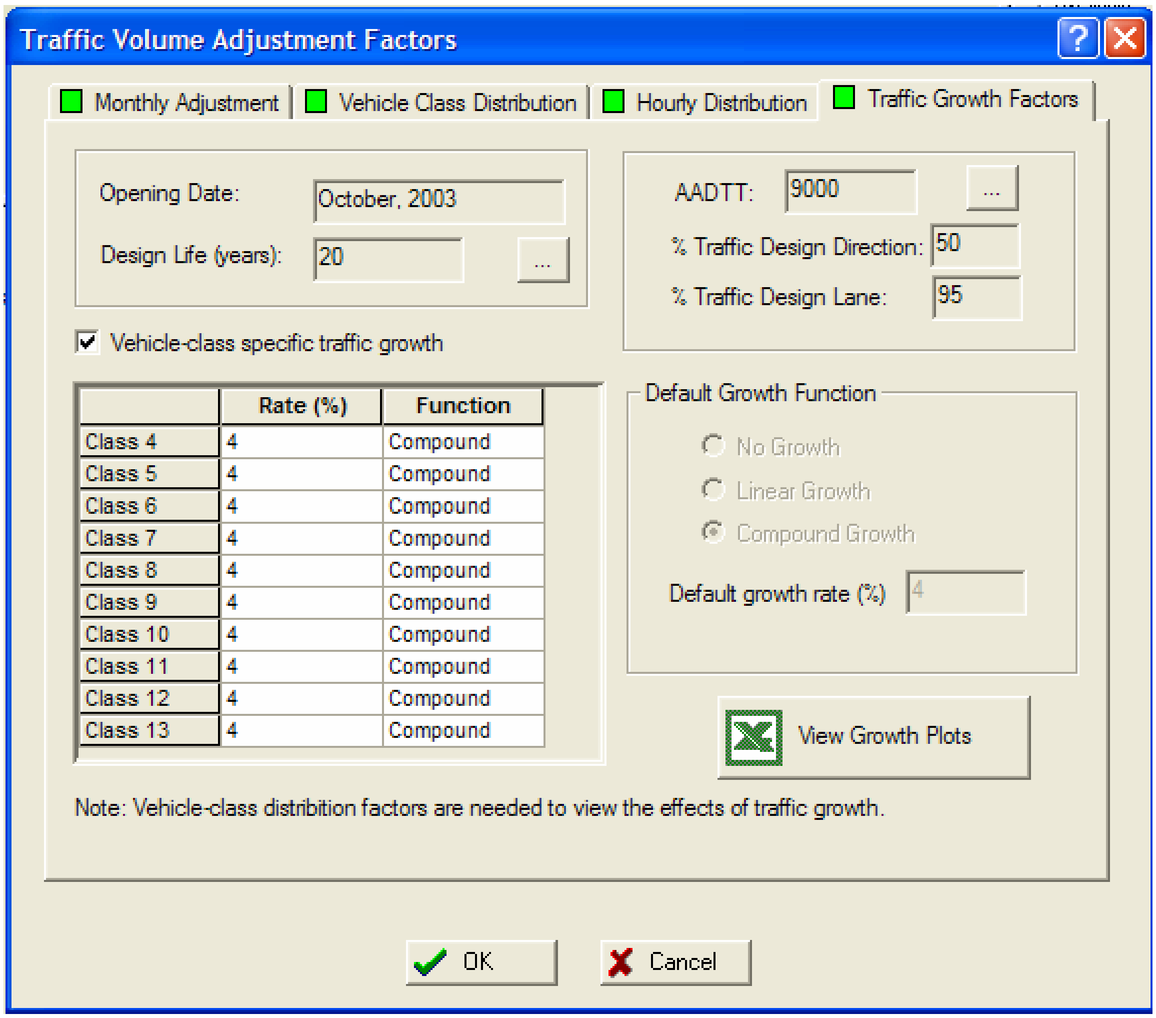

Figure 10. Input – traffic volume adjustment factors – traffic growth factors

This screen permits the user to assign growth factors to the design traffic. Note that an overall growth factor may be used, or (subject to sufficient knowledge) growth factors may be assigned individually to vehicle classifications. Further, the growth may be identified as linear or compound.

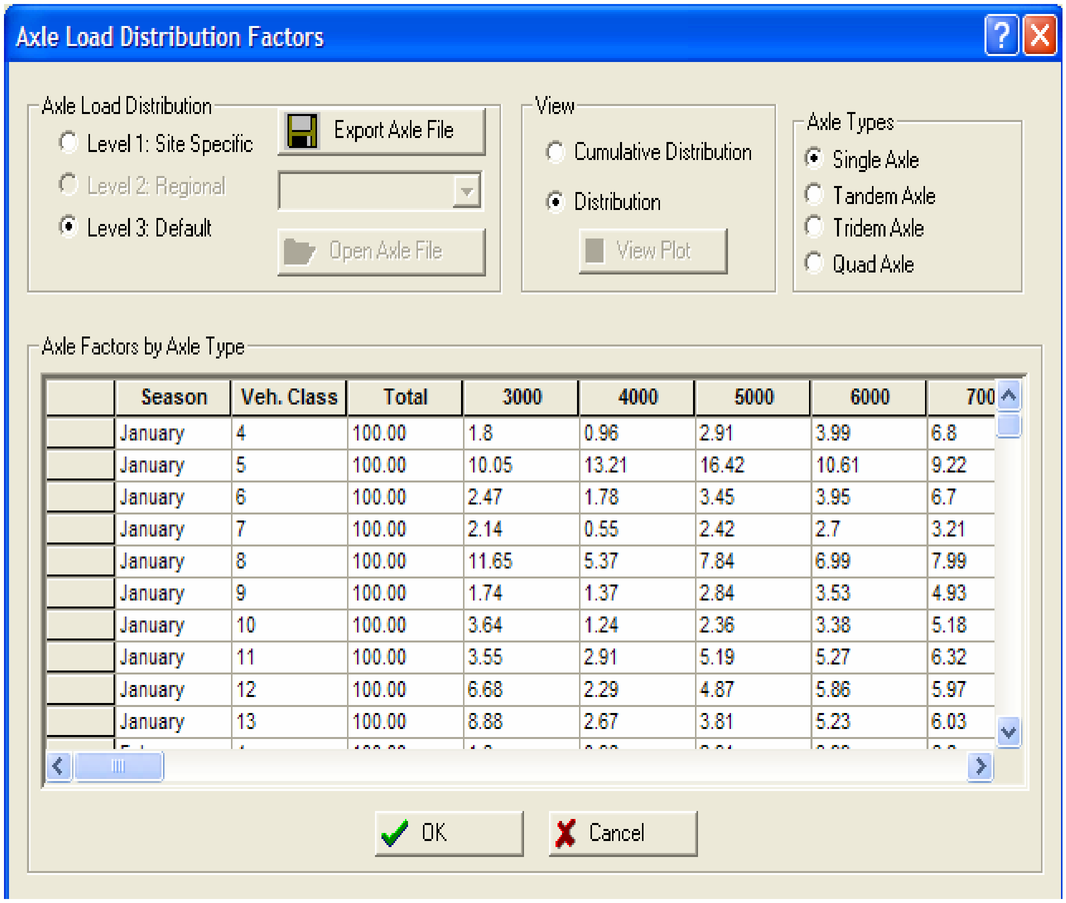

Figure 11. Input – axle load distribution factors

This screen permits the user to define the distribution of axle weights by vehicle class by month, by axle type (single, tandem, etc.). Once again this may be generic (Type 3) by functional class and volume, or project specific (Type 1).

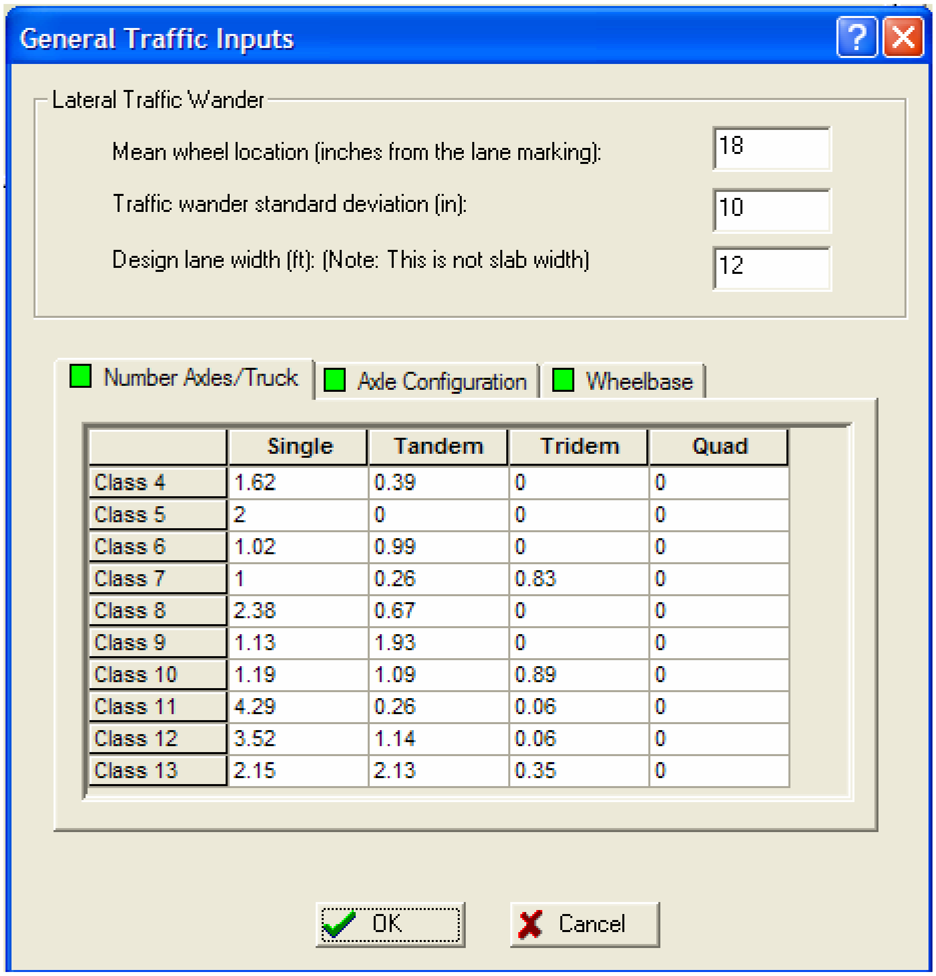

Figure 12. Input – general traffic inputs

This screen defines the elements of traffic wander, i.e., the typical distance from the pavement edge marking to the line of outside wheel travel, the standard deviation of traffic wander about that line and the design (marked) lane width. These are important parameters in the evaluation of rigid pavement.

Further, generic values of the number of axles per truck by vehicle classification and axle type may be input. As may also be the typical geometries and tire pressures for axle configurations (not shown), such as: axle spacing, dual tire spacing, etc. A special input (Wheelbase) is available for JPCP top-down cracking analysis which defines the spacing between the steering axle and the first loaded axle.

3.3 Environmental (Climate) Module

The Environmental (Climate) Module is based on the Enhanced Integrated Climatic Model developed at the University of Illinois. It is a powerful model that can compute the temperature distribution within layered pavement structures based on the external climatic records (temperature, wind, humidity, solar radiation, etc.) and includes routines that estimate the development and location of the freezing interface. As incorporated into the MEPDG it is essentially a closed system, which relies on the availability of a dataset of the factors listed above to define the local environmental effects.

In order to use this powerful module, the quality of the provided dataset is critically important. The datasets provided for the state of Iowa include:

Ames (63)	Lamoni (49)
Burlington (61)	Marshalltown (63)
Cedar Rapids (66)	Mason City (17)
Davenport (66)	Ottumwa (17)
Des Moines (66)	Sioux City (66)
Dubuque (66)	Spencer (63)
Estherville (66)	Waterloo (66)
Iowa City (66)	

The number enclosed within the parentheses indicates the number of months of data included within that specific database.

Figure 13. Distribution of Iowa climate stations (indicated by yellow circles)

Note: Yellow circles denote locations for Climate database in Iowa.
The MEPDG will use and *repeat* as necessary the number of data months available to fill out the design period; for example, a 20-year (240-month) design life in Ames (63) would repeat the first 63 months (5 years and 3 months) almost four times to fill the 240 month data requirement, whereas for Mason City (17) the available 17 month database would be

repeated about 17 times! Whether the designer selects a specific climatic record, or generates a "virtual" location, it is necessary to input a "depth to water table". This may have to be estimated, if not known.

The spatial coverage within the state of Iowa is not uniform.

3.4 Structure (Materials)

The two previous sections (Traffic and Climate) are relatively straightforward when compared to the Structure and Materials section. This is largely due to the large number of different material combinations possible in a pavement structure.

This section is designed to specifically define (i) the pavement, i.e., the ordered sequence of materials, (ii) the properties of the incorporated materials and (iii) other factors, such as drainage cross-slope, joint spacing, dowel details and drainage etc.

The required elements of the Structure input are:

Table 3. Elements of structure input

PCC	AC
Design Features	Drainage and Surface Properties
Drainage and Surface Properties	Layers
Layers	Thermal Cracking
	Distress Potential

3.4.1 Design Features (PCC only)

The Design Features input requires the user to input the slab, dowel and other data that is needed in conjunction with the vertical sequence of materials.

Joint spacing, dowel spacing and diameter, type of edge support and slab width are straightforward and conventionally available inputs. Other input, such as "Permanent curl/warp effective temperature difference (ºF)", deflection load transfer efficiency (LTE, %), Erodibility Index and Loss of bond age may not be familiar to the designer.

Until the Iowa DOT has established values for these unknown parameters, it is recommended that the designer use the built-in default values.

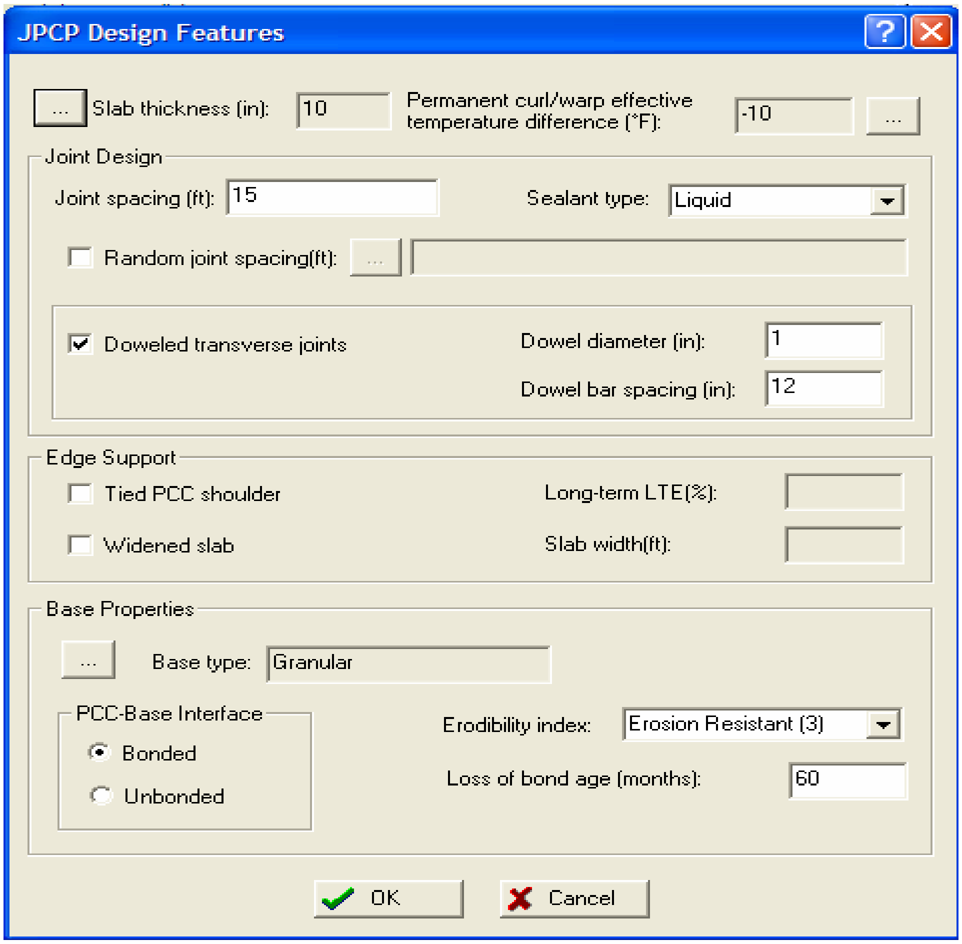

Figure 14. Input – JPCP design features

3.4.2 Drainage and Surface Properties

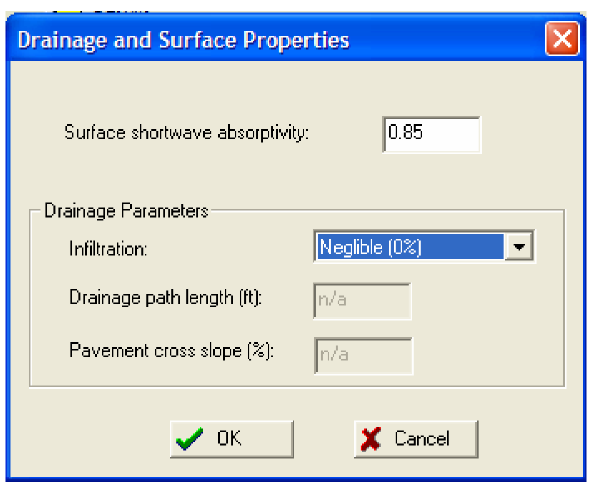

Figure 15. Input – drainage and surface properties

In this screen, the surface shortwave absorptivity is unlikely to be a known parameter, and unless indicated otherwise, the default value should be used.

The drainage parameters depend primarily on the selection of the Infiltration (Negligible (0%), Minor (10%), Moderate (50%) and Extreme (100%)). This estimate refers to the degree to which the surface drainage will permeate into the pavement through joints and cracks – and is therefore a direct reflection of the expectation of the designer with regard to the efficiency and frequency of joint and crack sealing activities throughout the design life. This may be reasonably obtained from maintenance records on similar and local pavements.

The Drainage path length and the Pavement cross slope may be abstracted from the standard detail and cross-section drawings.

3.4.3 Layers

The user has to define the sequence of material layers within the constructed pavement. This is achieved through an entry table in which the designer specifies (i) the number of layers used (including the subgrade), the type of each layer (PCC, HMA, Stabilized, Granular or Subgrade), the more specific material type within the layer and an initial thickness (inches).

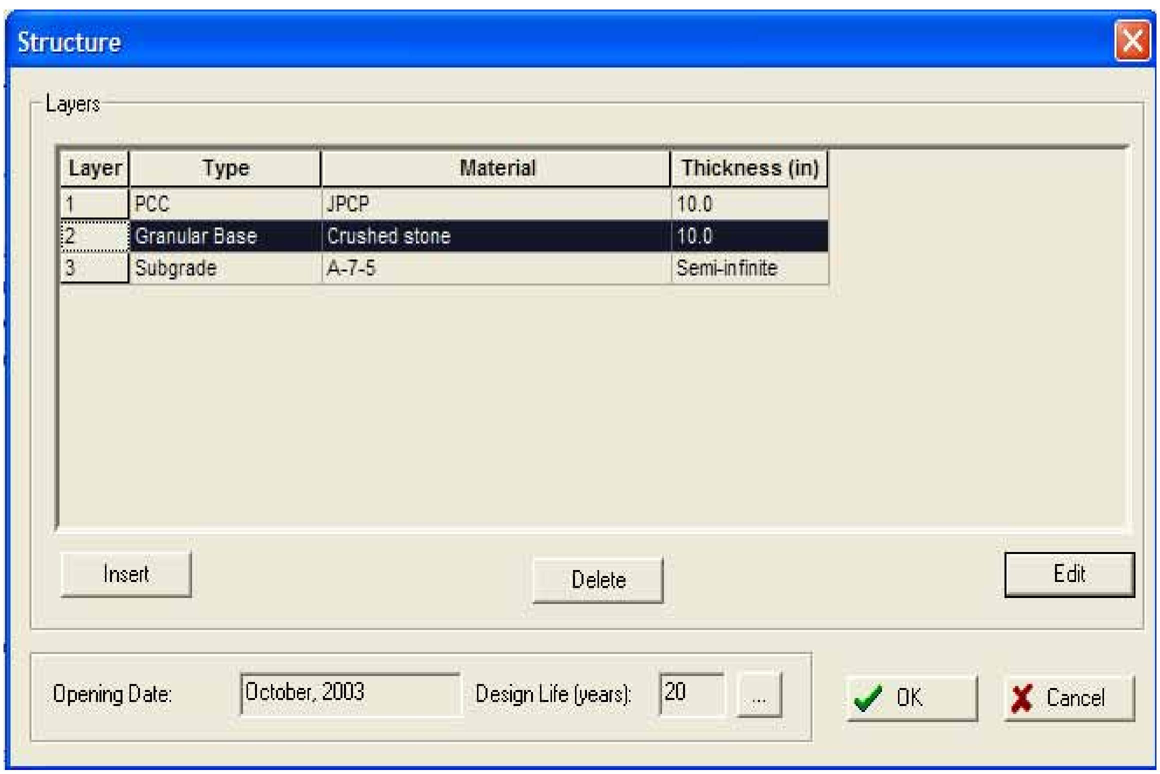

Figure 16. Input – structure

The input admits to six (6) general materials types:

- PCC
- Asphalt
- Stabilized Base
- Granular Base
- Subgrade
- Bedrock

Within these general descriptors, more specific designations must be made:

Table 4. Material type options

PCC	Asphalt	Stab. Base	Gran. Base	Subgrade	Bedrock
JPCP	AC	Cement Stab.	Crushed Stone	Any soil under the Unified or AASHTO classifications	Massive/Continuous
CRCP	Asph. Permeable Base	Soil Cement	Crushed Gravel		Highly fractured and Weathered
	AC (existing)	Lime cement Fly-ash	River run Gravel		
		Lime Fly Ash	Cold Recycled Asphalt Pavement		
		Lime stabilized	A-1-a		
			A-1-b		
			A-2-4		
			A-2-5		
			A-2-6		
			A-2-7		
			A-3		

3.4.3.1 Materials

The following discussion relates only to the three major material types dealt with in the MEPDG: Concrete, Asphalt and Unbound materials.

3.4.3.1.1 Concrete

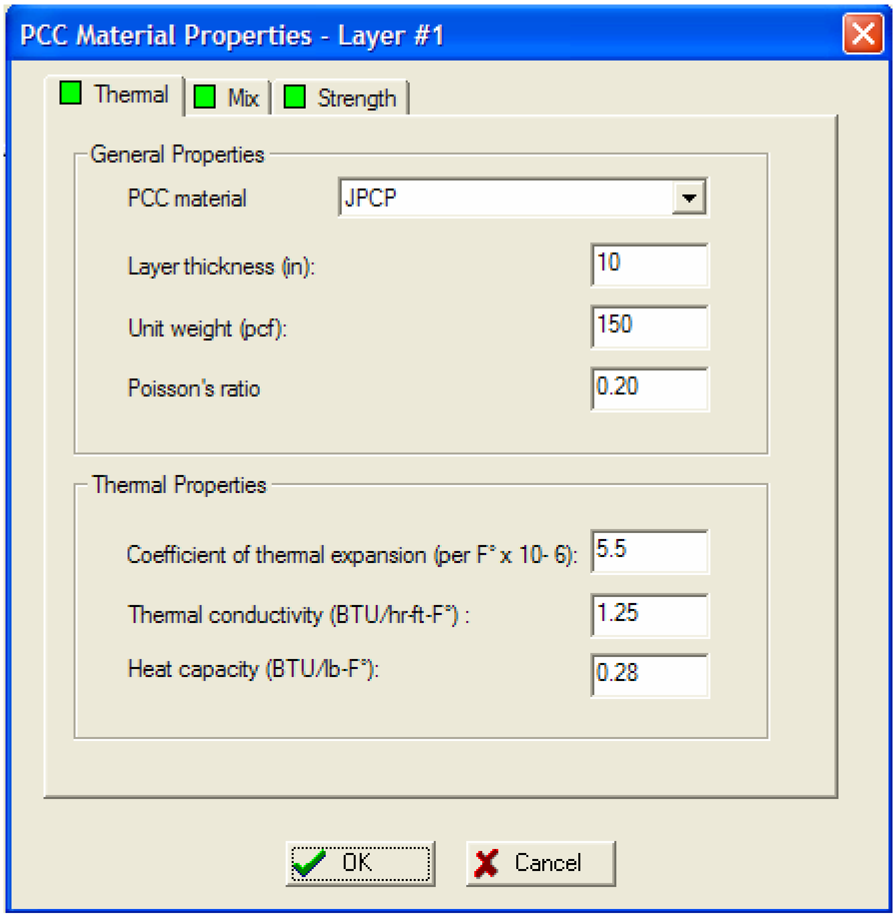

Figure 17. Input – PCC material properties – thermal

The input screen for concrete materials is reasonably straightforward, and consists of three tabs: Thermal, Mix, and Strength

Thermal: The upper block of this screen is straightforward and the required parameters known. However the lower block "Thermal Properties" represents material not conventionally available to designers. In the absence of known values, default values can be entered, however, care must be taken (especially for PCC pavements), and since the computed performance predictions have been found to be sensitive to these parameters. PCC thermal conductivity, heat capacity, and the coefficient of thermal expansion are the required thermal properties of the PCC layer.

Mix: Once again, the upper part of this screen (below) is relatively straightforward and can be based on specification. However, the PCC zero-stress temperature is a "new" parameter that is again critical to performance prediction. The lower part of the screen is all "new" with the exception of the identification of the curing method. It is unlikely that these shrinkage parameters are currently known.

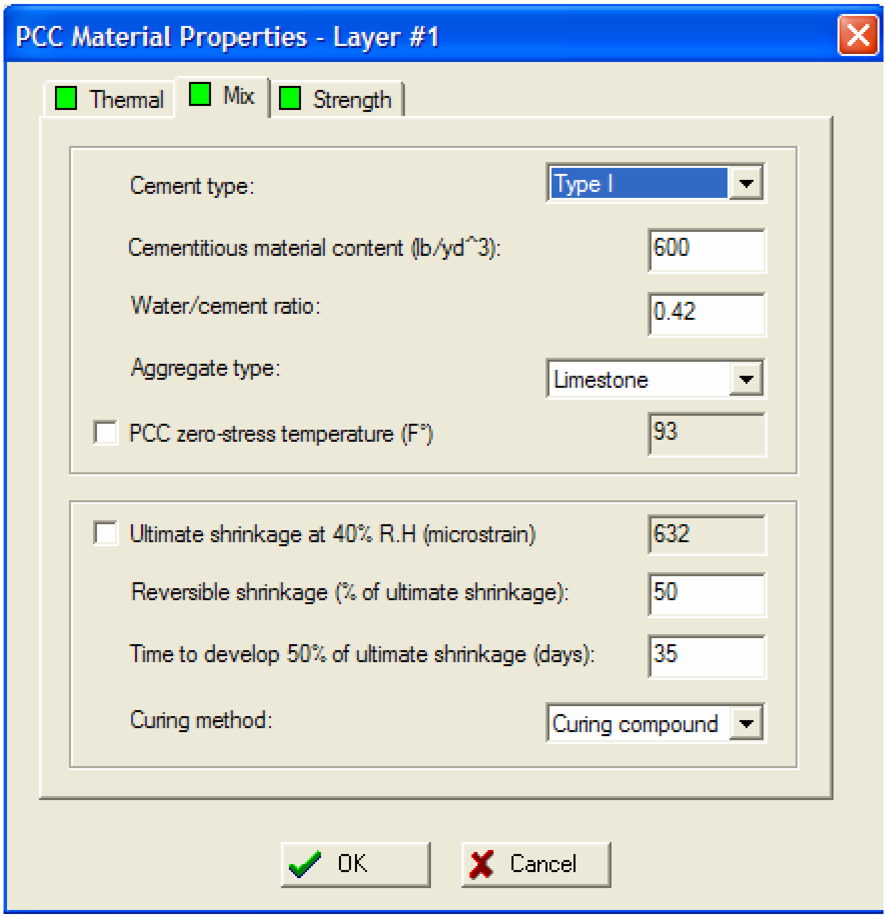

Figure 18. Input – PCC material properties – mix

Strength: Modulus of elasticity and flexural strength are the main strength parameters used in the MEPDG software to characterize PCC materials. The ratio of stress to strain in the elastic range of a stress-strain curve for a given concrete mixture defines its modulus of elasticity. The PCC modulus of elasticity is influenced significantly by mix design parameters and mode of testing. The mixture parameters that most strongly influence elastic modulus include ratio of water to cementitious materials, and relative proportions of paste and aggregate. The flexural strength, often termed modulus of rupture (MR), can be defined as the maximum tensile stress at rupture at the bottom of a simply supported concrete beam during a flexural test with third point loading. Like all measures of PCC strength, the modulus of rupture is strongly influenced by mix design parameters.

The strength information required depends on the Level available:

- Level 3 requires any two of:
    - 28-day Modulus of Rupture (psi)
    - 28-day Compressive Strength (psi)
    - 28-day Elastic Modulus (psi)

- Level 2 requires the history of compressive strengths, i.e.,
    - 7-day compressive strength (psi)
    - 14-day compressive strength (psi)
    - 28-day compressive strength (psi)
    - 90-day compressive strength (psi)
    - 20-year/28-day ratio

- Level 1 requires same information as in Level 2 for the Elastic Modulus (psi) and Modulus of Rupture (MR).

Poisson's ratio, unit weight, and PCC layer thickness are the other input parameters for PCC design. Tables 5 and 6 summarize the input level requirements for Poisson's ratio and unit weight.

Table 5. Typical Poisson's ratio (μ) values for PCC materials

PCC materials	Level 3 μ_{range}	Level 3 $\mu_{typical}$
PCC Slabs	0.15 – 0.25	0.20
Fractured Slab		
Crack/Seat	0.15 – 0.25	0.20
Break/Seat	0.15 – 0.25	0.20
Rubbilized	0.25 – 0.40	0.30

Table 6. Unit weight estimation of PCC materials

Material group category	Input Level	Description
PCC	1	• Estimate value from testing performed in accordance with AASHTO T 121 – Mass per Cubic Meter (Cubic Foot), Yield, and Air Content (Gravimetric) of Concrete
	2	• Not applicable.
	3	• User selects design values based upon agency historical data or from typical values shown below: Typical range for normal weight concrete: 140 to 160 lb/ft^3

3.4.3.1.2 Asphalt Materials

The information needed to fulfill the requirements of asphalt materials at Level 1 is more complex and testing more difficult. Levels 2 and 3 rely on an empirical relationship derived by M. Witczak.

The entry screen (below) shows the three tabs relating to the Asphalt Mix, Asphalt Binder and Asphalt General. Of these, the Asphalt General tab information is identical for all three levels of input.

Asphalt Mix: Levels 2 and 3 input provides gradation information necessary for Witczak's empirical equation to estimate the Master Curve. The required gradation information is : the cumulative % retained on the ¾" sieve, the cumulative % retained on the 3/8" sieve, the cumulative % retained on the #4 sieve, and the % *passing* the #200 sieve. Notwithstanding the awkwardness of switching from % retained to % passing, this is easy input!

At Level 1, the required input is more complex and less easily come by. It is necessary to perform a complete temperature/frequency sweep test suite on samples of the mixture such that the Master Curve can be generated by the software. This requires specialized testing equipment (which the DOT currently possesses) and at least 3 temperatures and 3 frequencies. More temperatures and frequencies are helpful.

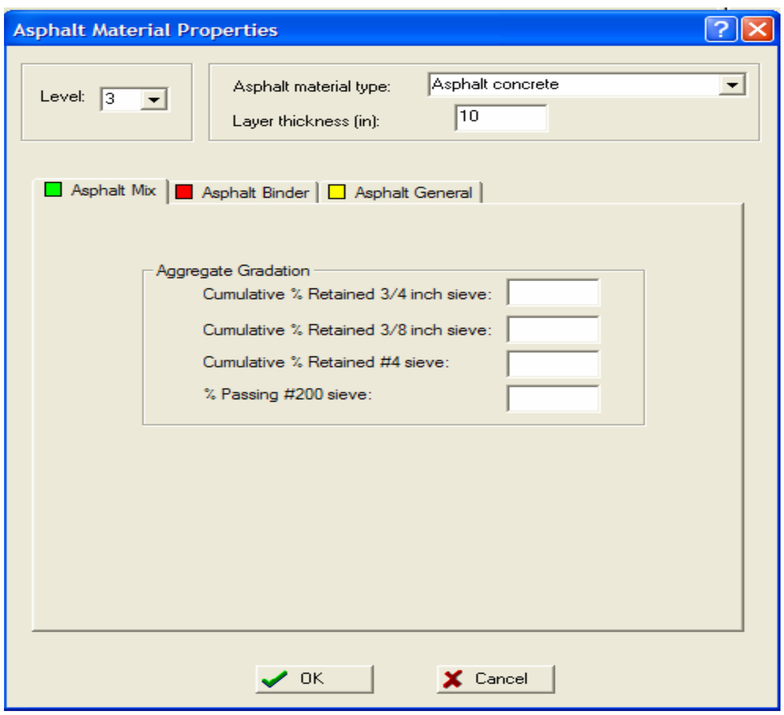

Figure 19. Input – asphalt material properties – asphalt mix – level 3

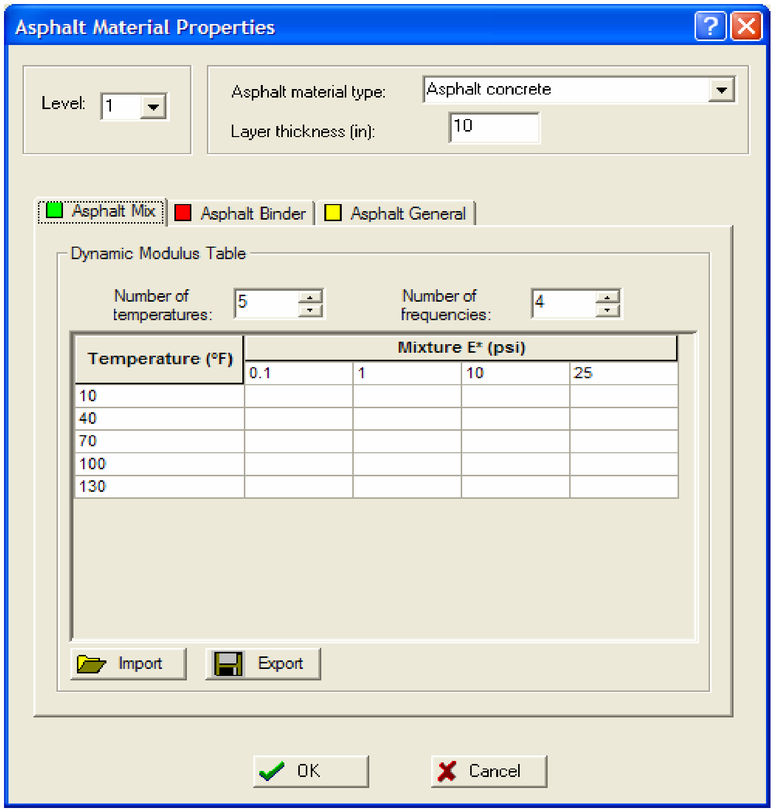

Figure 20. Input – asphalt material properties – asphalt mix – level 1

Asphalt Binder: The Asphalt Binder tab allows (i) the identification of a PG grade (e.g., PG 58-28) (Level 3), which thereafter sets generic defaults within the program, (ii) actual binder test results (G* and δ) using the Dynamic Shear Rheometer (DSR) on short-term aged (RTFO) binders (Levels 1 and 2). These tests are simple to run, and the DOT is currently performing these tests routinely in the Binder lab.

Older binder grades may be used in the absence of a Superpave designation (e.g., 85-100 pen, or AC-10)

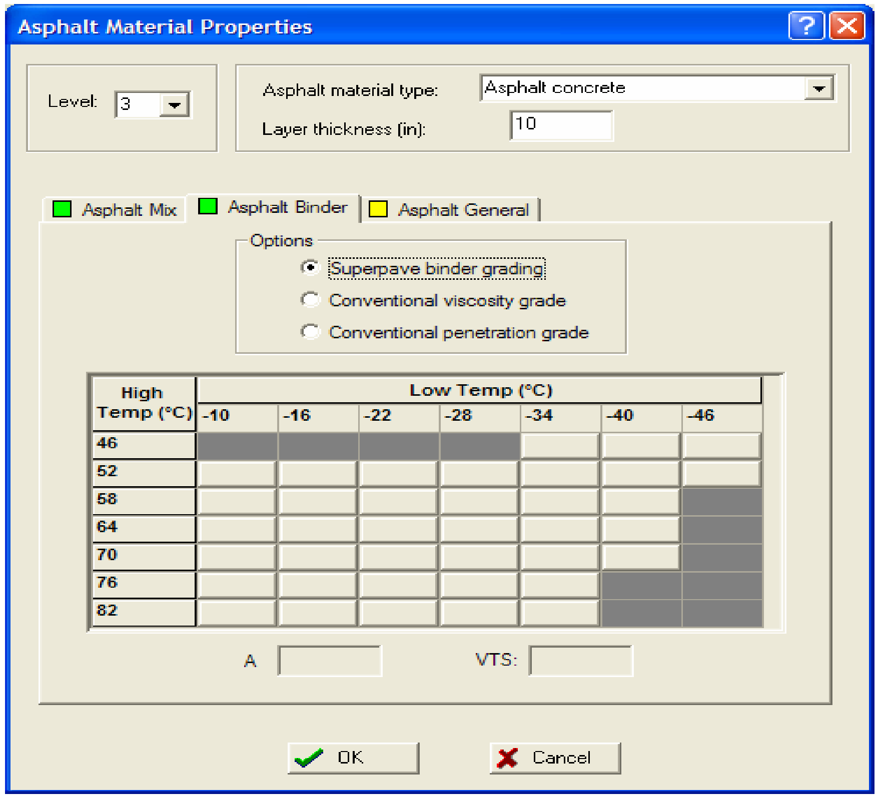

Figure 21. Input – asphalt material properties – asphalt binder – level 3

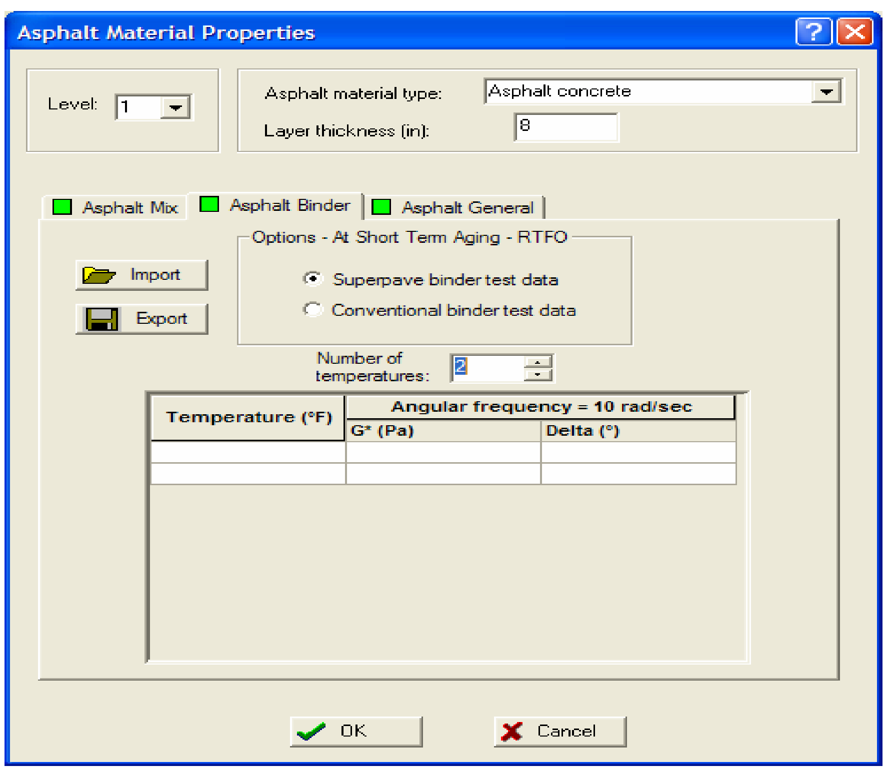

Figure 22. Input – asphalt material properties – asphalt binder – level 1

Asphalt General: The Reference Temperature (shown as 70ºF) need not be changed by the user. The "Volumetric Properties as Built" should reflect the "as-constructed condition of the mixture – *not the design condition (typically @ 4% air voids)*. For this input, the Effective Binder Content (volumetric) is easier computed as the difference between the %VMA and the Air voids %. The Unit Weight is simply the Bulk Density (as constructed) multiplied by 62.4 to render units of lb/ft^3. The Poisson's Ratio box can be left as shown, and indeed it has long been known that except for large deviations in Poisson's Ratio, the performance of pavement is relatively insensitive to error.

As with PCC materials, the thermal properties of asphalt materials are currently not known quantities. In the absence of actual information, the default values should be used.

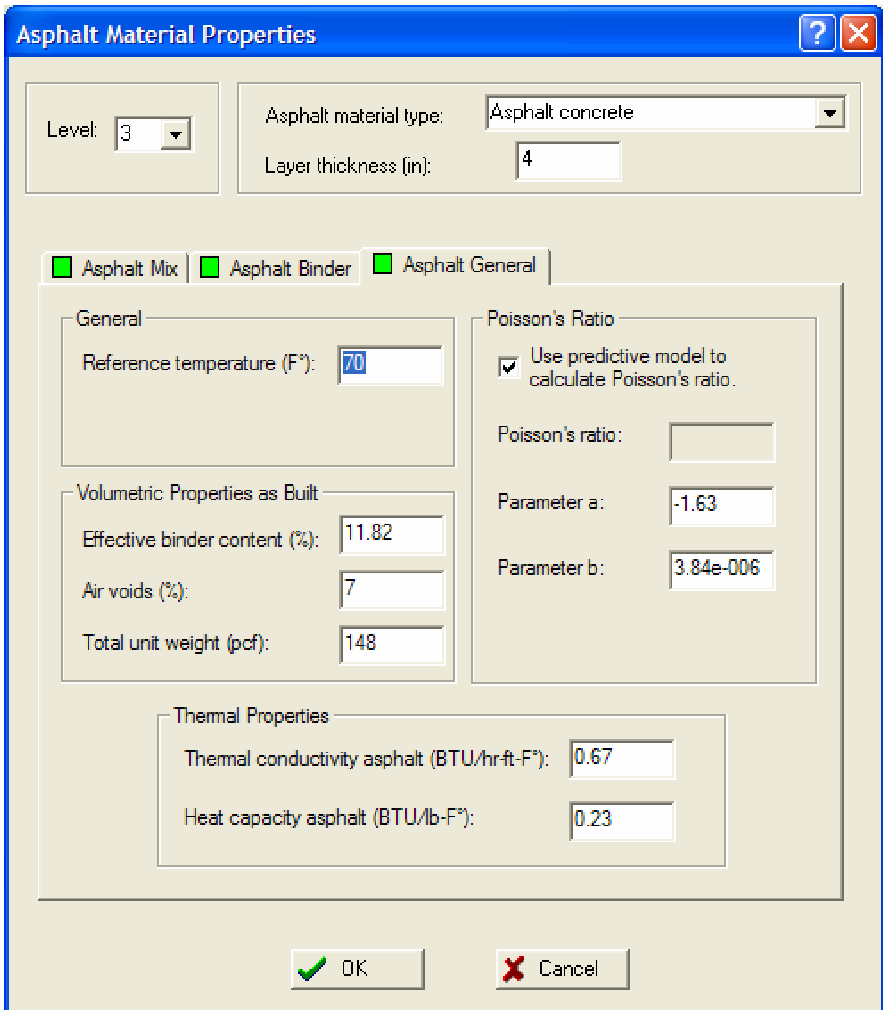

Figure 23. Input – asphalt material properties – asphalt general

3.4.3.1.3 Asphalt Thermal Cracking

A separate input is available for entry of the tested tensile properties of asphalt mixtures which are critical in the estimation of thermal (transverse) cracking. The default condition is calculated from the Asphalt Binder and Mixture properties entered in the screens above. The test data is based on the results of controlled Indirect Tensile testing of the mixture.

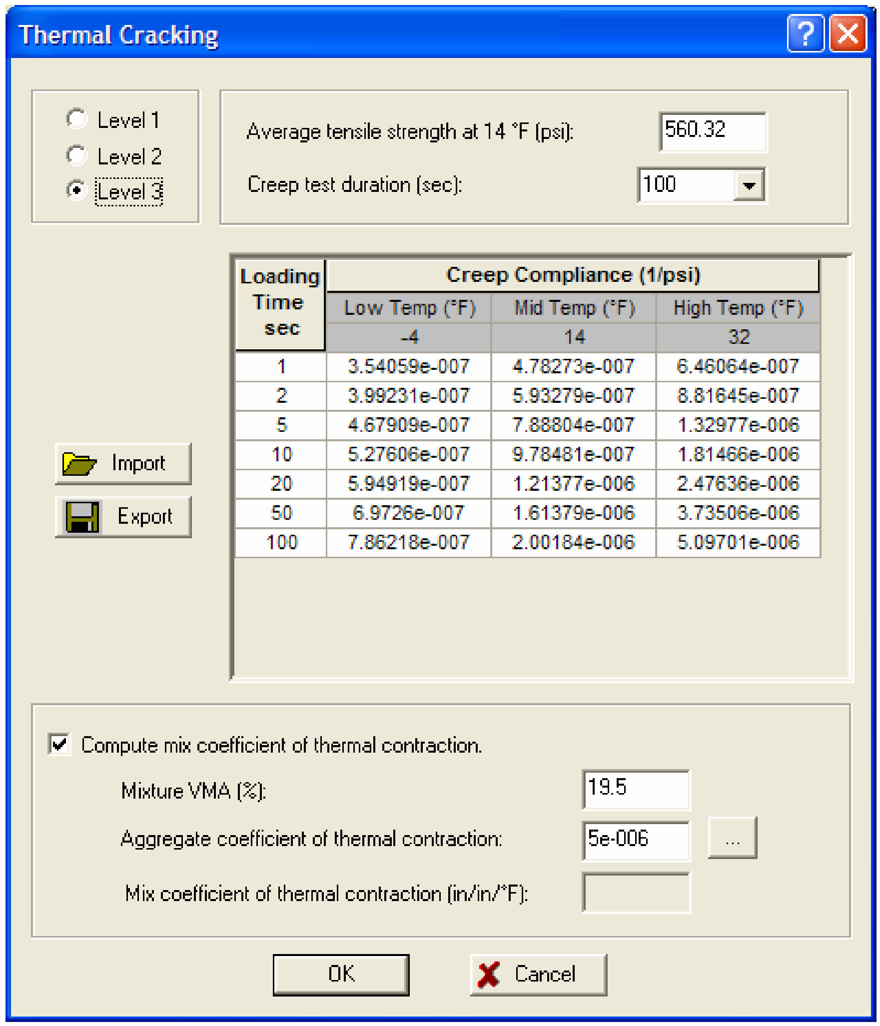

Figure 24. Input – thermal cracking

3.4.3.1.4 Stabilized Materials

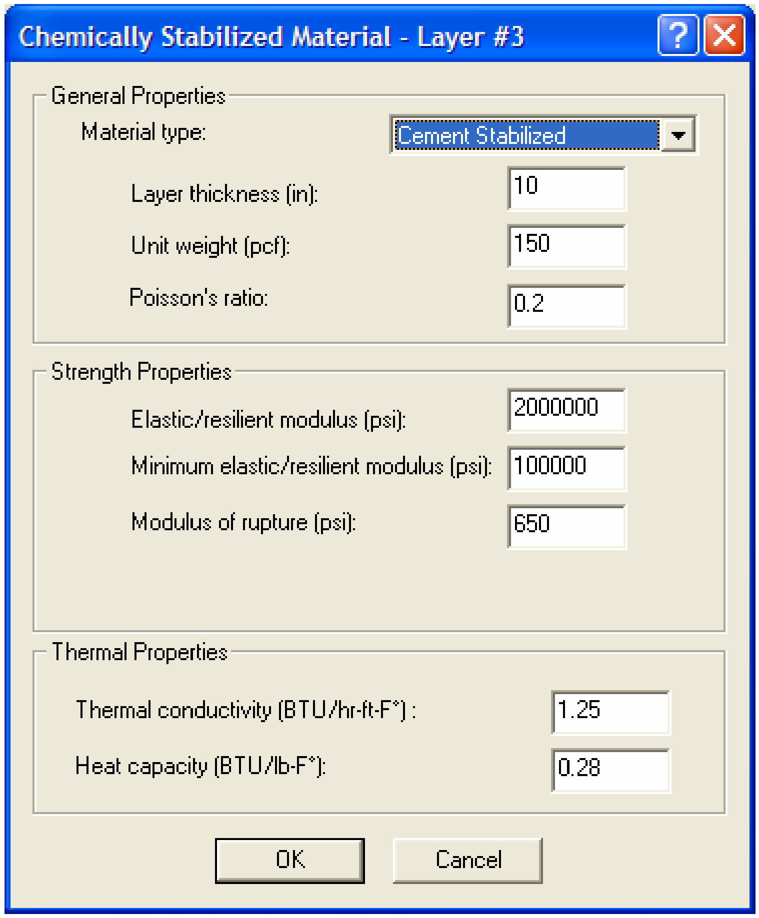

Figure 25. Input – stabilized materials

For stabilized materials, the General Properties inputs are straightforward, with the exception of an estimate for Poisson's Ratio***, which may typically use the supplied default value.***

Strength values will, in many cases, be derived from either actual tests, project specifications, or from the supplied default values. For many stabilized materials, these values are not well known, and reasonable estimates may have to be used.

The Thermal Properties inputs are typically unknown, and until Iowa values can be established, it appears reasonable to use the defaults provided.

3.4.3.1.5 Unbound (Granular) Materials

Unbound, or granular materials comprise engineered materials such as crushed stone and drainage aggregates as well as some natural soils, both coarse- and fine-grained.

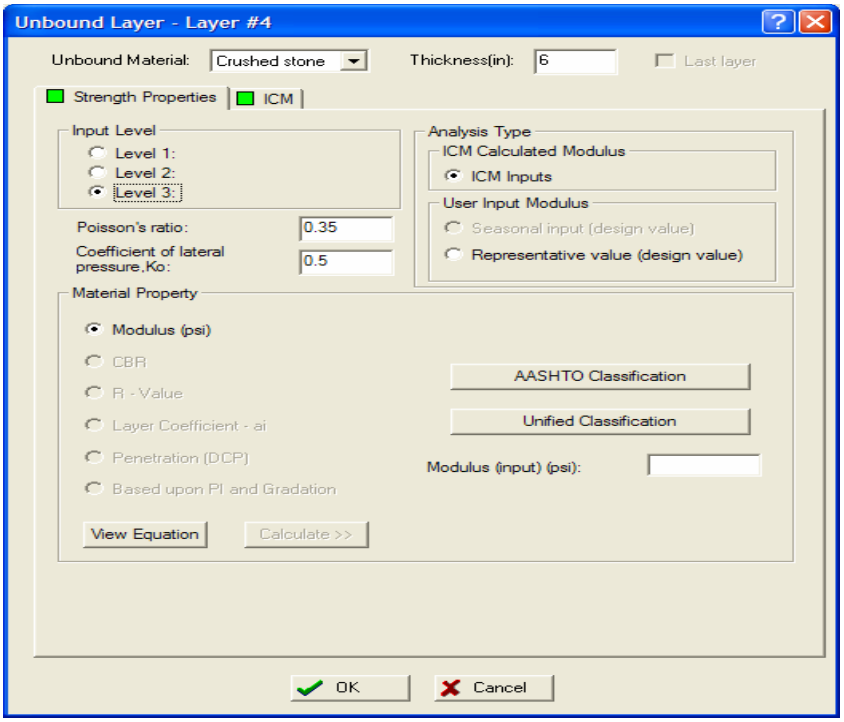

Figure 26. Input – unbound layer – level 3

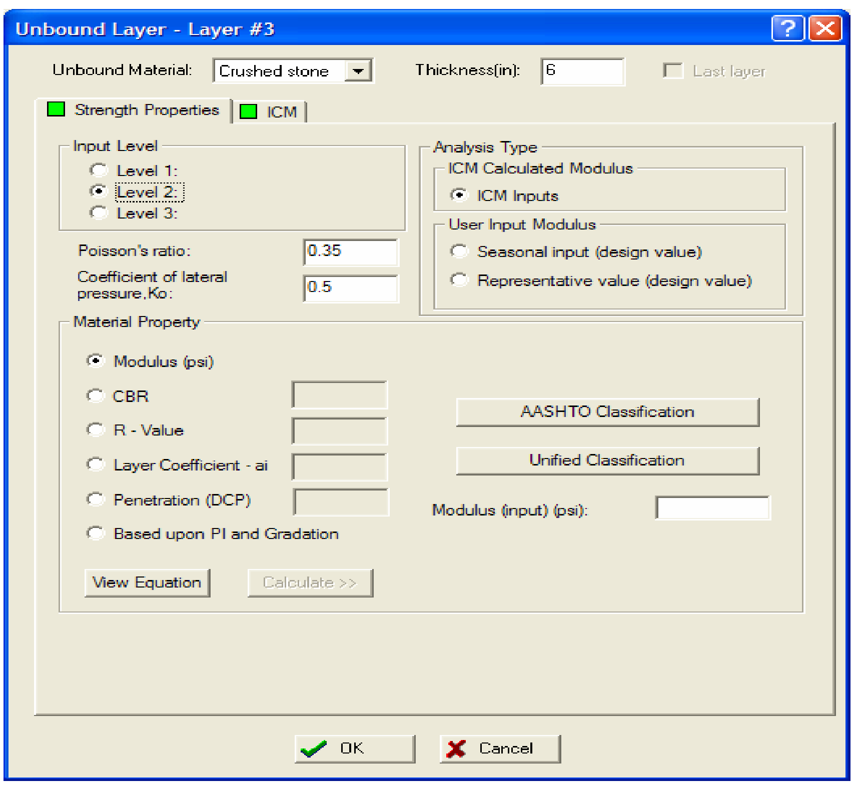

Figure 27. Input – unbound layer – level 2

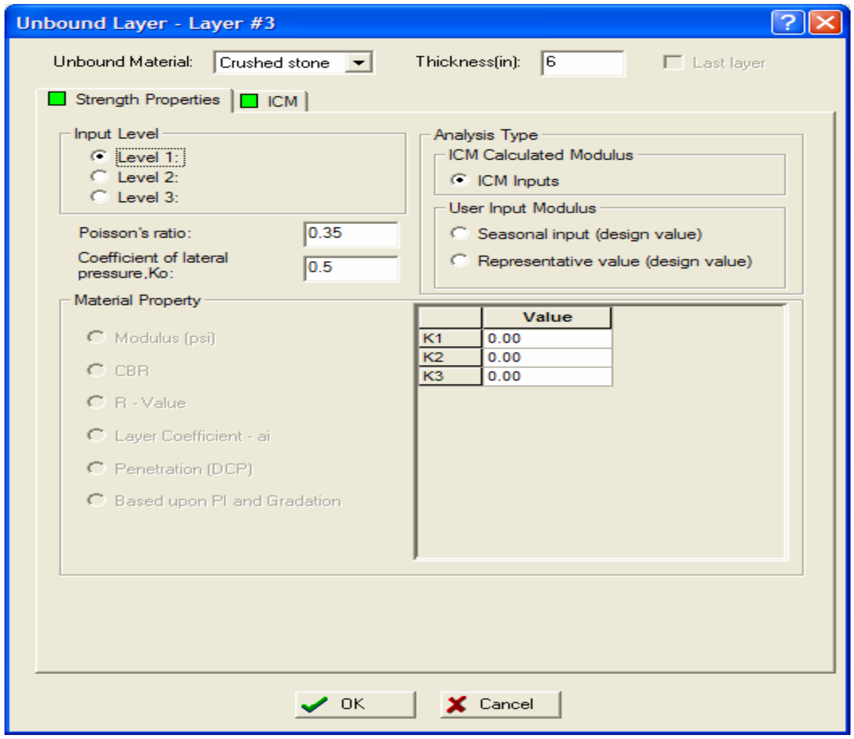

Figure 28. Input – unbound layer – level 1

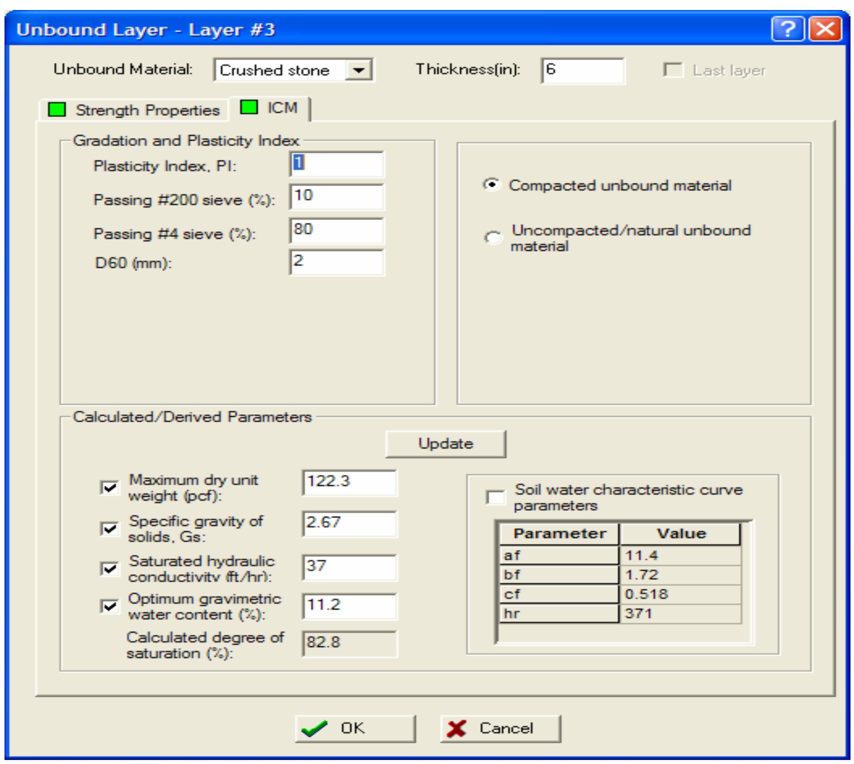

Figure 29. Input – unbound layer – ICM

At Level 3 input, only a "representative" subgrade resilient modulus is expected. The program "creates" a seasonal resilient modulus pattern based on the ICM inputs (next screen tab).

Level 2 input allows the user to enter either a "representative" resilient modulus or a month-by-month set of resilient moduli. Further estimates may be had through various calibrated regressions between resilient modulus and other measures, such as CBR, R-value, etc. The program "creates" a seasonal resilient modulus pattern based on the ICM inputs (next screen tab).

Level 1 input (currently uncalibrated) permits direct entry of the $k_1 - k_3$ indices based on testing of the materials. Further, seasonal variations are allowed through the ICM screen.

The ICM input screen requires conventional soil inputs, such as gradation, moisture-density results, specific gravity and unit weights.

These materials typically exhibit non-linear response to load, and are particularly sensitive to the state-of-stress and degree of water saturation. When fully implemented, the universal Witzcak-Uzan relationship will be used by the MEPDG to estimate the Resilient Modulus of the unbound material under all conditions:

$$M_r = k_1 p_a \left(\frac{\theta}{p_a} \right)^{k_2} \left(\frac{\tau_{oct}}{p_a} + 1 \right)^{k_3}$$

where: k_1, k_2 and k_3 are parameters from physical testing
p_a is the normalizing atmospheric pressure
θ is the bulk stress, $\theta = \sigma_1 + \sigma_2 + \sigma_3$
τ_{oct} is the octahedral stress, $\tau_{oct} = 1/3 \sqrt{((\sigma_1 - \sigma_2)^2 + (\sigma_1 - \sigma_3)^2 + (\sigma_2 - \sigma_3)^2)}$

Further adjustment is made based on the Degree of Saturation.

General correlations between Resilient Modulus and other parameters are given in the following table:

Table 7. Estimator relationships for unbound/soil materials resilient moduli

Strength Index Property	Model	Comments	Test Standard
CBR	$M_r = 2555(CBR)^{0.64}$	CBR = California Bearing Ratio, percent	AASHTO T193—The California Bearing Ratio
R-value	$M_r = 1155 + 555R$	R = R-value	AASHTO T190—Resistance R-Value and Expansion Pressure of Compacted Soils
AASHTO layer coefficient	$M_r = 30000\left(\frac{a_i}{0.14}\right)$	a_i = AASHTO layer coefficient	AASHTO Guide for the Design of Pavement Structures (1993)
PI and gradation*	$CBR = \frac{75}{1 + 0.728(wPI)}$	wPI = P200*PI P200= percent passing No. 200 sieve size PI = plasticity index, percent	AASHTO T27—Sieve Analysis of Coarse and Fine Aggregates AASHTO T90—Determining the Plastic Limit and Plasticity Index of Soils
DCP*	$CBR = \frac{292}{DCP^{1.12}}$	CBR = California Bearing Ratio, percent DCP =DCP index, in/blow	ASTM D6951—Standard Test Method for Use of the Dynamic Cone Penetrometer in Shallow Pavement Applications

*Estimates of CBR are used to estimate M_r.

3.4.3.1.6 Subgrade Materials

Subgrade material inputs are identical to those required for unbound materials (4.4.3.1.4)

4 ANALYTIC COMPUTATION

This report will give little explanation of the analytical computations used in the software – this is beyond the “need to know” requirements of most designers and users of the software. However, brief descriptions are given of some important concepts.

4.1 Time-stepping

In the initial screens, the months of construction and opening to traffic are required. These allow the environmental module to coordinate the environmental data to the actual or expected seasonal temperature and moisture conditions. While the environmental files (*.icm) may start in, say, January; if the pavement were to be opened to traffic in October, it would be inappropriate to start by using January data.

Having coordinated construction and traffic opening with the environmental data, the program computes the temperature and moisture profiles through the depth of the pavement using gradation, moisture and thermal information (heat capacity and thermal conductivity). The program "applies" to the structural model, the traffic anticipated during the next increment of time taking due account for the axle and wheel types and wander.

4.2 Material Moduli

Having established the temperature and moisture profiles, the program estimates an appropriate modulus profile.

The elastic (resilient) modulus of PCC materials are not materially affected by temperature, however, PCC slabs are significantly influenced by thermal gradients which cause warping. By combining the effects of (i) the initial built-in effective temperature gradient, (ii) the actual thermal gradient at time t, and (iii) the moisture gradient at time t, the program computes the non-load related stresses induced in PCC slabs.

The resilient modulus of HMA (AC) materials are significantly influenced by temperature and temperature gradients – as well as the time, or duration of loading which varies with depth below the surface. The program estimates the combined effects of temperature and time of loading at each depth within the AC layers using Witczak's semi-empirical equation:

$$\log(E^*) = \delta + \frac{\alpha}{1 + e^{\beta + \gamma\left[\log(t) - c\left(\log(\eta) - \log(\eta_{T_r})\right)\right]}} \qquad (2.2.15)$$

where

E^*	=	Dynamic modulus, psi
t	=	Time of loading, sec
η	=	Viscosity at temperature of interest, CPoise
η_{Tr}	=	Viscosity at reference temperature, CPoise
$\alpha,\beta,\delta,\gamma,c$	=	Mixture specific fitting parameters.

In stabilized materials, elastic moduli are insensitive to temperature (unless frozen) but are influenced by moisture.

In unbound (granular) and subgrade materials, estimates are made of the imposed (traffic + self-weight) stress state, which is then applied to the universal Witczak-Uzan relationship to estimate the effective modulus:

$$M_r = k_1 p_a \left(\frac{\theta}{p_a}\right)^{k_2} \left(\frac{\tau_{oct}}{p_a} + 1\right)^{k_3}$$

where: k_1, k_2 and k_3 are parameters from physical testing or other estimates

p_a is the normalizing atmospheric pressure

θ is the bulk stress, $\theta = \sigma_1 + \sigma_2 + \sigma_3$

τ_{oct} is the octahedral stress, $\tau_{oct} = 1/3 \sqrt{((\sigma_1 - \sigma_2)^2 + (\sigma_1 - \sigma_3)^2 + (\sigma_2 - \sigma_3)^2)}$

5 INCREMENTAL DISTRESS

At time = 0 (i.e., opening to traffic), all distresses are set to zero, except the roughness parameter, IRI, which is set to the initial IRI value provided in the introductory screens.

As time increments, and the stress state within the pavement at each time increment is applied to a number of semi-empirical relationships that estimate incremental damage or development of distress. Many of these relationships, or transfer functions, are based in theory (e.g., fracture mechanics) and laboratory testing, and have been "calibrated" to nationally published LTPP field data.
These transfer functions are used to increment the appropriate distress using the general form:

$$Distress\left(@time = t + \Delta t\right) = Distress\left(@time = t\right) + \Delta Distress$$

5.1 Transfer Functions

The following relationships are given for reference only, and provide a simplified explanation of the type and shape of the distress transfer functions included in the MEPDG.

5.1.1 HMA Rutting

$$HMA: \quad RD_{AC} = \sum \varepsilon_p \bullet h = \sum \beta a_1 T^{a_2} N^{a_3} \bullet \varepsilon_r \bullet h$$

where: ε_p = permanent vertical strain
h = layer thickness
T = temperature
N = Number of loads applied
ε_r = vertical resilient (elastic) strain
β, a_1, a_2 and a_3 = material constants

$$Unbound: \quad \delta_{UB} = \beta\left(\frac{\varepsilon_0}{\varepsilon_r}\right)e^{-\left(\frac{\rho}{N}\right)^{\beta_0}} \varepsilon_v h$$

where: ε_v = average vertical strain over depth increment
β, ε_0, ρ and β_0 are material constants – different for each unbound material type.

The total rut depth, RD, is given by:

$$RD = RD_{AC} + \delta_{UB} + \delta_{SG}$$

5.1.2 HMA Fatigue Cracking

The following general relationship is used to develop the incremental additions to fatigue cracking, both "bottom up or alligator" and "top down or longitudinal":

$$N_f = Ck_1\left(\frac{1}{\varepsilon_t}\right)^{k_2}\left(\frac{1}{E}\right)^{k_3}$$

where: C, k_1, k_2, k_3 are material properties (differentiating between bottom-up and top-down cracking)

5.1.3 HMA Thermal (Transverse) Cracking

The amount of transverse cracking expected in the pavement system is predicted by relating the crack depth to an amount of cracking (crack frequency) by the following expression:

$$C_f = \beta_1 * N\left(\frac{\log C / h_{ac}}{\sigma}\right) \tag{3.3.40}$$

where:

C_f	=	Observed amount of thermal cracking.
β_1	=	Regression coefficient determined through field calibration.
$N(z)$	=	Standard normal distribution evaluated at (z).
σ	=	Standard deviation of the log of the depth of cracks in the pavement.
C	=	Crack depth.
h_{ac}	=	Thickness of asphalt layer.

The amount of crack propagation induced by a given thermal cooling cycle is predicted using the Paris law of crack propagation:

$$\Delta C = A \Delta K^n \tag{3.3.41}$$

where:

ΔC	=	Change in the crack depth due to a cooling cycle.
ΔK	=	Change in the stress intensity factor due to a cooling cycle.
A, n	=	Fracture parameters for the asphalt mixture.

5.1.4 PCC Transverse Cracking

The applied number of load applications ($n_{i,j,k,l,m,n}$) is the actual number of axle type k of load level l that passed through traffic path n under each condition (age, season, and temperature difference). The allowable number of load applications is the number of load cycles at which fatigue failure is expected (corresponding to 50 percent slab cracking) and is a function of the applied stress and PCC strength. The allowable number of load applications is determined using the following fatigue model:

$$\log\left(N_{i,j,k,l,m,n}\right) = C_1 \cdot \left(\frac{MR_i}{\sigma_{i,j,k,l,m,n}}\right)^{C_2} + 0.4371 \qquad (3.4.10)$$

where,

$N_{i,j,k,\ldots}$ = allowable number of load applications at condition i, j, k, l, m, n
MR_i = PCC modulus of rupture at age i, psi
$\sigma_{i,j,k,\ldots}$ = applied stress at condition i, j, k, l, m, n
C_1 = calibration constant = 2.0
C_2 = calibration constant = 1.22

5.1.5 PCC Faulting

The mean transverse joint faulting is predicted using an incremental approach. A faulting increment is determined each month and the current faulting level affects the magnitude of increment. The faulting at each month is determined as a sum of faulting increments from all previous months in the pavement life since the traffic opening using the following model:

$$Fault_m = \sum_{i=1}^{m} \Delta Fault_i \tag{3.4.16}$$

$$\Delta Fault_i = C_{34} * (FAULTMAX_{i-1} - Fault_{i-1})^2 * DE_i \tag{3.4.17}$$

$$FAULTMAX_i = FAULTMAX_0 + C_7 * \sum_{j=1}^{m} DE_j * Log(1 + C_5 * 5.0^{EROD})^{C_6} \tag{3.4.18}$$

$$FAULTMAX_0 = C_{12} * \delta_{curling} * \left[Log(1 + C_5 * 5.0^{EROD}) * Log(\frac{P_{200} * WetDays}{p_s}) \right]^{C_6} \tag{3.4.19}$$

where,

$Fault_m$	=	mean joint faulting at the end of month m, in.
$\Delta Fault_i$	=	incremental change (monthly) in mean transverse joint faulting during month *i*, in.
$FAULTMAX_i$	=	maximum mean transverse joint faulting for month *i*, in.
$FAULTMAX_0$	=	initial maximum mean transverse joint faulting, in.
$EROD$	=	base/subbase erodibility factor.
DE_i	=	differential deformation energy accumulated during month *i*.
$EROD$	=	base/subbase erodibility factor (see PART 2, Chapter 2).
$\delta_{curling}$	=	maximum mean monthly slab corner upward deflection PCC due to temperature curling and moisture warping.
P_S	=	overburden on subgrade, lb.
P_{200}	=	percent subgrade material passing #200 sieve.
$WetDays$	=	average annual number of wet days (greater than 0.1 in rainfall).

C_1 through C_8 and C_{12}, C_{34} are national calibration constants:

$$C_{12} = C_1 + C_2 * FR^{0.25} \tag{3.4.20}$$

$$C_{34} = C_3 + C_4 * FR^{0.25} \tag{3.4.21}$$

C_1	=	1.29	C_5	=	250
C_2	=	1.1	C_6	=	0.4
C_3	=	0.001725	C_7	=	1.2
C_4	=	0.0008			

FR = base freezing index defined as percentage of time the top base temperature is below freezing (32 °F) temperature.

5.1.6 HMA and PCC – Roughness IRI

Without providing detail, the International Roughness Index, IRI, is computed separately for each type of pavement and material combination based solely on linear regression using LTPP national calibration. These relationships are of the general form:

$$IRI_t = IRI_{t=0} + a_1 Distress(1) + a_2 Distress(2) + a_3 Distress(3) + \ldots\ldots$$

6 OUTPUT

In all cases, the output is given in MS Excel format and includes:

- A summary of input data, including secondary variables and indices based on the input data.
- A summary table comparing the terminal values of distress and the matching performance criteria.
- A time-based summary of time or temperature variable parameters (e.g., Resilient moduli).
- For each distress type:
  - A tabular summary of the time development of the distress over the design period
  - A graphical plot of the time development of the distress over the design period

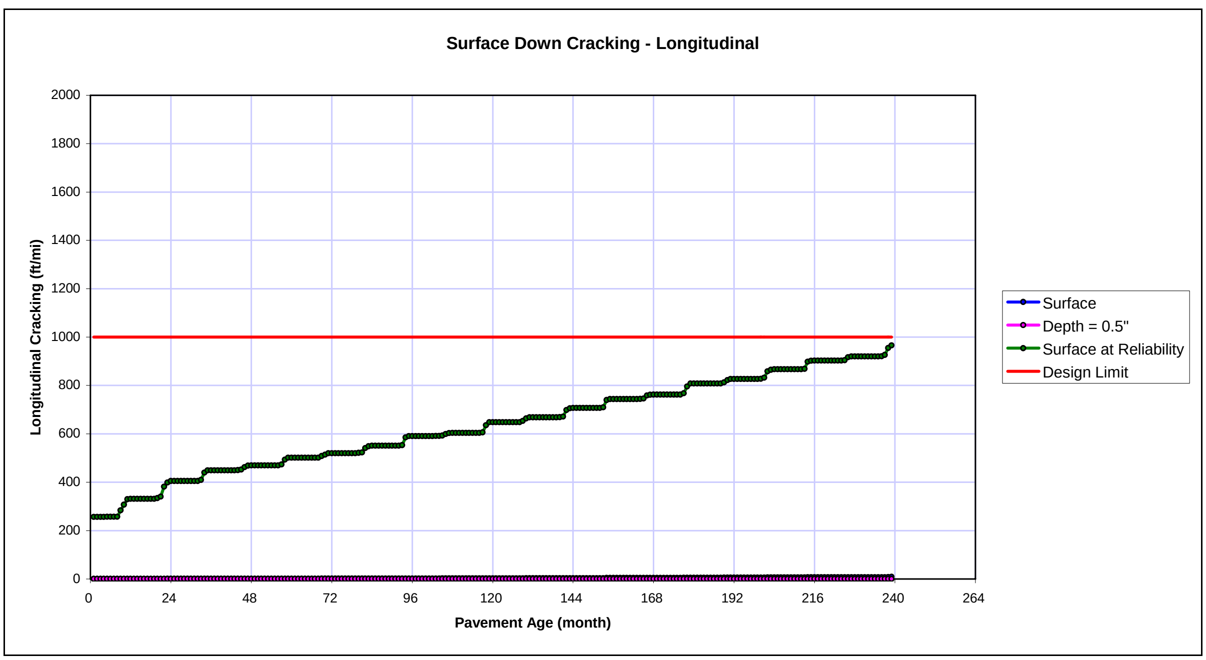

Figure 30. Output – sample – HMA surface down cracking - longitudinal

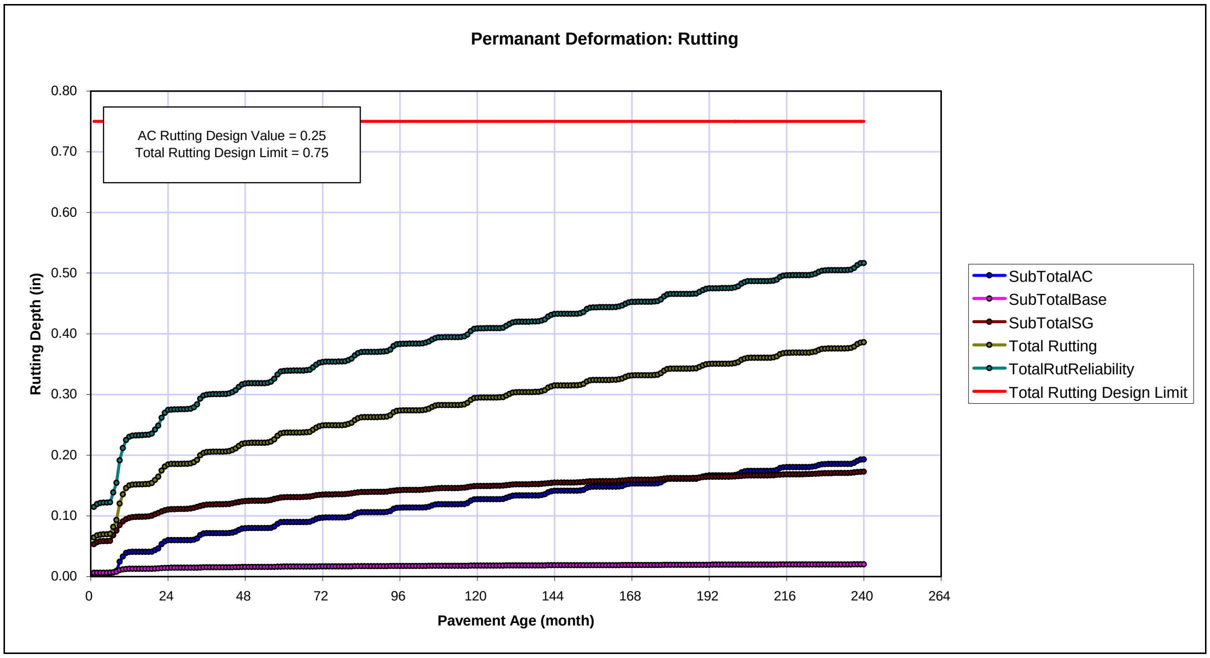

Figure 31. Output – sample – HMA permanent deformation - rutting

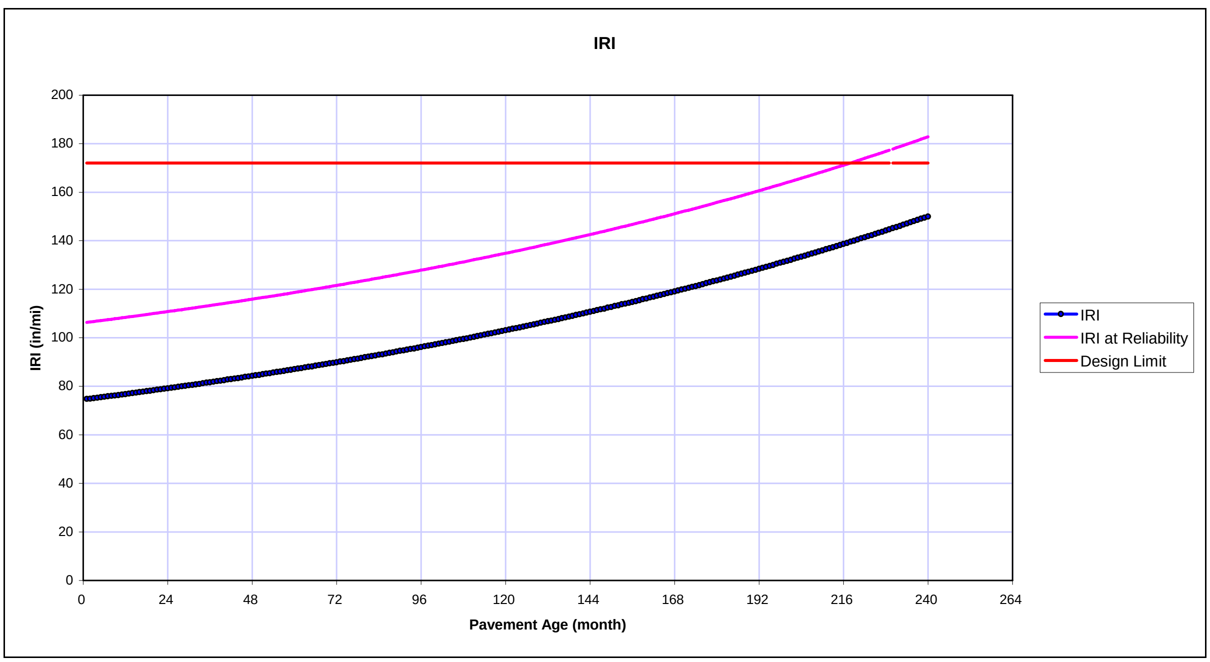

Figure 32. Output – sample – International Roughness Index (IRI)

Complete examples of both PCC and HMA outputs are included in the Appendices.

7 SENSITIVITY ANALYSIS – RIGID PAVEMENT SYSTEMS

To study the sensitivity of large number of input parameters on the predicted pavement distresses, two rigid pavement sections were selected from the Iowa Department of Transportation (Iowa DOT) Pavement Management Information System (PMIS). A history of pavement deflection testing, material testing, traffic, and other related data were also available in the LTPP database. Several hundred sensitivity runs were conducted using the MEPDG software to study the selected rigid pavement sites extensively. For unknown input parameters needed to run the MEPDG software, the nationally calibrated default values were used. Sensitivity analyses were conducted on a standard pavement section formed from two JPCP sites to study the effects on pavement performance in terms of faulting, transverse cracking, and smoothness. Based on the sensitivity analysis, a sensitivity chart was formed and presented from the most sensitive to insensitive to help the pavement design engineers identify the level of importance associated with each input parameter.

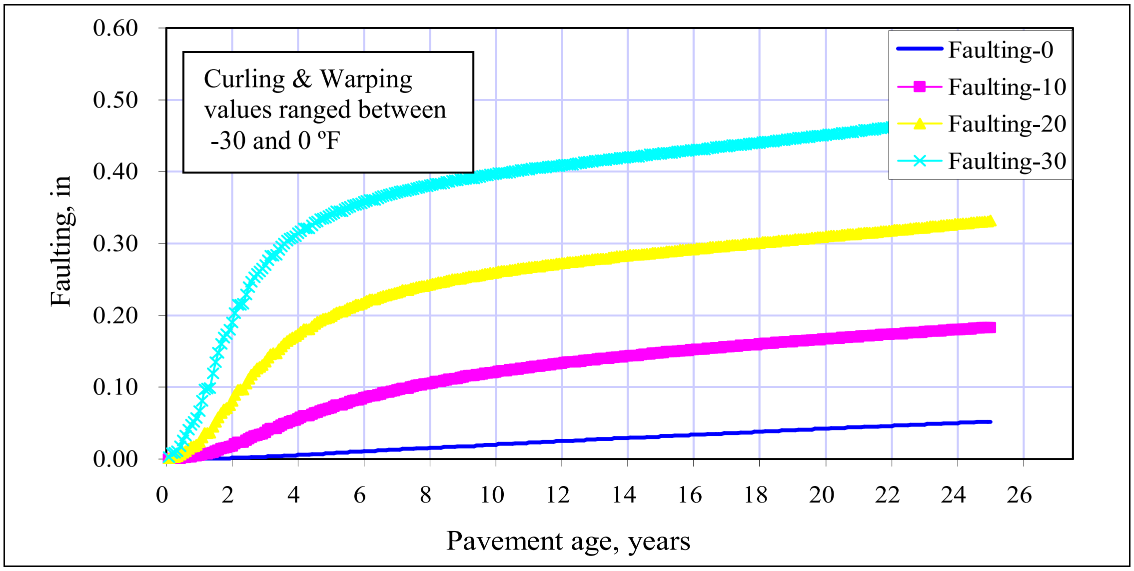

Figure 33. Faulting for different curl/warp effective temperature difference (built-in)

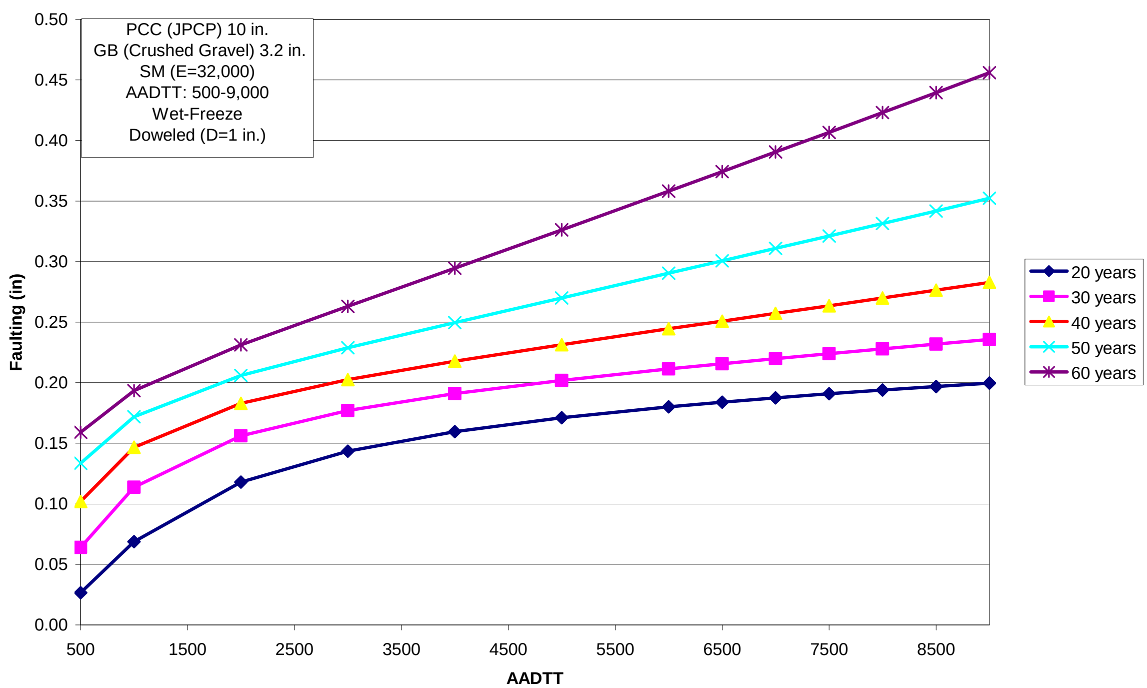

Figure 34. Faulting for different AADT at different design lives

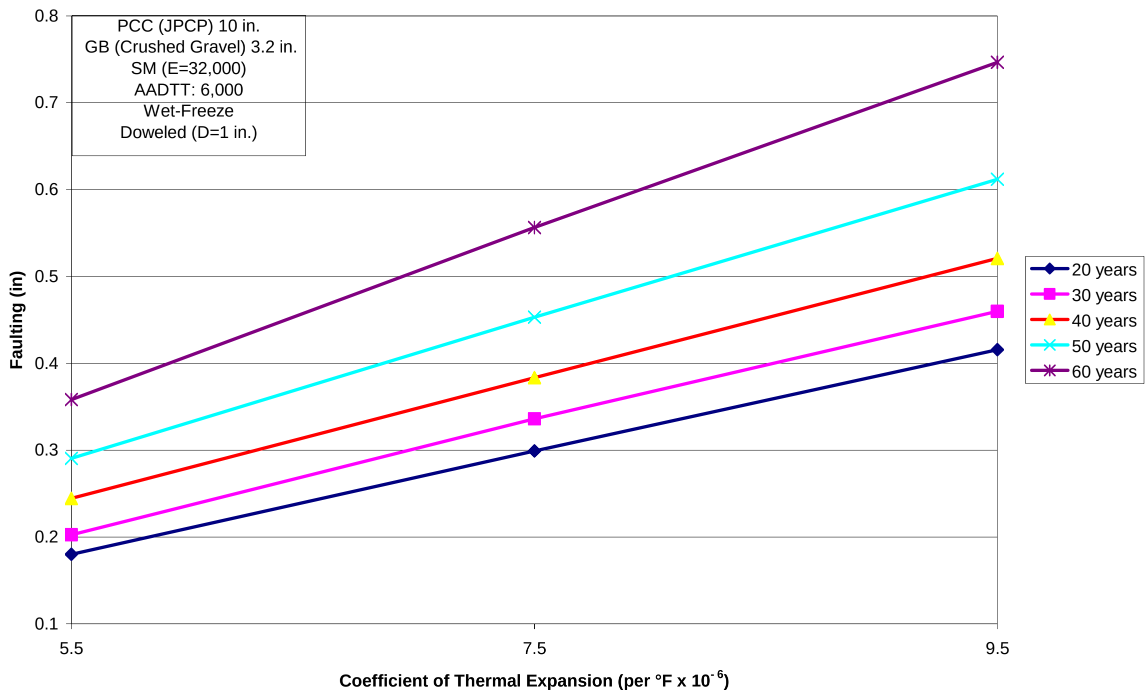

Figure 35. Faulting for different coefficient of thermal expansions at different design lives

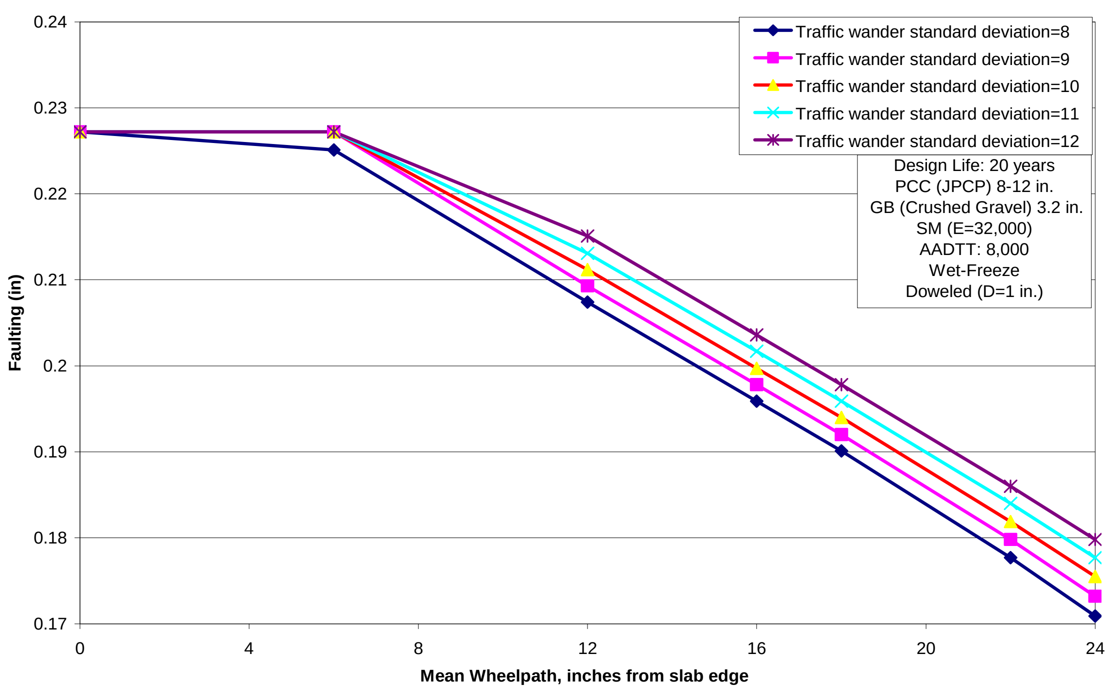

Figure 36. Faulting for different mean wheel-path at different traffic wander standard deviation

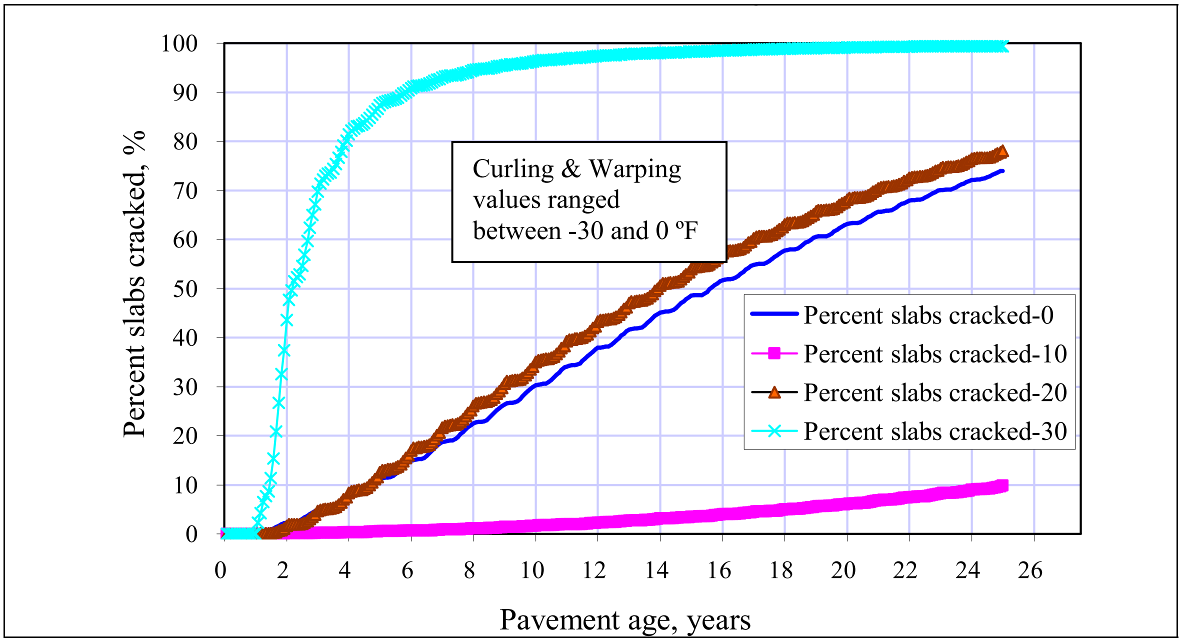

Figure 37. Cracking for different curl/warp effective temperature difference (built-in)

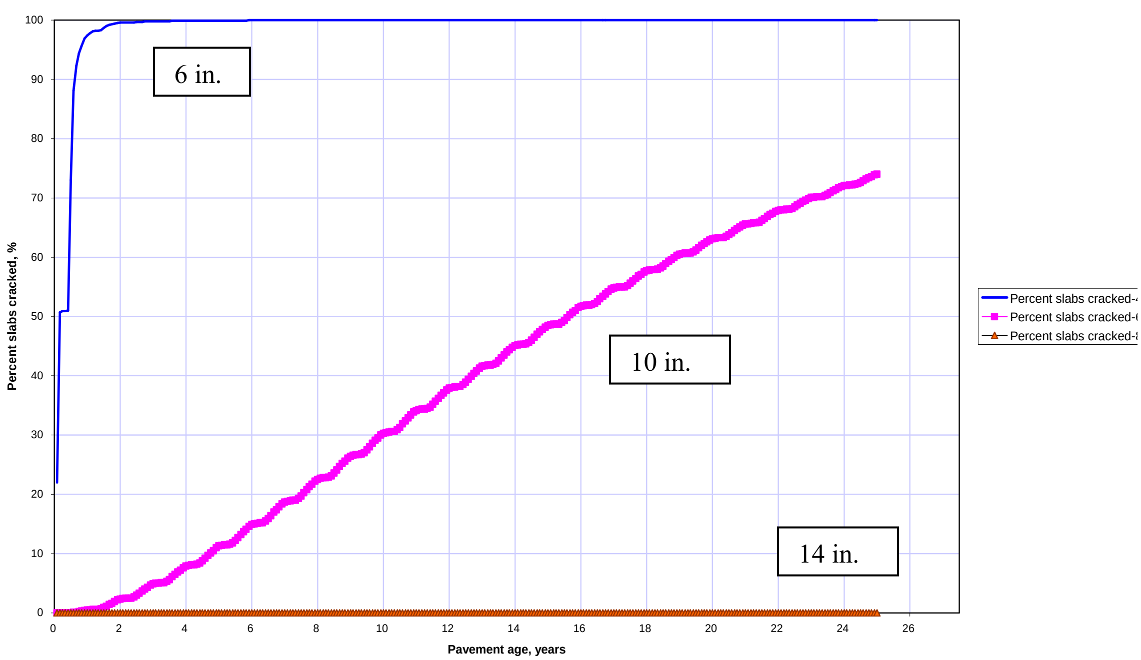

Figure 38. Cracking for different PCC layer thicknesses

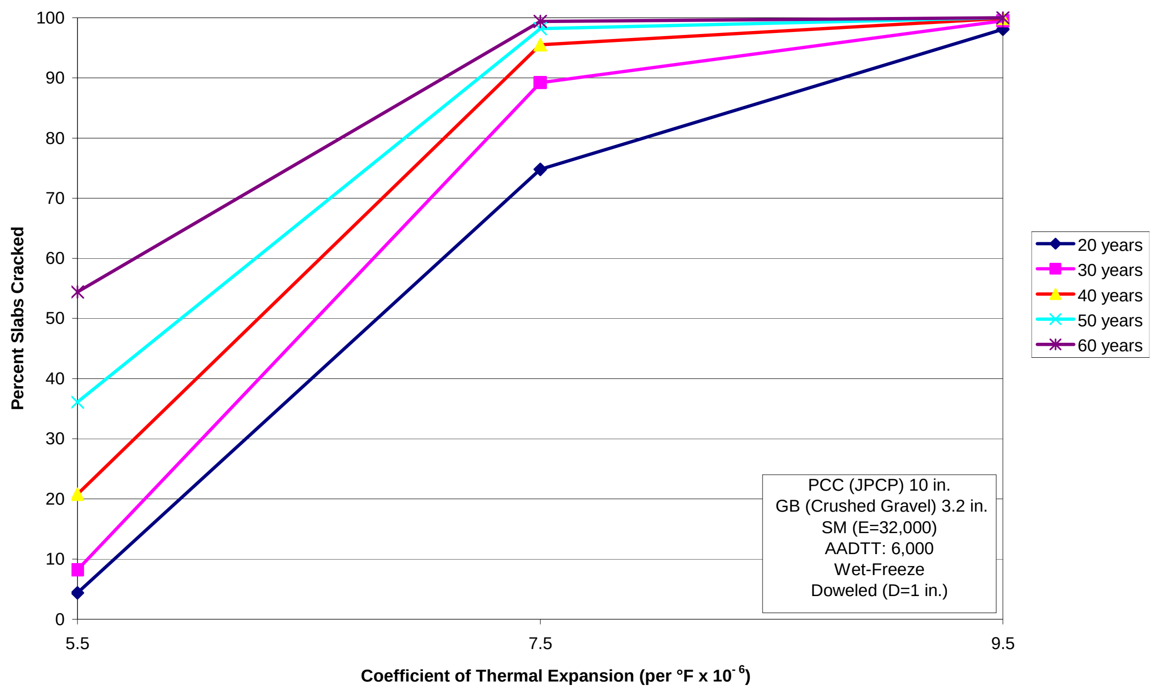

Figure 39. Cracking for different coefficient of thermal expansion at different design lives

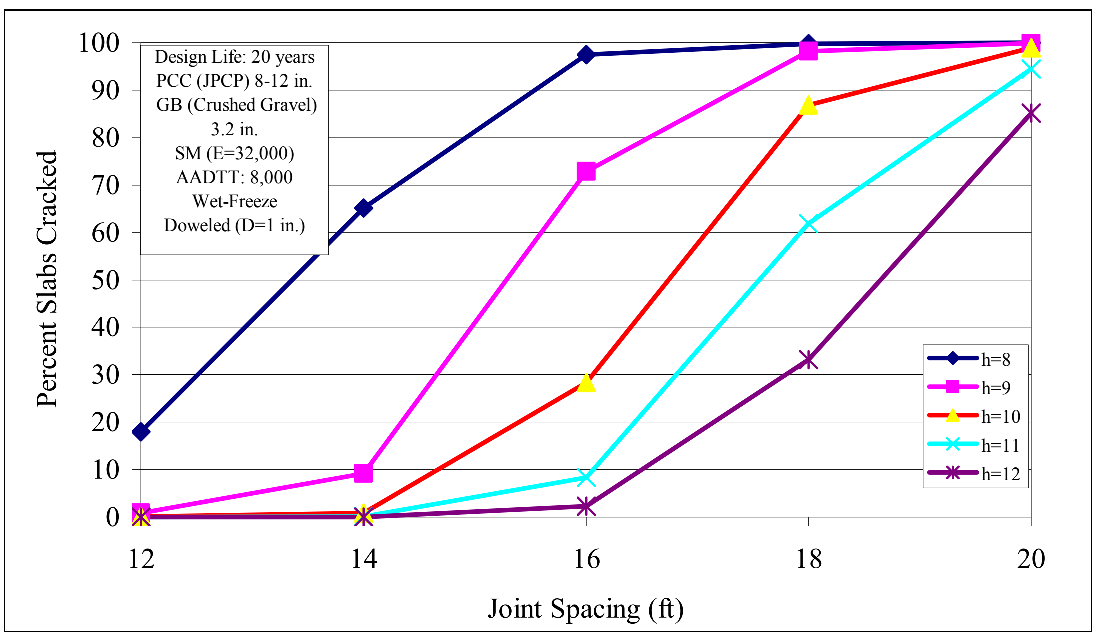

Figure 40. Cracking for different joint spacing at different pavement thicknesses

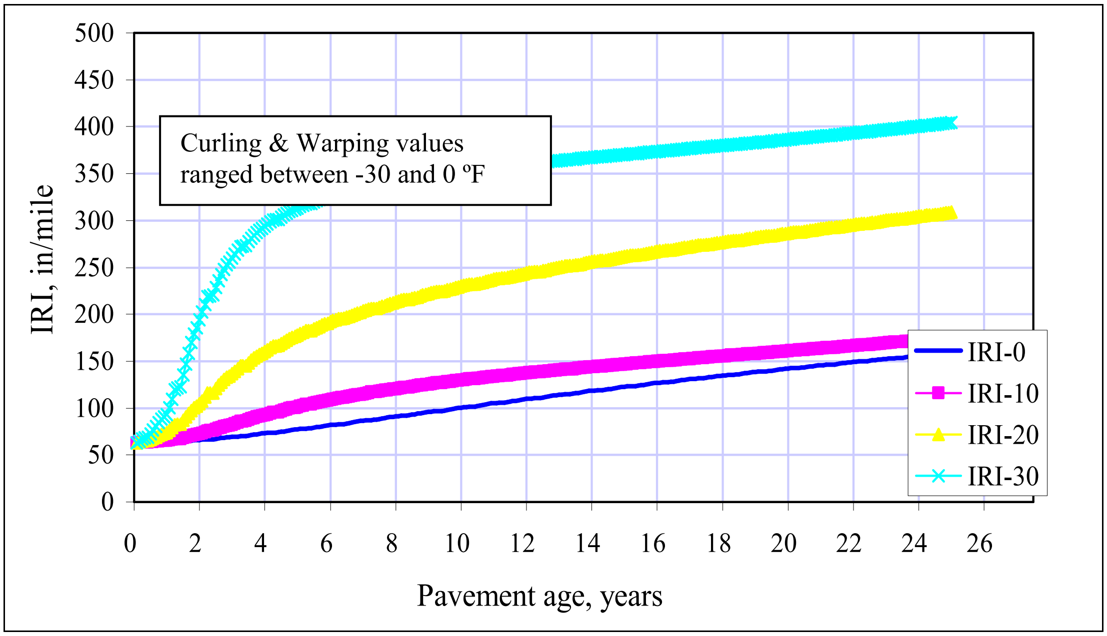

Figure 41. IRI (smoothness) for different curl/warp effective temperature difference (built-in)

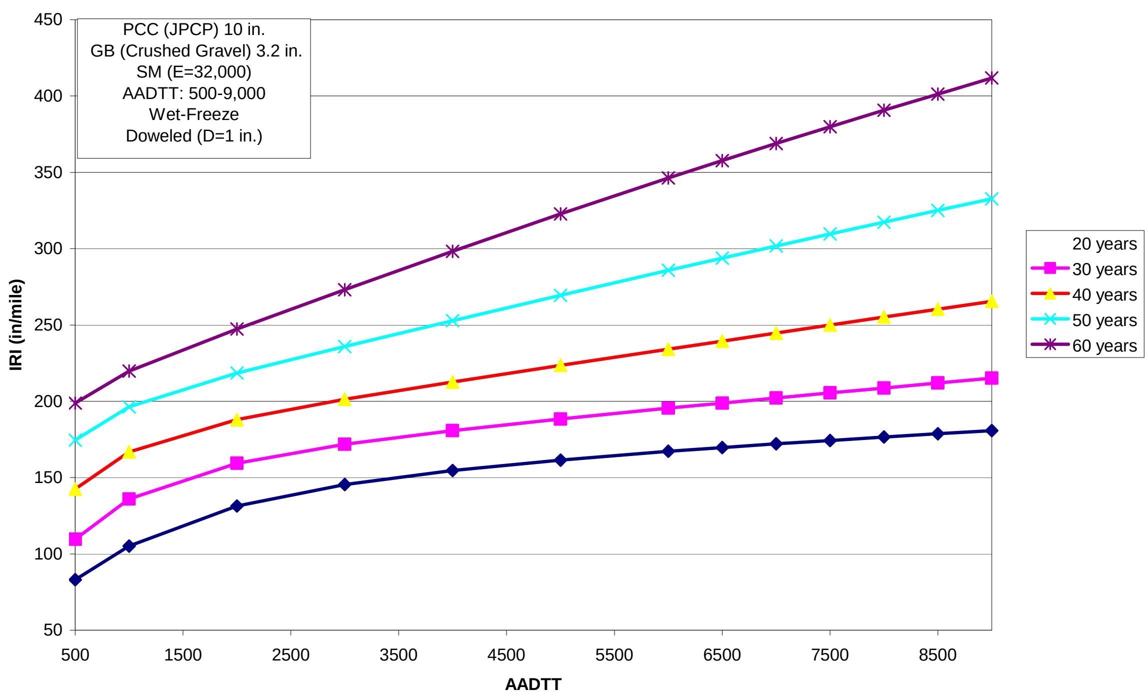

Figure 42. Smoothness for different AADTT at different design lives

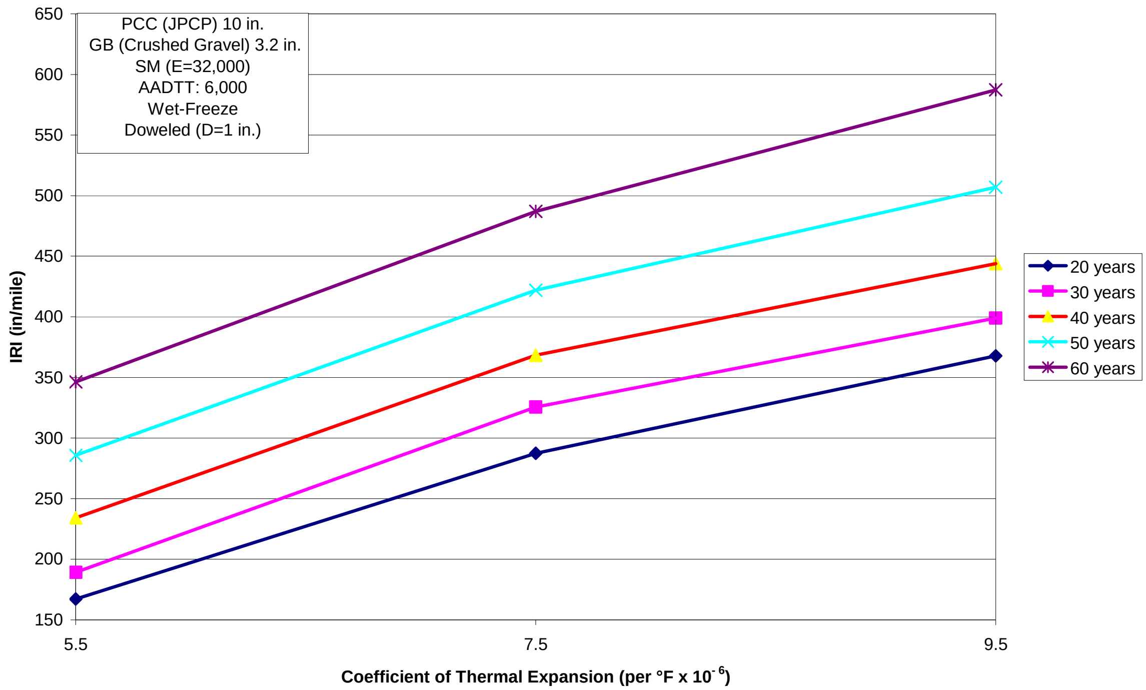

Figure 43. Smoothness for different coefficients of thermal expansion at different design lives

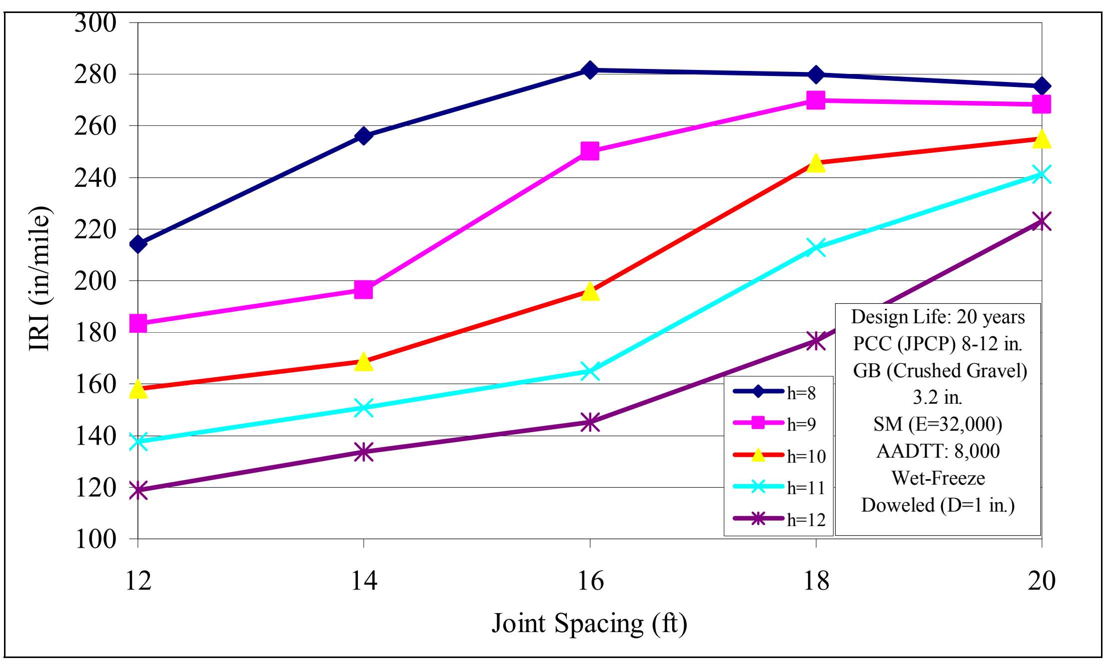

Figure 44. Smoothness for different joint spacing at different pavement thicknesses

Table 7. Summary of results of sensitivity analysis for rigid pavements

	JPCP concrete material inputs	Performance models			Input level		
		Faulting	Cracking	Smooth-ness	1	2	3
Design features	***Curl/warp effective temperature difference***	ES	ES	ES	●	●	●
	Joint spacing	I/LS	ES	S	●	●	●
	Sealant type	I	I	I	●	●	●
	Dowel diameter	I/LS	I	I/LS	●	●	●
	Dowel spacing	I	I	I	●	●	●
	Edge support	I	S	LS	●	●	●
	PCC-base interface	I	I	I	●	●	●
	Erodibility index	I	I	I	●	●	●
Drainage and surface properties	***Surface shortwave absorptivity***	I/LS	LS/S	LS/S	●	●	●
	Infiltration of surface water	I	I	I	●	●	●
	Drainage path length	I	I	I	●	●	●
	Pavement cross slope	I	I	I	●	●	●
PCC general properties	**PCC layer thickness**	I/(LS)	ES	S	●	●	●
	Unit weight	LS	S	I/LS	●	●	●
	Poisson's ratio	LS	S	S	●	●	●
PCC thermal properties	***Coefficient of thermal expansion***	LS / S	ES	ES	●	●	●
	Thermal conductivity	LS / S	VS / ES	VS	●	●	●
	Heat capacity	I / LS	I / LS	I	●	●	●

Table 7. (continued)

	JPCP concrete material inputs	Performance models			Input level		
		Faulting	Cracking	Smooth-ness	1	2	3
PCC $_{mix}$ properties	*Cement type*	I / LS	I	I	●	●	●
	Cement content	LS / (S)	I	LS / (S)	●	●	●
	Water/cement ratio	LS / (S)	I	LS / (S)	●	●	●
	Aggregate type	I	I	I	●	●	●
	PCC set (zero stress) temperature	I / LS	I	I / LS	●	●	●
	Ultimate shrinkage at 40% R.H.	LS	I	LS / I	●	●	●
	Reversible shrinkage	I	I	I	●	●	●
	Time to develop 50% of ultimate shrinkage	I	I	I	●	●	●
	Curing method	I / LS	I	I	●	●	●
PCC strength properties	*28-day PCC modulus of rupture*	LS / I	ES	S			●
	28-day PCC compressive strength	I	ES	S			●
Climate (in Iowa)	***Climatic data from different stations***	LS	LS / S	LS	●	●	●

ES = Extreme sensitivity

VS = Very sensitive

S = Sensitive

LS = Low Sensitivity

I = Insensitive

● = Applies to a specific input level

Bold = Designer can control directly

Italic = Designer may change, but needs to get permission of a specific committee or the agency

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Table 8. Summary of sensitivity level of input parameters for faulting of JPCP

Performance Models	Inputs		
	Extreme Sensitivity	Sensitive to Very Sensitive	Low Sensitive to Insensitive
Faulting	• ***Curl/Warp Effective Temperature Difference*** • **Doweled Transverse Joints**	• ***AADTT*** • ***Mean Wheel Location*** • **Unbound Layer Modulus** • *Cement Content* • *Water/Cement Ratio* • ***Coefficient of Thermal Expansion*** • ***Thermal Conductivity***	• *Sealant Type* • *Dowel Diameter* • *Dowel Spacing* • ***PCC-Base Interface*** • **Erodibility Index** • ***Traffic Wander*** • *Design Lane Width* • ***Infiltration of Surface Water*** • **Drainage Path Length** • **Pavement Cross Slope** • *Cement Type* • **Aggregate Type** • ***PCC Set (Zero Stress) Temperature*** • ***Ultimate Shrinkage at 40% R.H.*** • ***Reversible Shrinkage*** • ***Time to Develop 50% of Ultimate Shrinkage*** • *Curing Method* • **Edge Support** • ***Surface Shortwave Absortivity*** • ***Unit Weight*** • ***Poisson's Ratio*** • ***Climate*** • *PCC Strength* • *Joint Spacing* • **PCC Layer Thickness** • ***Heat capacity***

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Table 9. Summary of sensitivity level of input parameters for transverse cracking of JPCP

Performance Models	**Inputs**		
	Extreme Sensitivity	**Sensitive to Very Sensitive**	**Low Sensitive to Insensitive**
Cracking	• ***Curl/Warp Effective Temperature Difference*** • ***PCC Thermal Properties (Coeff. of Thermal Expansion, Thermal Conduct.)*** • **PCC Layer Thickness** • *PCC Strength Properties* • *Joint Spacing*	• **Edge Support** • ***Mean Wheel Location*** • ***Unit Weight*** • ***Poisson's Ratio*** • ***Climate*** • ***Surface Shortwave Absortivity*** • AADTT	• *Sealant Type* • *Dowel Diameter* • **Doweled Transverse Joints** • *Dowel Spacing* • ***PCC-Base Interface*** • **Erodibility Index** • ***Traffic Wander*** • *Design Lane Width* • ***Infiltration of Surface Water*** • **Drainage Path Length** • **Pavement Cross Slope** • *Cement Type* • *Cement Content* • *Water/Cement Ratio* • **Aggregate Type** • ***PCC Set (Zero Stress) Temperature*** • ***Ultimate Shrinkage at 40% R.H.*** • ***Reversible Shrinkage*** • ***Time to Develop 50% of Ultimate Shrinkage*** • *Curing Method* • **Unbound Layer Modulus** • ***Heat Capacity***

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Table 10. Summary of sensitivity level of input parameters for smoothness of JPCP

Performance Models	**Inputs**		
	Extreme Sensitivity	**Sensitive to Very Sensitive**	**Low Sensitive to Insensitive**
Smoothness	• ***Curl/Warp Effective Temperature Difference*** • ***PCC Thermal Properties (Coefficient of Thermal Expansion, Thermal Conductivity)***	• **Doweled Transverse Joints** • ***AADTT*** • ***Mean Wheel Location*** • *Joint Spacing* • **PCC Layer Thickness** • *PCC Strength Properties* • ***Poisson's Ratio*** • ***Surface Shortwave Absortivity*** • **Unbound Layer Modulus** • *Cement Content* • *Water/Cement Ratio*	• *Sealant Type* • *Dowel Diameter* • *Dowel Spacing* • ***PCC-Base Interface*** • **Erodibility Index** • ***Traffic Wander*** • *Design Lane Width* • ***Infiltration of Surface Water*** • **Drainage Path Length** • **Pavement Cross Slope** • *Cement Type* • **Aggregate Type** • ***PCC Set (Zero Stress) Temperature*** • ***Ultimate Shrinkage at 40% R.H.*** • ***Reversible Shrinkage*** • ***Time to Develop 50% of Ultimate Shrinkage*** • *Curing Method* • **Edge Support** • ***Climate*** • ***Unit Weight***

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8 SENSITIVITY ANALYSIS – FLEXIBLE PAVEMENT SYSTEMS

A similar set of sensitivity analyses was undertaken for AC pavements. A study was conducted to evaluate the relative sensitivity of MEPDG input parameters to AC material properties, traffic, and climatic conditions based on field data from two existing Iowa flexible pavement systems (US-020 in Buchanan County and I-80 in Cedar County). Although the actual pavement structures in these two locations are AC overlay of AC pavements, they were represented as thick AC pavement structures, normally used on the Interstate and State roads in Iowa, for MEPDG analysis.

The design input parameters were divided into two groups – fixed input parameters and varied input parameters. While investigating the effect of a particular design parameter on performance, a "standard" value was assigned for the other design parameters. The ranges of magnitude for the varied input parameters were selected based on the recommendations of MEPDG and engineering judgment. Twenty three key input parameters were selected as varied input parameters for the flexible pavement structure. The sensitivities of five MEPDG performance measures for flexible pavement systems (i.e., longitudinal cracking, alligator cracking, thermal cracking, rutting, fatigue cracking, and smoothness) were studied by either varying a single input parameter or by varying two input parameters at a time.

The results of the sensitivity analyses are summarized in the following tables. Some figures are also included to illustrate certain key findings.

Table 11. Summary of sensitivities - HMA

	Flexible pavement inputs	Performance models								
		Cracking			Rutting					Smoothness
		Longitudinal	Alligator	Transverse	ACC surface	ACC base	Sub-base	Sub-grade	Total	
ACC general property	ACC layer thickness	S	I	I	I	I	I	I	I / LS	I
ACC mix properties	Nominal maximum size	S	I	I	I / LS	I	I	I	I / LS	I
	PG grade	ES	I	ES	LS / S	I	I	I	LS / S	LS / S
	Volumetric (Vbe/Va/ VMA)	VS	I	VS / ES	LS	I	I	I	LS	LS / S
	Unit weight	LS /S	I	I	I / LS	I	I	I	I / LS	I
	Poisson's ratio	LS / S	I	I	S	I	I	I	S	I
ACC thermal propert	*Thermal conductive*	S	I	LS	I / LS	I	I	I	I	I
	Heat Capacity	VS	I	VS	LS / S	I	I	I	LS / S	LS
Traffic	*Tire pressure*	VS	I	I	LS	I	I	I	LS	I
	AADT	VS	LS / S	I	ES	S	I	S	ES	I
	Traffic distribution	VS	I	I	LS	I	I	I	LS	I
	Traffic velocity	VS	I	I	S/VS	I / LS	I	I	S / VS	I
	Traffic wander	LS / S	I	I	I	I	I	I	I	I

Table 11. (Continued)

	Flexible pavement inputs	Performance models								
		Cracking			Rutting					Smoothness
		Longitudinal	Alligator	Transverse	ACC surface	ACC base	Sub-base	Sub-grade	Total	
Climate	***Climate data from different stations***	**VS**	**I**	**ES**	**S**	**I/LS**	**I**	**I/LS**	**S**	**S**
Base	**Layer thickness**	**S/VS**	**S/VS**	**I**	**VS**	**I/LS**	**I**	**I/LS**	**VS**	**LS**
	Type of base (Mr)	**LS / S**	**ES**	**I/LS**	**VS**	**LS/S**	**I/LS**	**I/LS**	**VS**	**VS/S**
Sub-Base	**Layer thickness**	**LS / S**	**I**	**I**	**I**	**I**	**I**	**I/LS**	**I**	**I**
	Type of sub-base (Mr)	**I**	**I**	**I**	**I**	**I**	**I**	**I**	**I**	**I**
Sub-grade	***Type of subgrade (Mr)***	**ES**	**LS**	**I**	**I**	**I**	**I**	**I/LS**	**I/LS**	**I / LS**
Others	***Aggregate thermal coefficient***	**I**	**I**	**I**	**I**	**I**	**I**	**I**	**I**	**I**

LEGEND

ES = Extreme sensitivity

VS = Very sensitive

S = Sensitive

LS = Low Sensitivity

I = Insensitive

● = Applies to a specific input level

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Table 12. Summary of sensitivity level of input parameters for HMA longitudinal cracking

Performance Models	**Inputs**		
	Extreme Sensitivity	**Sensitive to Very Sensitive**	**Low Sensitive to Insensitive**
Longitudinal Cracking	• **PG Grade** • ***Type of Subgrade (Mr)***	• **ACC Layer Thickness** • **Nominal Maximum Size** • ***Unit Weight*** • ***Poisson's Ratio*** • ***AC Volumetric Properties (Vbe, Va, VMA)*** • ***Thermal Conductivity*** • ***Heat Capacity*** • ***Tire Pressure*** • ***AADT*** • ***Traffic Distribution*** • ***Traffic Velocity*** • ***Traffic Wander*** • ***Climate Data*** • **Base Layer Thickness** • **Type of Base (Mr)** • **Subbase Layer Thickness**	• **Type of Subbase (Mr)** • ***Aggregate Thermal Coefficient***

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Table 13. Summary of sensitivity level of input parameters for HMA alligator cracking

Performance Models	Inputs		
	Extreme Sensitivity	Sensitive to Very Sensitive	Low Sensitive to Insensitive
Alligator Cracking	• **Type of Base (Mr)** • **Base Layer Thickness**	• ***AADT***	• **PG Grade** • **ACC Layer Thickness** • **Nominal Maximum Size** • ***Unit Weight*** • ***Poisson's Ratio*** • ***AC Volumetric Properties (Vbe, Va, VMA)*** • ***Thermal Conductivity*** • ***Heat Capacity*** • ***Tire Pressure*** • ***Traffic Distribution*** • ***Traffic Velocity*** • ***Traffic Wander*** • ***Climate Data*** • ***Type of Subgrade (Mr)*** • **Type of Subbase (Mr)** • **Subbase Layer Thickness** • ***Aggregate Thermal Coefficient***

Bold = Designer can control directly

Italic = Designer may change, but needs to get permission of a specific committee or the agency

Bold, italic = Designer may not change, but must know

Table 14. Summary of sensitivity level of input parameters for HMA transverse cracking

Performance Models	Inputs		
	Extreme Sensitivity	Sensitive to Very Sensitive	Low Sensitive to Insensitive
Transverse Cracking	• **PG Grade** • ***AC Volumetric Properties (Vbe, Va, VMA)*** • ***Heat Capacity*** • ***Climate Data***		• **ACC Layer Thickness** • **Nominal Maximum Size** • ***Unit Weight*** • ***Poisson's Ratio*** • ***Thermal Conductivity*** • ***Tire Pressure*** • ***AADT*** • ***Traffic Distribution*** • ***Traffic Velocity*** • ***Traffic Wander*** • **Type of Base (Mr)** • **Base Layer Thickness** • ***Type of Subgrade (Mr)*** • **Type of Subbase (Mr)** • **Subbase Layer Thickness** • ***Aggregate Thermal Coefficient***

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Table 15. Summary of sensitivity level of input parameters for AC surface layer rutting

Performance Models	**Inputs**		
	Extreme Sensitivity	**Sensitive to Very Sensitive**	**Low Sensitive to Insensitive**
AC Surface Rutting	• **AADT** • ***Traffic Velocity*** • **Base Layer Thickness** • **Type of Base (Mr)**	• ***Climate Data*** • **PG Grade** • ***Poisson's Ratio*** • ***Heat Capacity***	• **ACC Layer Thickness** • ***AC Volumetric Properties (Vbe, Va, VMA)*** • **Nominal Maximum Size** • ***Unit Weight*** • ***Thermal Conductivity*** • ***Tire Pressure*** • ***Traffic Distribution*** • ***Traffic Wander*** • ***Type of Subgrade (Mr)*** • **Type of Subbase (Mr)** • **Subbase Layer Thickness** • ***Aggregate Thermal Coefficient***

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Table 16. Summary of sensitivity level of input parameters for AC-stabilized base layer rutting

Performance Models	Inputs		
	Extreme Sensitivity	**Sensitive to Very Sensitive**	**Low Sensitive to Insensitive**
AC Stabilized Base Layer Rutting		• **AADT** • **Type of Base (Mr)**	• **PG Grade** • **ACC Layer Thickness** • ***Poisson's Ratio*** • ***AC Volumetric Properties (Vbe, Va, VMA)*** • **Nominal Maximum Size** • ***Unit Weight*** • ***Thermal Conductivity*** • ***Heat Capacity*** • ***Climate Data*** • ***Traffic Velocity*** • ***Tire Pressure*** • ***Traffic Distribution*** • ***Traffic Wander*** • ***Type of Subgrade (Mr)*** • **Base Layer Thickness** • **Type of Subbase (Mr)** • **Subbase Layer Thickness** • ***Aggregate Thermal Coefficient***

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Table 17. Summary of sensitivity level of input parameters for subbase layer rutting

Performance Models	Inputs		
	Extreme Sensitivity	Sensitive to Very Sensitive	Low Sensitive to Insensitive
Subbase Layer Rutting		• **AADT** • **Type of Base (Mr)**	• **PG Grade** • **ACC Layer Thickness** • ***Poisson's Ratio*** • ***AC Volumetric Properties (Vbe, Va, VMA)*** • **Nominal Maximum Size** • ***Unit Weight*** • ***Thermal Conductivity*** • ***Heat Capacity*** • ***Climate Data*** • ***Traffic Velocity*** • ***Tire Pressure*** • ***Traffic Distribution*** • ***Traffic Wander*** • ***Type of Subgrade (Mr)*** • **Base Layer Thickness** • **Type of Subbase (Mr)** • **Subbase Layer Thickness** • ***Aggregate Thermal Coefficient***

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Table 18. Summary of sensitivity level of input parameters for subgrade layer rutting

Performance Models	Inputs		
	Extreme Sensitivity	Sensitive to Very Sensitive	Low Sensitive to Insensitive
Subgrade Layer Rutting		• **AADT**	• **PG Grade** • **ACC Layer Thickness** • ***Poisson's Ratio*** • ***AC Volumetric Properties (Vbe, Va, VMA)*** • **Nominal Maximum Size** • ***Unit Weight*** • ***Thermal Conductivity*** • ***Heat Capacity*** • ***Climate Data*** • ***Traffic Velocity*** • ***Tire Pressure*** • ***Traffic Distribution*** • ***Traffic Wander*** • *Type of Subgrade (Mr)* • Type of Base (Mr) • **Base Layer Thickness** • **Type of Subbase (Mr)** • **Subbase Layer Thickness** • ***Aggregate Thermal Coefficient***

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Table 19. Summary of sensitivity level of input parameters for HMA total rutting

Performance Models	Inputs		
	Extreme Sensitivity	**Sensitive to Very Sensitive**	**Low Sensitive to Insensitive**
Total Rutting	• **AADT**	• **PG Grade** • ***Poisson's Ratio*** • ***Heat Capacity*** • ***Traffic Velocity*** • ***Climate Data*** • **Base Layer Thickness** • **Type of Base (Mr)**	• **ACC Layer Thickness** • *AC Volumetric Properties (Vbe, Va, VMA)* • **Nominal Maximum Size** • ***Unit Weight*** • ***Thermal Conductivity*** • ***Tire Pressure*** • ***Traffic Distribution*** • ***Traffic Wander*** • ***Type of Subgrade (Mr)*** • **Type of Subbase (Mr)** • **Subbase Layer Thickness** • ***Aggregate Thermal Coefficient***

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Table 20. Summary of sensitivity level of input parameters for HMA smoothness

Performance Models	**Inputs**		
	Extreme Sensitivity	**Sensitive to Very Sensitive**	**Low Sensitive to Insensitive**
Smoothness	• **AADT**	• **PG Grade** • *AC Volumetric Properties (Vbe, Va, VMA)* • ***Climate Data*** • **Type of Base (Mr)**	• **ACC Layer Thickness** • ***Poisson's Ratio*** • **Base Layer Thickness** • **Nominal Maximum Size** • ***Unit Weight*** • ***Thermal Conductivity*** • ***Heat Capacity*** • ***Tire Pressure*** • ***Traffic Velocity*** • ***Traffic Distribution*** • ***Traffic Wander*** • ***Type of Subgrade (Mr)*** • **Type of Subbase (Mr)** • **Subbase Layer Thickness** • ***Aggregate Thermal Coefficient***

Bold = Designer can control directly

Italic = Designer may change, but needs to get permission of a specific committee or the agency

Bold, italic = Designer may not change, but must know

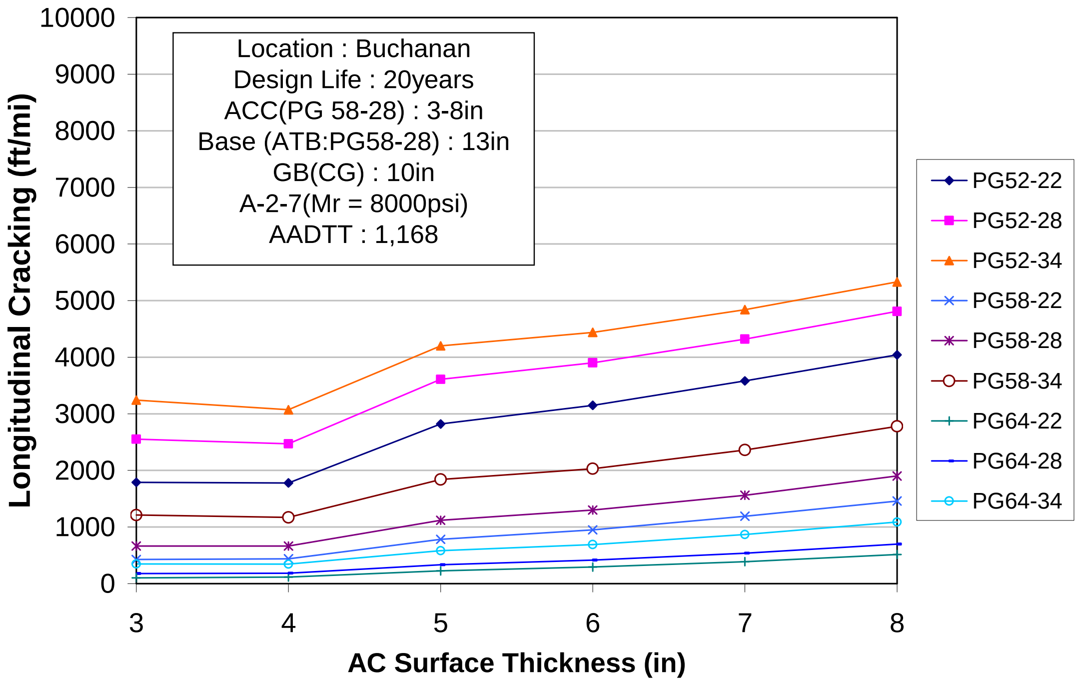

Figure 45. Effect of PG grade on HMA longitudinal cracking for different AC thicknesses

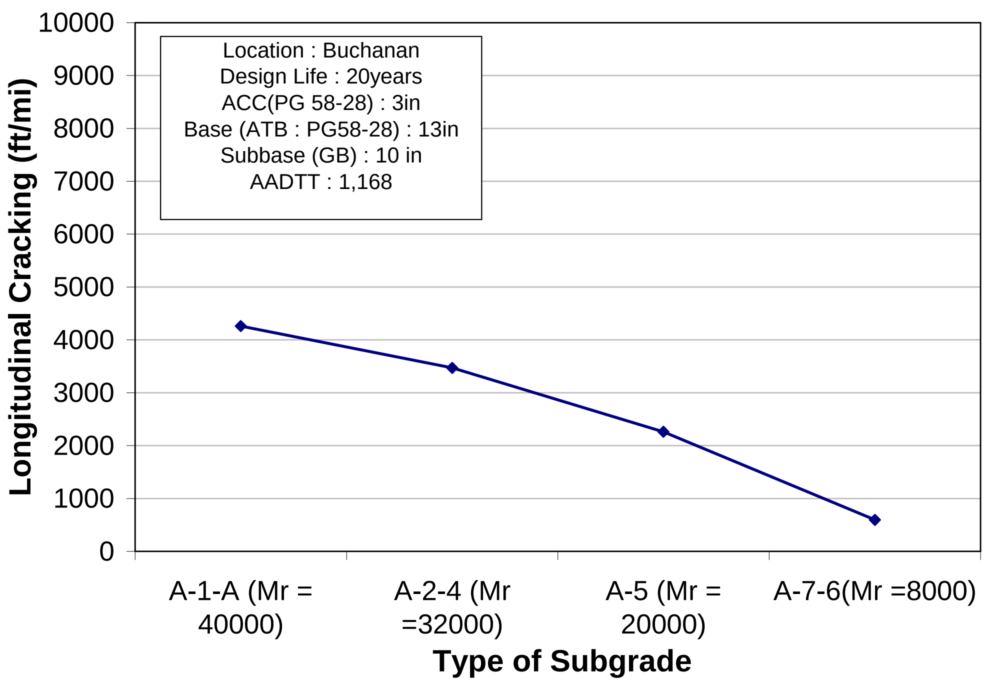

Figure 46. Effect of subgrade type on HMA longitudinal cracking

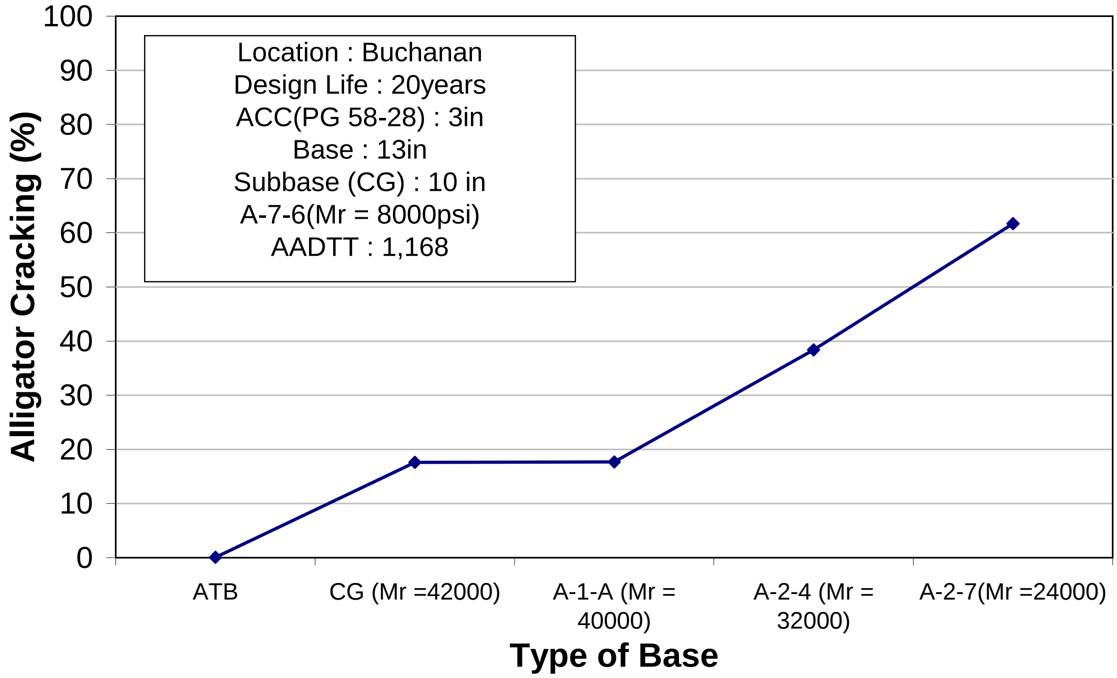

Figure 47. Effect of base type (Mr) on HMA alligator cracking

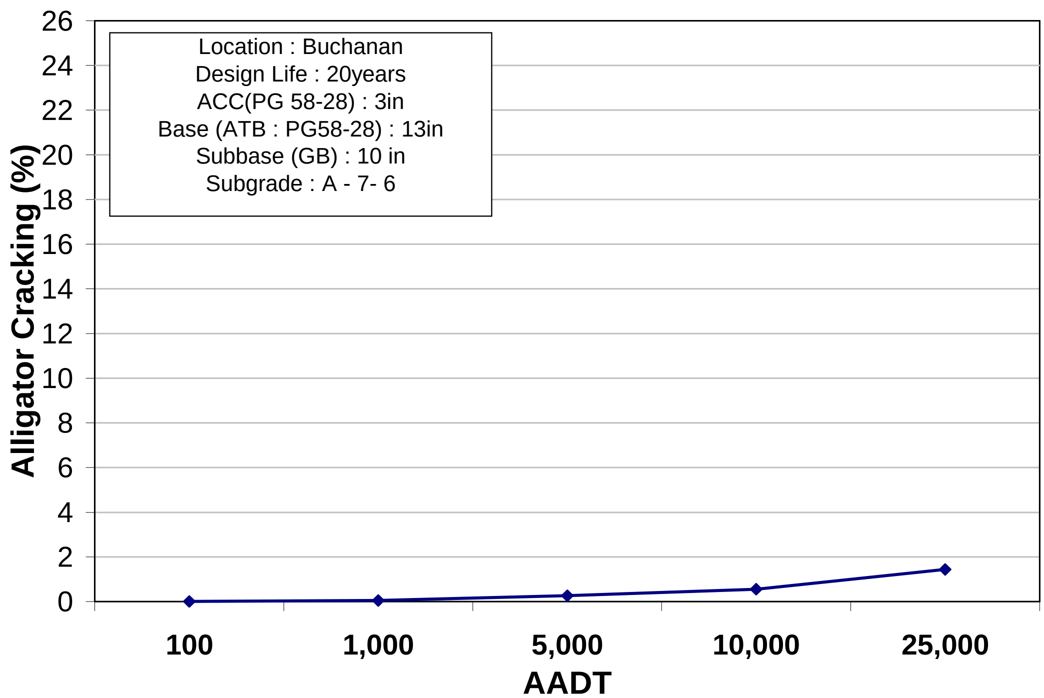

Figure 48. Effect of AADT on HMA alligator cracking

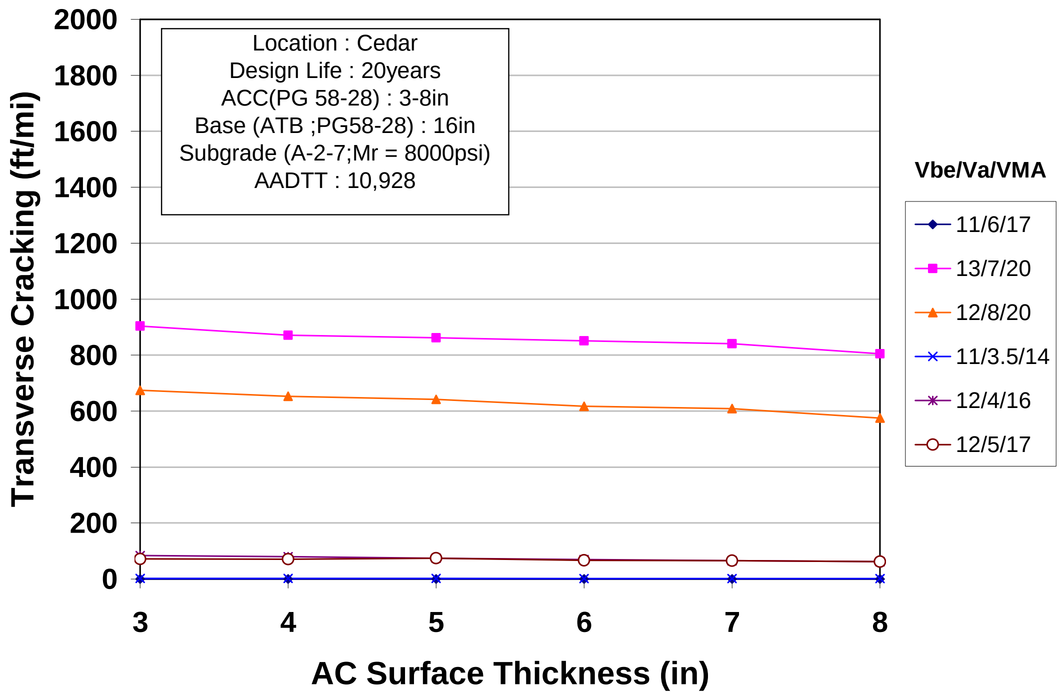

Figure 49. Effect of AC volumetric properties on HMA transverse cracking for different AC thicknesses

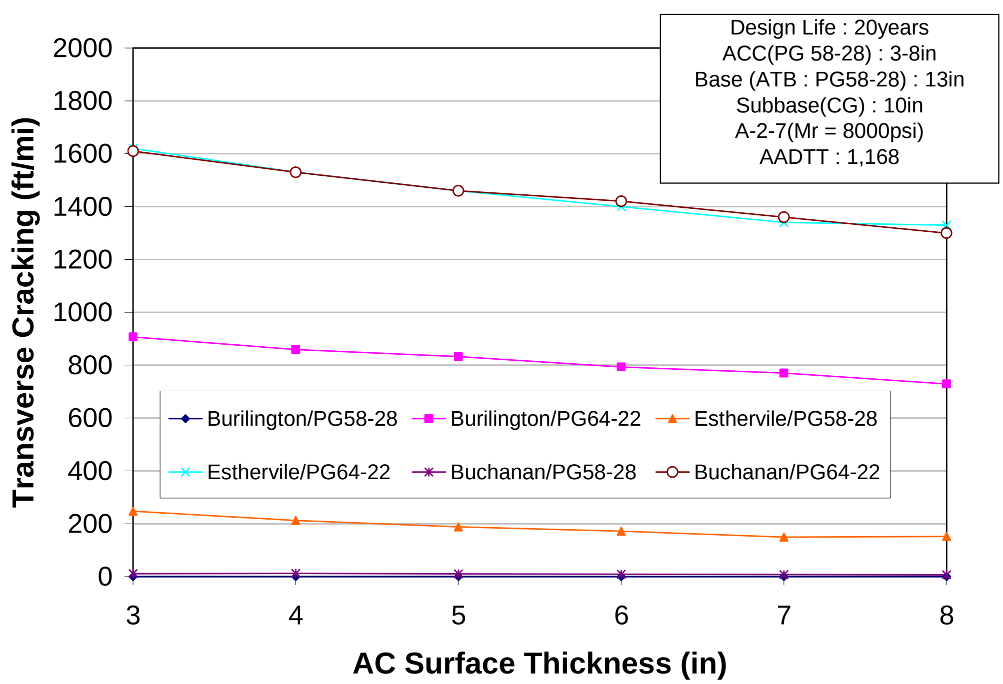

Figure 50. Effect of climate and PG grade on HMA transverse cracking for different AC thicknesses

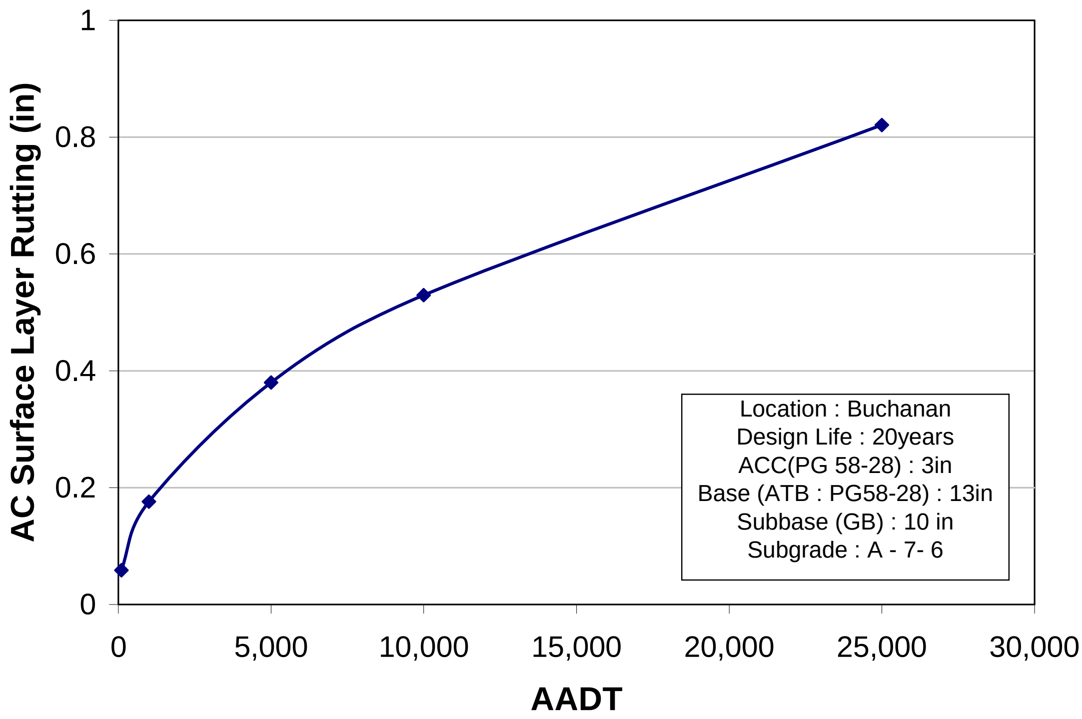

Figure 51. Effect of AADT on AC surface rutting

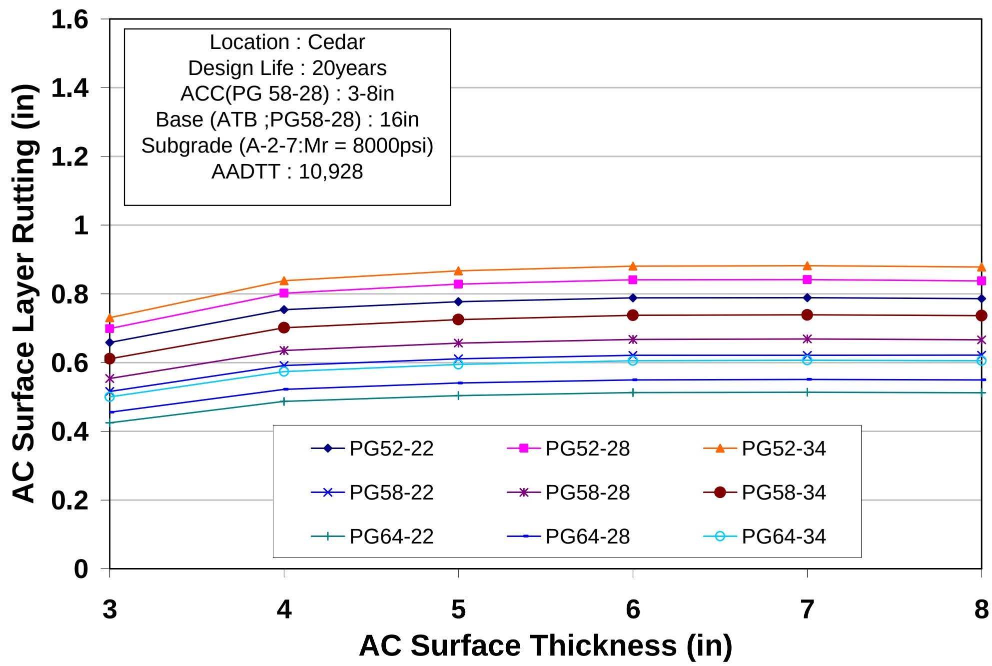

Figure 52. Effect of PG grade on AC surface rutting for different AC thicknesses

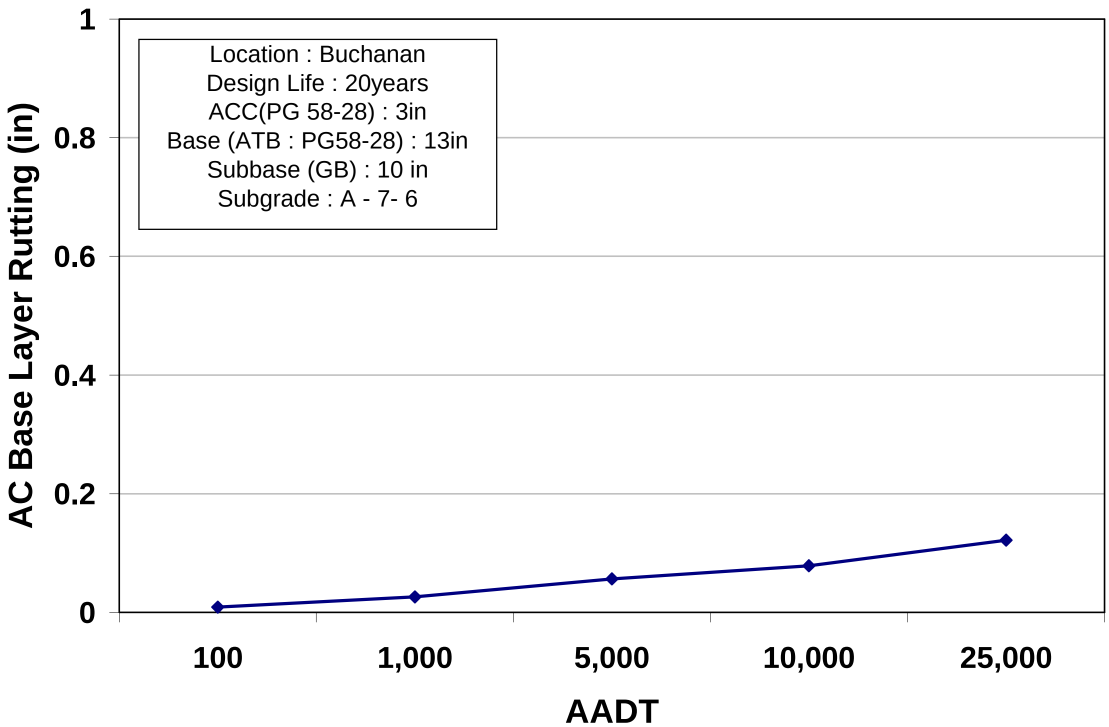

Figure 53. Effect of AADT on AC base layer rutting

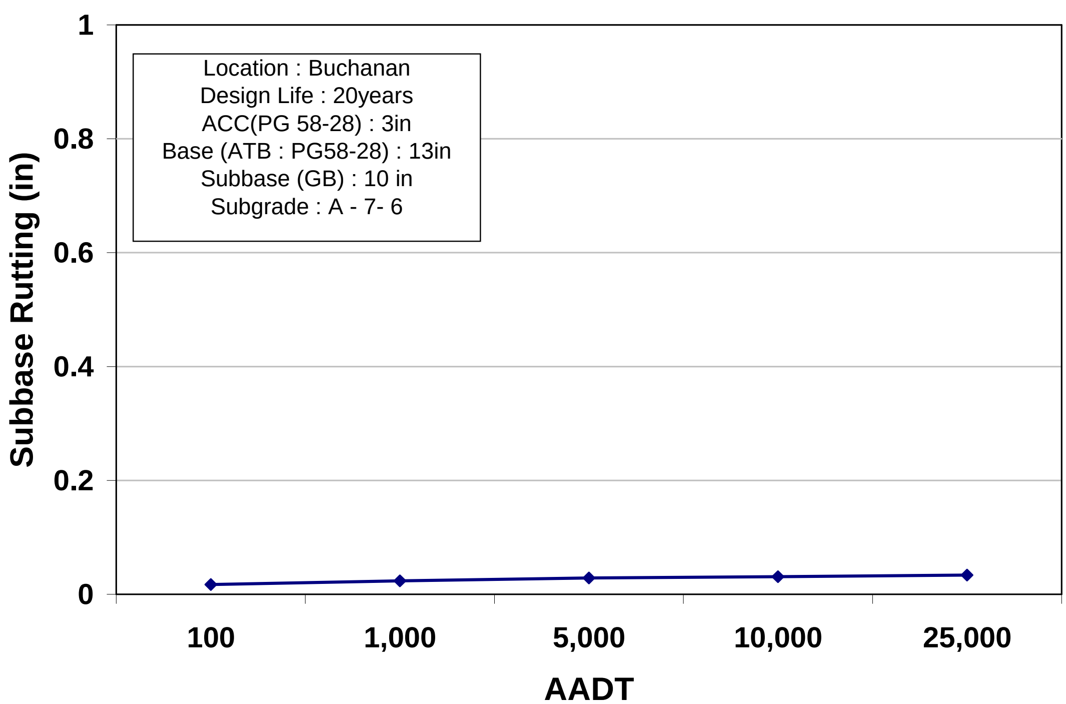

Figure 54. Effect of AADT on subbase layer rutting

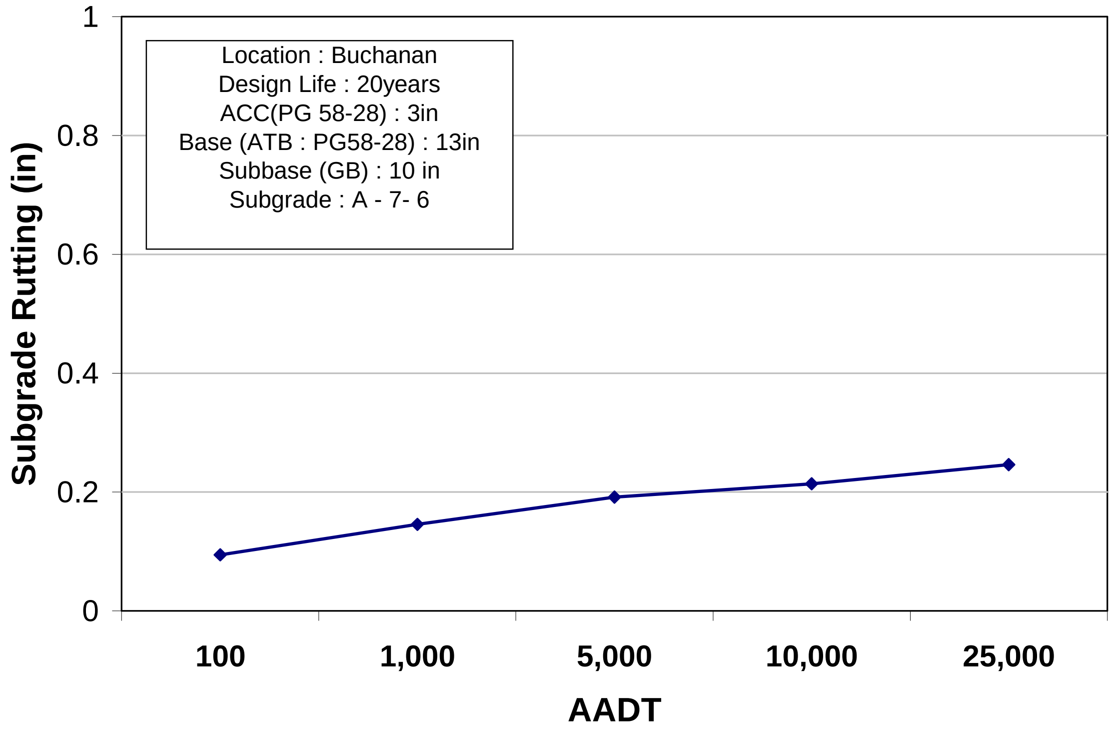

Figure 55. Effect of AADT on subgrade layer rutting

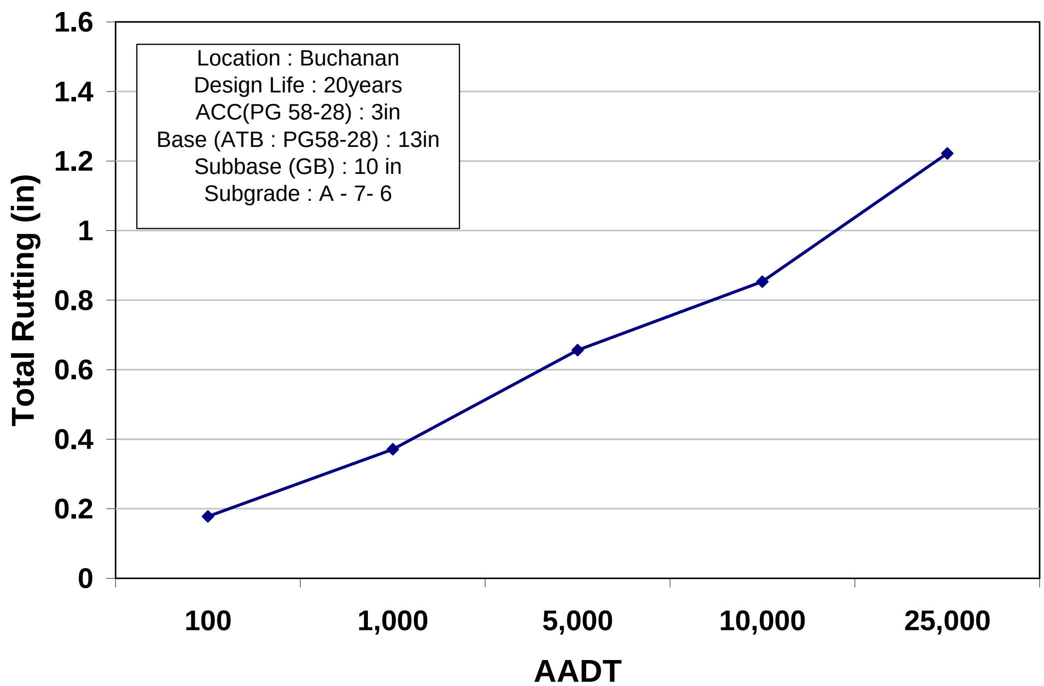

Figure 56. Effect of AADT on total rutting

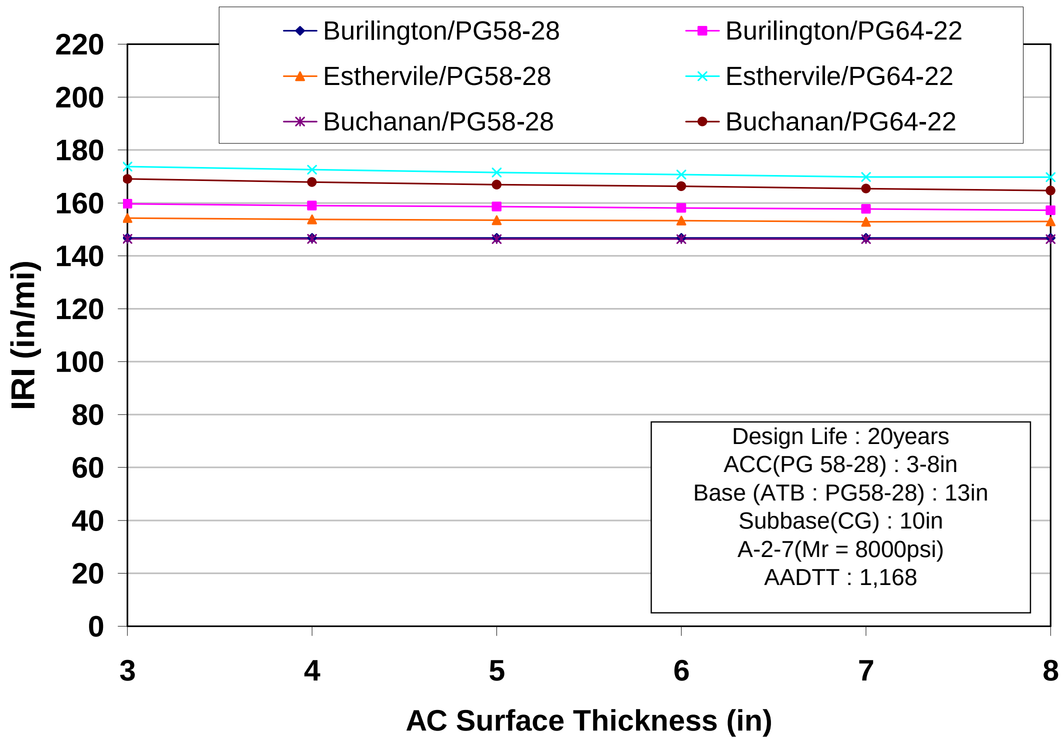

Figure 57. Effect of climate and PG grade on IRI for different AC surface thicknesses

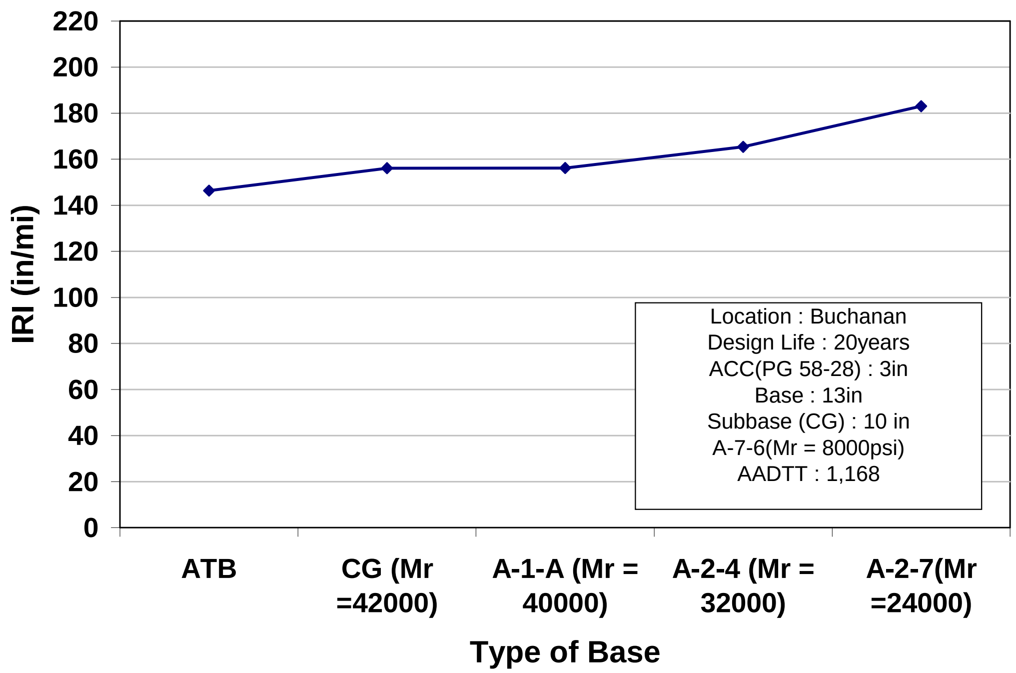

Figure 58. Effect of base type on IRI

9 SUMMARY AND CONCLUSIONS

The following conclusions were drawn as a result of the sensitivity analyses conducted for rigid pavement systems:

- The extremely sensitive input parameters for transverse cracking are found as:
    - Curl/warp effective temperature difference (built-in)
    - Coefficient of thermal expansion
    - Thermal conductivity
    - PCC layer thickness
    - PCC strength properties, and
    - Joint spacing

  In addition, the sensitive to very sensitive input parameters for transverse cracking are:
    - Edge support
    - Mean wheel location (traffic wander)
    - Unit weight
    - Poisson's ratio
    - Climate
    - Surface shortwave absortivity, and
    - Annual average daily truck traffic (AADTT)

  Other examined parameters are found as less sensitive to insensitive.

- The extremely sensitive input parameters for faulting are:
    - Curl/warp effective temperature difference (built-in), and
    - Doweled transverse joints (load transfer mechanism, doweled or un-doweled)

  The sensitive to very sensitive input parameters for faulting are:
    - Coefficient of thermal expansion
    - Thermal conductivity
    - Annual average daily truck traffic (AADTT)
    - Mean wheel location (traffic wander)
    - Unbound layer modulus
    - Cement content, and
    - Water to cement ratio

  Other examined parameters are found as less sensitive to insensitive.

- The extremely sensitive input parameters for smoothness are:
    - Curl/warp effective temperature difference
    - Coefficient of thermal expansion, and
    - Thermal conductivity

  Furthermore, the sensitive to very sensitive input parameters for smoothness are:

- Annual average daily truck traffic (AADTT)
- Doweled transverse joints (load transfer mechanism, doweled or un-doweled)
- Mean wheel location (traffic wander)
- Joint spacing
- PCC layer thickness
- PCC strength properties
- Poisson's ratio
- Surface shortwave absortivity
- Unbound layer modulus
- Cement content, and
- Water to cement ratio

Other examined input parameters are found as less sensitive to insensitive.

- The Curl/warp effective temperature difference, coefficient of thermal expansion, and thermal conductivity come out to be the most critical design input parameters that affect each performance criteria. Since these input parameters can not be modified, accurate values should be input into the model. The sensitivity of the model to these parameters is extremely high; therefore, pavement performance outputs can vary significantly. Thus, extreme attention should be given to determine input data for these particular parameters. If necessary, material test(s) should be carried out to determine the magnitude of these parameters. Otherwise the accuracy of the predicted pavement distresses differs significantly.

- Among of the extremely sensitive and sensitive to very sensitive parameters, the pavement design engineer can only modify; PCC layer thickness, properties of the dowel bar system used in transverse joints, and joint spacing. PCC strength properties are also modifiable provided that pavement design specifications are met.

- For pavement smoothness, comparison of the MEPDG analysis and actual field data of the two selected JPCP sites indicated that the use of MEPDG needs to be calibrated for Iowa suggesting that the accuracy of the actual field data is questionable.

- Since the available field data for transverse cracking in pavement management information system are in different units then those used in the MPEDG, it is recommended that the units of MPEDG should be correlated to the actual field data.

Based on the large number of sensitivity runs conducted for rigid pavement systems, it was considered that the MEPDG software is very user friendly and was designed very professionally. However, below are some of the issues that were identified and needs to be addressed in the MEPDG software and the documentation.

- One needs to be very careful using the MEPDG software since in many places in the software the change in PCC material types was not automatically reflected in the engineering properties (e.g., coefficient of thermal coefficient) of the PCC layer.

- Some of the major climatic stations in Iowa were not included in the climatic stations database available in the MEPDG.

- The climatic data provided for Iowa had deficiencies and incomplete and unreasonable data in it.

- In some cases, MEPDG software crashed when a different subgrade type was considered in the analysis. It is suspected that this was related to the deficiencies in the climatic database.

- In many cases, values of the modulus of subgrade reaction (k-value) were considered to be high for certain subgrade types used in the analyses. This was related to the relationship considered between the subgrade resilient modulus (Mr) and the k-value used in the MEPDG. Mr values considered in the MEPDG software were found to be high and it was difficult to use a reasonable or low Mr value in the analysis.

- Some of the input parameters required in the MEPDG software are very difficult to obtain and some of these input parameters have no impact on the predicted pavement distresses.

- The reliability concept adopted in the MEPDG software and the documentation is not clear at all. It is recommended that, instead of using the 90% reliability reported by the MEPDG software, 50% reliability output for design and analysis should be adopted until further notice.

- The inputs and the predicted pavement distresses are only available in the standard US units.

- In small number of cases, the MEPDG software did not run all the way to the end thus producing incomplete results or no results at all. However, when the same input files were used in the MEPDG software installed in a different computer with the very same operating system no such problems were encountered.

Based on the results of the sensitivity study conducted for flexible pavement systems, the following observations were made and the conclusions were drawn:

- Below is the list of extremely sensitive (ES) input parameters for specific distresses:

- Transverse cracking: PG grade and type of subgrade (Mr)
- Alligator cracking: type of base (Mr)
- Transverse cracking: PG grade, volumetric properties of AC mix (Vbe, Va, VMA), and climate.
- AC surface rutting: AADT
- Rutting in base: none
- Rutting in subbase: none
- Rutting in subgrade: none
- Smoothness: none

- Few input parameter used in this study affect all the predicted performance measures. However, the binder PG grade, volumetric properties, climate, AADTT and type of base generally influenced most of the predicted performance measures.

- Compared to other performance measures, the predicted longitudinal cracking was influenced by most input parameters. A reasonable design concept to reduce longitudinal cracking should be considered in relatively thick pavement designs.

- Alligator cracking does not seem to be a critical distress in the relatively thick AC pavement structures.

- The input parameters related to material properties and climate were particularly sensitive to predicted transverse cracking.

- AC surface rutting contributed mostly to total rutting as one would expect in relatively thick AC pavement structures.

- IRI was not sensitive to most input parameters. This might be due to the nature of the IRI model used in the MEPDG.

APPENDIX A: HOT MIX ASPHALT DATA

Project: mepdg-hma

General Information

Design Life	20 years
Base/Subgrade construction:	September, 2003
Pavement construction:	September, 2003
Traffic open:	October, 2003
Type of design	Flexible

Description:

Analysis Parameters

Analysis type	Probabilistic

Performance Criteria

	Limit	Reliability
Initial IRI (in/mi)	63	
Terminal IRI (in/mi)	172	90
AC Surface Down Cracking (Long. Cracking) (ft/500):	1000	90
AC Bottom Up Cracking (Alligator Cracking) (%):	25	90
AC Thermal Fracture (Transverse Cracking) (ft/mi):	1000	90
Chemically Stabilized Layer (Fatigue Fracture)	25	90
Permanent Deformation (AC Only) (in):	0.25	90
Permanent Deformation (Total Pavement) (in):	0.75	90

Location:	SAMPLE FOR DOT REPORT	
Project ID:	Project ID here	
Section ID:	Section ID here	
Date:	2/18/2005	
Station/milepost format:	Miles: 0.000	
Station/milepost begin:		25
Station/milepost end:		26
Traffic direction:	East bound	

Default Input Level

Default input level	Level 3, Default and historical agency values.

Traffic

Initial two-way aadtt:	8000
Number of lanes in design direction:	2
Percent of trucks in design direction (%):	50
Percent of trucks in design lane (%):	95
Operational speed (mph):	60

Traffic -- Volume Adjustment Factors

Monthly Adjustment Factors (Level 3, Default MAF)

Month	Vehicle Class									
	Class 4	Class 5	Class 6	Class 7	Class 8	Class 9	Class 10	Class 11	Class 12	Class 13
January	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
February	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
March	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
April	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
May	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
June	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
July	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
August	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
September	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
October	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
November	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
December	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Vehicle Class Distribution

(Level 3, Default Distribution)

AADTT distribution by vehicle class

Class 4	1.8%
Class 5	24.6%
Class 6	7.6%
Class 7	0.5%
Class 8	5.0%
Class 9	31.3%
Class 10	9.8%
Class 11	0.8%
Class 12	3.3%
Class 13	15.3%

Hourly truck traffic distribution

by period beginning:

Midnight	2.3%	Noon	5.9%
1:00 am	2.3%	1:00 pm	5.9%
2:00 am	2.3%	2:00 pm	5.9%
3:00 am	2.3%	3:00 pm	5.9%
4:00 am	2.3%	4:00 pm	4.6%
5:00 am	2.3%	5:00 pm	4.6%
6:00 am	5.0%	6:00 pm	4.6%
7:00 am	5.0%	7:00 pm	4.6%
8:00 am	5.0%	8:00 pm	3.1%
9:00 am	5.0%	9:00 pm	3.1%
10:00 am	5.9%	10:00 pm	3.1%
11:00 am	5.9%	11:00 pm	3.1%

Traffic Growth Factor

Vehicle Class	Growth Rate	Growth Function
Class 4	4.0%	Compound
Class 5	4.0%	Compound
Class 6	4.0%	Compound
Class 7	4.0%	Compound
Class 8	4.0%	Compound
Class 9	4.0%	Compound
Class 10	4.0%	Compound
Class 11	4.0%	Compound
Class 12	4.0%	Compound
Class 13	4.0%	Compound

Traffic -- Axle Load Distribution Factors

Level 3: Default

Traffic -- General Traffic Inputs

Mean wheel location (inches from the lane marking):	18
Traffic wander standard deviation (in):	10
Design lane width (ft):	12

Number of Axles per Truck

Vehicle Class	Single Axle	Tandem Axle	Tridem Axle	Quad Axle
Class 4	1.62	0.39	0.00	0.00
Class 5	2.00	0.00	0.00	0.00
Class 6	1.02	0.99	0.00	0.00
Class 7	1.00	0.26	0.83	0.00
Class 8	2.38	0.67	0.00	0.00
Class 9	1.13	1.93	0.00	0.00
Class 10	1.19	1.09	0.89	0.00
Class 11	4.29	0.26	0.06	0.00
Class 12	3.52	1.14	0.06	0.00
Class 13	2.15	2.13	0.35	0.00

Axle Configuration

Average axle width (edge-to-edge) outside dimensions,ft):	8.5
Dual tire spacing (in):	12

Axle Configuration

Single Tire (psi):	120
Dual Tire (psi):	120

Average Axle Spacing

Tandem axle(psi):	51.6
Tridem axle(psi):	49.2
Quad axle(psi):	49.2

Climate

icm file:	estherville
Latitude (degrees.minutes)	43.25
Longitude (degrees.minutes)	-94.45
Elevation (ft)	1316
Depth of water table (ft)	12

Structure--Design Features

Structure--Layers

Layer 1 -- Asphalt concrete

Material type:	Asphalt concrete
Layer thickness (in):	11

General Properties

General
Reference temperature (F°): 70

Volumetric Properties as Built
Effective binder content (%): 11
Air voids (%): 7.5
Total unit weight (pcf): 148

Poisson's ratio: 0.35 (predicted)
Parameter a: -1.63
Parameter b: 0.00000384

Thermal Properties
Thermal conductivity asphalt (BTU/hr-ft-F°): 0.67
Heat capacity asphalt (BTU/lb-F°): 0.23

Asphalt Mix

Cumulative % Retained 3/4 inch sieve: 5
Cumulative % Retained 3/8 inch sieve: 35
Cumulative % Retained #4 sieve: 50
% Passing #200 sieve: 4.5

Asphalt Binder

Option: Superpave binder grading
A 10.7070 (correlated)
VTS: -3.6020 (correlated)

High temp. °C	Low temperature, °C						
	-10	-16	-22	-28	-34	-40	-46
46							
52							
58							
64							
70							
76							
82							

Layer 2 -- A-2-6

Unbound Material: A-2-6
Thickness(in): 6

Strength Properties

Input Level: Level 3
Analysis Type: ICM inputs (ICM Calculated Modulus)
Poisson's ratio: 0.35
Coefficient of lateral pressure,Ko: 0.5
Modulus (input) (psi): 26000

ICM Inputs

Gradation and Plasticity Index

Plasticity Index, PI:	15
Passing #200 sieve (%):	20
Passing #4 sieve (%):	95
D60 (mm):	0.1

Calculated/Derived Parameters

Maximum dry unit weight (pcf):	117.5 (derived)
Specific gravity of solids, Gs:	2.71 (derived)
Saturated hydraulic conductivity (ft/hr):	3.25e-005 (derived)
Optimum gravimetric water content (%):	13.9 (derived)
Calculated degree of saturation (%):	85.9 (calculated)

Soil water characteristic curve parameters: Default values

Parameters	Value
a	23.1
b	1.35
c	0.586
Hr.	794

Layer 3 -- A-7-5

Unbound Material:	A-7-5
Thickness(in):	9

Strength Properties

Input Level:	Level 3
Analysis Type:	ICM inputs (ICM Calculated Modulus)
Poisson's ratio:	0.35
Coefficient of lateral pressure,Ko:	0.5
Modulus (input) (psi):	12000

ICM Inputs

Gradation and Plasticity Index

Plasticity Index, PI:	30
Passing #200 sieve (%):	85
Passing #4 sieve (%):	99
D60 (mm):	0.01

Calculated/Derived Parameters

Maximum dry unit weight (pcf):	97.1 (user input)
Specific gravity of solids, Gs:	2.75 (user input)
Saturated hydraulic conductivity (ft/hr):	2.53e-007 (user input)
Optimum gravimetric water content (%):	24.8 (user input)
Calculated degree of saturation (%):	88.9 (calculated)

Soil water characteristic curve parameters: Default values

Parameters	Value
a	301
b	0.995
c	0.732
Hr.	15700

Layer 4 -- CL

Unbound Material:	CL
Thickness(in):	Semi-infinite

Strength Properties

Input Level:	Level 3
Analysis Type:	ICM inputs (ICM Calculated Modulus)
Poisson's ratio:	0.35
Coefficient of lateral pressure,Ko:	0.5
Modulus (input) (psi):	16000

ICM Inputs

Gradation and Plasticity Index

Plasticity Index, PI:	15
Passing #200 sieve (%):	75
Passing #4 sieve (%):	95
D60 (mm):	0.1

Calculated/Derived Parameters

Maximum dry unit weight (pcf):	97.1 (user input)
Specific gravity of solids, Gs:	2.73 (user input)
Saturated hydraulic conductivity (ft/hr):	3.25e-005 (user input)
Optimum gravimetric water content (%):	18.6 (user input)
Calculated degree of saturation (%):	87.6 (calculated)

Soil water characteristic curve parameters: Default values

Parameters	Value
a	68.1
b	1.15
c	0.658
Hr.	2720

Distress Model Calibration Settings - Flexible

AC Fatigue Level 3 (Nationally calibrated values)

k1	0.00432
k2	3.9492
k3	1.281

AC Rutting Level 3 (Nationally calibrated values)

k1	-3.4488
k2	1.5606
k3	0.4791

Standard Deviation Total Rutting (RUT): 0.1587*POWER(RUT,0.4579)+0.001

Thermal Fracture Level 3 (Nationally calibrated values)

k1	5

Std. Dev. (THERMAL): 0.2474 * THERMAL + 10.619

CSM Fatigue	Level 3 (Nationally calibrated values)
k1	1
k2	1
Subgrade Rutting	Level 3 (Nationally calibrated values)
Granular:	
k1	1.673
Fine-grain:	
k1	1.35

AC Cracking

AC Top Down Cracking

C1 (top)	7
C2 (top)	3.5
C3 (top)	0
C4 (top)	1000
Standard Deviation (TOP)	200 + 2300/(1+exp(1.072-2.1654*log(TOP+0.0001)))

AC Bottom Up Cracking

C1 (bottom)	1
C2 (bottom)	1
C3 (bottom)	0
C4 (bottom)	6000
Standard Deviation (TOP)	32.7 + 995.1 /(1+exp(2-2*log(BOTTOM+0.0001)))

CSM Cracking

C1 (CSM)	1
C2 (CSM)	1
C3 (CSM)	0
C4 (CSM)	1000
Standard Deviation (CSM)	CTB*1

IRI

IRI Flexible Pavements with GB

C1 (GB)	0.0463
C2 (GB)	0.00119
C3 (GB)	0.1834
C4 (GB)	0.00384
C5 (GB)	0.00736
C6 (GB)	0.00115
Std. Dev (GB)	0.387

IRI Flexible Pavements with ATB

C1 (ATB)	0.009995
C2 (ATB)	0.000518
C3 (ATB)	0.00235
C4 (ATB)	18.36
C5 (ATB)	0.9694
Std. Dev (ATB)	0.292

IRI Flexible Pavements with CSM

C1 (CSM)	0.00732
C2 (CSM)	0.07647
C3 (CSM)	0.000145
C4 (CSM)	0.00842
C5 (CSM)	0.000212
Std. Dev (CSM)	0.229

Project: mepdg-hma
Reliability Summary

Performance Criteria	Distress Target	Reliablity Target	Distress Predicted	Reliability Predicted	Acceptable
Terminal IRI (in/mi)	172	90	166.1	59.07	Fail
AC Surface Down Cracking (Long. Cracking) (ft/500):	1000	90	1600	39.57	Fail
AC Bottom Up Cracking (Alligator Cracking) (%):	25	90	8.1	97.16	Pass
AC Thermal Fracture (Transverse Cracking) (ft/mi):	1000	90	1	99.999	Pass
Chemically Stabilized Layer (Fatigue Fracture)	25	90			N/A
Permanent Deformation (AC Only) (in):	0.25	90	0.8	0.01	Fail
Permanent Deformation (Total Pavement) (in):	0.75	90	1.11	1.61	Fail

Predicted distress: Project mepdg-hma

Pavement age mo	Pavement age yr	Month	Logitudinal Cracking (ft/mi)	Alligator Cracking (%)	Transverse Cracking (ft/mi)	Subtotal AC Rutting (in)	Total Rutting (in)	IRI (in/mi)	Heavy Trucks (cumulative)	IRI at Reliability (in/mi)
1	0.08	October	0.02	0.0152	0	0.025	0.136	74.8	115663	106.39
2	0.17	November	0.02	0.018	0	0.026	0.142	75	231325	106.61
3	0.25	December	0.02	0.0183	0	0.026	0.143	75.2	346988	106.83
4	0.33	January	0.02	0.0183	0	0.026	0.144	75.4	462650	107.04
5	0.42	February	0.03	0.0183	0	0.026	0.144	75.7	578313	107.27
6	0.5	March	0.04	0.0195	0	0.027	0.146	75.9	693975	107.49
7	0.58	April	0.06	0.0411	0	0.035	0.177	76.1	809638	107.72
8	0.67	May	0.17	0.0751	0	0.048	0.206	76.4	925300	107.95
9	0.75	June	3.42	0.156	0	0.102	0.279	76.6	1040960	108.2
10	0.83	July	8.74	0.221	0	0.136	0.322	76.9	1156630	108.45
11	0.92	August	14.4	0.279	0	0.159	0.351	77.1	1272290	108.69
12	1	September	16.6	0.316	0	0.167	0.362	77.3	1387950	108.93
13	1.08	October	17.1	0.334	0	0.169	0.366	77.6	1508240	109.17
14	1.17	November	17.1	0.335	0	0.169	0.366	77.8	1628530	109.4
15	1.25	December	17.1	0.337	0	0.169	0.366	78	1748820	109.63
16	1.33	January	17.1	0.338	0	0.169	0.367	78.3	1869110	109.86
17	1.42	February	17.1	0.339	0	0.169	0.367	78.5	1989400	110.09
18	1.5	March	17.1	0.342	0	0.169	0.367	78.7	2109680	110.32
19	1.58	April	17.5	0.363	0	0.171	0.371	79	2229970	110.56
20	1.67	May	21.7	0.418	0	0.18	0.384	79.2	2350260	110.81
21	1.75	June	27.5	0.474	0	0.192	0.399	79.5	2470550	111.07
22	1.83	July	42.4	0.552	0	0.219	0.43	79.7	2590840	111.33
23	1.92	August	52.4	0.613	0	0.236	0.449	80	2711130	111.58
24	2	September	58.8	0.663	0	0.244	0.46	80.2	2831420	111.84
25	2.08	October	59	0.679	0	0.245	0.461	80.5	2956520	112.08
26	2.17	November	59	0.681	0	0.245	0.462	80.7	3081620	112.33
27	2.25	December	59	0.683	0	0.245	0.462	81	3206720	112.57
28	2.33	January	59	0.684	0	0.245	0.462	81.2	3331820	112.81
29	2.42	February	59	0.684	0	0.245	0.462	81.5	3456920	113.06
30	2.5	March	59	0.688	0	0.245	0.463	81.7	3582020	113.3
31	2.58	April	59.1	0.705	0	0.246	0.464	81.9	3707120	113.55
32	2.67	May	61.1	0.744	0	0.248	0.469	82.2	3832220	113.81
33	2.75	June	68.4	0.804	0	0.258	0.48	82.5	3957320	114.08
34	2.83	July	85	0.876	0	0.278	0.504	82.7	4082420	114.35
35	2.92	August	95	0.934	0	0.288	0.515	83	4207520	114.62
36	3	September	98.5	0.969	0	0.291	0.519	83.3	4332620	114.88
37	3.08	October	98.6	0.982	0	0.291	0.52	83.5	4462730	115.13
38	3.17	November	98.6	0.987	0	0.291	0.521	83.8	4592830	115.39
39	3.25	December	98.6	0.989	0	0.291	0.521	84	4722940	115.64
40	3.33	January	98.6	0.989	0	0.291	0.521	84.3	4853040	115.9
41	3.42	February	98.7	0.989	0	0.291	0.521	84.5	4983150	116.16
42	3.5	March	98.7	0.998	0	0.292	0.522	84.8	5113250	116.42
43	3.58	April	99.2	1.02	0	0.292	0.523	85.1	5243360	116.68
44	3.67	May	103	1.06	0	0.296	0.527	85.3	5373460	116.95
45	3.75	June	108	1.11	0	0.302	0.535	85.6	5503570	117.23
46	3.83	July	121	1.17	0	0.314	0.549	85.9	5633670	117.51
47	3.92	August	132	1.23	0	0.323	0.56	86.2	5763780	117.79
48	4	September	135	1.27	0	0.326	0.564	86.5	5893880	118.07
49	4.08	October	136	1.29	0	0.327	0.565	86.7	6029190	118.34
50	4.17	November	136	1.29	0	0.327	0.565	87	6164500	118.6
51	4.25	December	136	1.29	0	0.327	0.565	87.3	6299810	118.87
52	4.33	January	136	1.29	0	0.327	0.565	87.5	6435110	119.14
53	4.42	February	136	1.29	0	0.327	0.565	87.8	6570420	119.41
54	4.5	March	136	1.29	0	0.327	0.565	88.1	6705730	119.68
55	4.58	April	136	1.31	0	0.327	0.566	88.3	6841040	119.96
56	4.67	May	138	1.35	0	0.329	0.57	88.6	6976350	120.25
57	4.75	June	150	1.43	0	0.338	0.582	88.9	7111660	120.54
58	4.83	July	171	1.52	0	0.356	0.602	89.2	7246970	120.85
59	4.92	August	186	1.59	0	0.368	0.615	89.5	7382280	121.15
60	5	September	189	1.62	0	0.37	0.618	89.8	7517580	121.43
61	5.08	October	189	1.63	0	0.37	0.619	90.1	7658310	121.71
62	5.17	November	189	1.63	0	0.37	0.619	90.4	7799030	122
63	5.25	December	189	1.63	0	0.37	0.619	90.6	7939750	122.28

64	5.33	January	189	1.63	0	0.37	0.619	90.9	8080470	122.56
65	5.42	February	189	1.63	0	0.37	0.619	91.2	8221190	122.85
66	5.5	March	189	1.63	0	0.37	0.619	91.5	8361910	123.13
67	5.58	April	189	1.65	0	0.371	0.62	91.8	8502630	123.42
68	5.67	May	190	1.68	0	0.372	0.622	92.1	8643350	123.72
69	5.75	June	202	1.77	0	0.38	0.632	92.4	8784070	124.03
70	5.83	July	216	1.85	0	0.39	0.644	92.7	8924800	124.35
71	5.92	August	228	1.91	0	0.397	0.652	93	9065520	124.66
72	6	September	232	1.95	0	0.4	0.656	93.3	9206240	124.96
73	6.08	October	234	1.97	0	0.4	0.657	93.6	9352590	125.26
74	6.17	November	234	1.97	0	0.4	0.657	93.9	9498940	125.56
75	6.25	December	234	1.97	0	0.4	0.657	94.2	9645290	125.85
76	6.33	January	234	1.97	0	0.4	0.657	94.5	9791640	126.15
77	6.42	February	234	1.97	0	0.4	0.657	94.8	9937990	126.45
78	6.5	March	234	1.98	0	0.4	0.657	95.1	10084300	126.75
79	6.58	April	234	2	0	0.401	0.658	95.4	10230700	127.06
80	6.67	May	242	2.05	0	0.405	0.662	95.7	10377000	127.38
81	6.75	June	254	2.11	0	0.41	0.669	96	10523400	127.7
82	6.83	July	279	2.2	0	0.425	0.685	96.4	10669700	128.03
83	6.92	August	296	2.27	0	0.434	0.695	96.7	10816100	128.36
84	7	September	307	2.33	0	0.439	0.701	97	10962400	128.69
85	7.08	October	307	2.34	0	0.44	0.702	97.3	11114600	129
86	7.17	November	307	2.34	0	0.44	0.702	97.6	11266800	129.31
87	7.25	December	307	2.35	0	0.44	0.702	97.9	11419000	129.62
88	7.33	January	307	2.35	0	0.44	0.702	98.3	11571300	129.94
89	7.42	February	307	2.35	0	0.44	0.702	98.6	11723500	130.25
90	7.5	March	307	2.35	0	0.44	0.702	98.9	11875700	130.57
91	7.58	April	307	2.37	0	0.44	0.703	99.2	12027900	130.89
92	7.67	May	311	2.41	0	0.442	0.705	99.5	12180100	131.22
93	7.75	June	323	2.48	0	0.448	0.712	99.9	12332300	131.56
94	7.83	July	350	2.57	0	0.462	0.728	100.2	12484500	131.91
95	7.92	August	366	2.63	0	0.469	0.736	100.6	12636700	132.25
96	8	September	371	2.67	0	0.471	0.738	100.9	12788900	132.59
97	8.08	October	372	2.69	0	0.471	0.738	101.2	12947200	132.92
98	8.17	November	372	2.69	0	0.471	0.739	101.5	13105500	133.25
99	8.25	December	372	2.69	0	0.471	0.739	101.9	13263800	133.58
100	8.33	January	372	2.69	0	0.471	0.739	102.2	13422100	133.91
101	8.42	February	372	2.7	0	0.471	0.739	102.5	13580300	134.24
102	8.5	March	372	2.7	0	0.471	0.739	102.9	13738600	134.57
103	8.58	April	372	2.73	0	0.472	0.74	103.2	13896900	134.91
104	8.67	May	377	2.77	0	0.474	0.742	103.5	14055200	135.26
105	8.75	June	388	2.84	0	0.478	0.748	103.9	14213500	135.62
106	8.83	July	407	2.91	0	0.487	0.757	104.3	14371800	135.98
107	8.92	August	424	2.98	0	0.494	0.765	104.6	14530100	136.34
108	9	September	430	3.02	0	0.496	0.767	105	14688400	136.69
109	9.08	October	430	3.04	0	0.496	0.768	105.3	14853000	137.04
110	9.17	November	430	3.04	0	0.496	0.768	105.7	15017600	137.38
111	9.25	December	430	3.04	0	0.496	0.768	106	15182300	137.73
112	9.33	January	430	3.04	0	0.496	0.768	106.3	15346900	138.08
113	9.42	February	431	3.04	0	0.496	0.768	106.7	15511500	138.42
114	9.5	March	431	3.04	0	0.496	0.768	107	15676100	138.77
115	9.58	April	431	3.06	0	0.497	0.769	107.4	15840800	139.13
116	9.67	May	434	3.11	0	0.498	0.771	107.7	16005400	139.5
117	9.75	June	453	3.2	0	0.505	0.78	108.1	16170000	139.88
118	9.83	July	487	3.31	0	0.518	0.794	108.5	16334600	140.27
119	9.92	August	510	3.39	0	0.527	0.804	108.9	16499300	140.65
120	10	September	514	3.43	0	0.528	0.806	109.3	16663900	141.02
121	10.1	October	514	3.44	0	0.528	0.807	109.6	16835100	141.38
122	10.2	November	514	3.45	0	0.528	0.807	110	17006300	141.75
123	10.3	December	514	3.45	0	0.528	0.807	110.3	17177500	142.11
124	10.3	January	514	3.45	0	0.528	0.807	110.7	17348700	142.48
125	10.4	February	514	3.45	0	0.528	0.807	111.1	17519900	142.85
126	10.5	March	514	3.45	0	0.529	0.807	111.4	17691100	143.22
127	10.6	April	514	3.47	0	0.529	0.807	111.8	17862300	143.59
128	10.7	May	515	3.51	0	0.53	0.809	112.2	18033500	143.97
129	10.8	June	536	3.61	0	0.537	0.818	112.6	18204800	144.38
130	10.8	July	557	3.7	0	0.545	0.827	113	18376000	144.78
131	10.9	August	577	3.78	0	0.551	0.834	113.4	18547200	145.18
132	11	September	583	3.83	0	0.553	0.836	113.8	18718400	145.57

133	11.1	October	585	3.85	0	0.554	0.837	114.1	18896400	145.96
134	11.2	November	585	3.85	0	0.554	0.837	114.5	19074500	146.34
135	11.3	December	585	3.86	0	0.554	0.837	114.9	19252600	146.72
136	11.3	January	585	3.86	0	0.554	0.837	115.3	19430600	147.11
137	11.4	February	585	3.86	0	0.554	0.837	115.7	19608700	147.49
138	11.5	March	585	3.86	0	0.554	0.837	116	19786700	147.88
139	11.6	April	585	3.88	0	0.554	0.838	116.4	19964800	148.28
140	11.7	May	596	3.95	0	0.557	0.842	116.8	20142800	148.69
141	11.8	June	613	4.02	0	0.562	0.847	117.2	20320900	149.1
142	11.8	July	650	4.12	0	0.574	0.86	117.7	20499000	149.53
143	11.9	August	675	4.21	0	0.582	0.868	118.1	20677000	149.95
144	12	September	690	4.27	0	0.586	0.873	118.5	20855100	150.37
145	12.1	October	690	4.29	0	0.586	0.874	118.9	21040200	150.77
146	12.2	November	690	4.29	0	0.586	0.874	119.3	21225400	151.17
147	12.3	December	690	4.3	0	0.586	0.874	119.7	21410600	151.58
148	12.3	January	690	4.3	0	0.586	0.874	120.1	21595800	151.98
149	12.4	February	690	4.3	0	0.586	0.874	120.5	21781000	152.39
150	12.5	March	690	4.3	0	0.587	0.874	120.9	21966100	152.8
151	12.6	April	690	4.32	0	0.587	0.874	121.3	22151300	153.21
152	12.7	May	695	4.37	0	0.588	0.876	121.7	22336500	153.64
153	12.8	June	713	4.45	0	0.593	0.882	122.2	22521700	154.08
154	12.8	July	752	4.55	0	0.606	0.895	122.6	22706900	154.53
155	12.9	August	775	4.64	0	0.612	0.902	123	22892000	154.97
156	13	September	783	4.68	0	0.614	0.904	123.5	23077200	155.4
157	13.1	October	783	4.7	0	0.614	0.904	123.9	23269800	155.82
158	13.2	November	783	4.71	0	0.614	0.905	124.3	23462400	156.25
159	13.3	December	783	4.71	0	0.614	0.905	124.7	23655000	156.68
160	13.3	January	783	4.71	0	0.614	0.905	125.1	23847600	157.1
161	13.4	February	783	4.71	0	0.614	0.905	125.6	24040200	157.53
162	13.5	March	783	4.72	0	0.614	0.905	126	24232700	157.96
163	13.6	April	783	4.74	0	0.614	0.905	126.4	24425300	158.4
164	13.7	May	790	4.8	0	0.616	0.908	126.9	24617900	158.85
165	13.8	June	806	4.87	0	0.62	0.912	127.3	24810500	159.31
166	13.8	July	832	4.96	0	0.628	0.921	127.8	25003100	159.77
167	13.9	August	857	5.04	0	0.634	0.927	128.2	25195700	160.24
168	14	September	864	5.09	0	0.636	0.93	128.7	25388300	160.69
169	14.1	October	865	5.11	0	0.636	0.93	129.1	25588500	161.14
170	14.2	November	865	5.11	0	0.636	0.93	129.6	25788800	161.59
171	14.3	December	865	5.11	0	0.636	0.93	130	25989100	162.04
172	14.3	January	865	5.11	0	0.636	0.93	130.4	26189400	162.48
173	14.4	February	865	5.11	0	0.636	0.93	130.9	26389700	162.94
174	14.5	March	865	5.11	0	0.636	0.93	131.3	26590000	163.39
175	14.6	April	866	5.14	0	0.637	0.931	131.8	26790300	163.85
176	14.7	May	869	5.19	0	0.638	0.933	132.3	26990600	164.32
177	14.8	June	895	5.3	0	0.644	0.94	132.7	27190900	164.81
178	14.8	July	942	5.43	0	0.656	0.953	133.2	27391200	165.31
179	14.9	August	973	5.53	0	0.664	0.962	133.7	27591400	165.8
180	15	September	981	5.58	0	0.665	0.964	134.2	27791700	166.28
181	15.1	October	981	5.59	0	0.666	0.964	134.6	28000000	166.75
182	15.2	November	981	5.6	0	0.666	0.964	135.1	28208300	167.22
183	15.3	December	981	5.6	0	0.666	0.964	135.6	28416600	167.69
184	15.3	January	981	5.6	0	0.666	0.964	136	28624900	168.17
185	15.4	February	982	5.6	0	0.666	0.964	136.5	28833200	168.64
186	15.5	March	982	5.6	0	0.666	0.964	137	29041500	169.12
187	15.6	April	982	5.63	0	0.666	0.965	137.4	29249800	169.6
188	15.7	May	984	5.67	0	0.667	0.966	137.9	29458200	170.1
189	15.8	June	1010	5.79	0	0.673	0.974	138.4	29666500	170.62
190	15.8	July	1040	5.9	0	0.681	0.982	138.9	29874800	171.13
191	15.9	August	1070	5.99	0	0.687	0.989	139.5	30083100	171.65
192	16	September	1080	6.05	0	0.689	0.991	140	30291400	172.16
193	16.1	October	1080	6.08	0	0.69	0.992	140.4	30508000	172.65
194	16.2	November	1080	6.08	0	0.69	0.992	140.9	30724600	173.15
195	16.3	December	1080	6.08	0	0.69	0.992	141.4	30941300	173.65
196	16.3	January	1080	6.08	0	0.69	0.992	141.9	31157900	174.14
197	16.4	February	1080	6.09	0	0.69	0.992	142.4	31374500	174.64
198	16.5	March	1080	6.09	0	0.69	0.992	142.9	31591200	175.15
199	16.6	April	1080	6.11	0	0.69	0.993	143.4	31807800	175.66
200	16.7	May	1100	6.2	0	0.693	0.997	143.9	32024400	176.19
201	16.8	June	1120	6.29	0	0.697	1.001	144.4	32241100	176.72

202	16.8	July	1170	6.4	0	0.709	1.013	145	32457700	177.27
203	16.9	August	1200	6.5	0	0.716	1.021	145.5	32674300	177.81
204	17	September	1220	6.58	0	0.72	1.026	146	32891000	178.35
205	17.1	October	1220	6.6	0	0.72	1.026	146.5	33116300	178.88
206	17.2	November	1220	6.6	0	0.72	1.026	147.1	33341600	179.39
207	17.3	December	1220	6.61	0	0.72	1.026	147.6	33566900	179.92
208	17.3	January	1220	6.61	0	0.72	1.026	148.1	33792200	180.44
209	17.4	February	1220	6.61	0	0.72	1.026	148.6	34017500	180.97
210	17.5	March	1220	6.61	0	0.72	1.026	149.1	34242800	181.5
211	17.6	April	1220	6.63	0	0.721	1.027	149.6	34468100	182.04
212	17.7	May	1230	6.69	0	0.722	1.029	150.2	34693400	182.59
213	17.8	June	1250	6.79	0	0.727	1.034	150.7	34918700	183.15
214	17.8	July	1300	6.91	0	0.739	1.047	151.3	35144000	183.72
215	17.9	August	1330	7	0	0.745	1.053	151.9	35369300	184.29
216	18	September	1340	7.06	0	0.746	1.055	152.4	35594600	184.85
217	18.1	October	1340	7.08	0	0.746	1.055	152.9	35828900	185.4
218	18.2	November	1340	7.09	0	0.747	1.055	153.5	36063200	185.95
219	18.3	December	1340	7.09	0	0.747	1.055	154	36297500	186.5
220	18.3	January	1340	7.09	0	0.747	1.055	154.6	36531800	187.05
221	18.4	February	1340	7.09	0	0.747	1.055	155.1	36766100	187.61
222	18.5	March	1340	7.1	0	0.747	1.055	155.6	37000400	188.17
223	18.6	April	1340	7.13	0	0.747	1.056	156.2	37234700	188.74
224	18.7	May	1350	7.19	0	0.749	1.058	156.8	37469000	189.32
225	18.8	June	1370	7.27	0	0.753	1.062	157.3	37703300	189.91
226	18.8	July	1410	7.38	0	0.76	1.07	157.9	37937700	190.5
227	18.9	August	1440	7.48	0	0.766	1.077	158.5	38172000	191.1
228	19	September	1450	7.53	0	0.768	1.079	159.1	38406300	191.69
229	19.1	October	1450	7.56	0	0.768	1.079	159.7	38650000	192.27
230	19.2	November	1450	7.56	0	0.768	1.079	160.2	38893600	192.85
231	19.3	December	1450	7.56	0	0.768	1.079	160.8	39137300	193.43
232	19.3	January	1450	7.56	0	0.768	1.079	161.3	39381000	194.01
233	19.4	February	1450	7.56	0	0.768	1.079	161.9	39624700	194.59
234	19.5	March	1450	7.56	0	0.768	1.079	162.5	39868400	195.18
235	19.6	April	1450	7.59	0	0.768	1.08	163.1	40112100	195.78
236	19.7	May	1450	7.66	0	0.77	1.082	163.7	40355800	196.39
237	19.8	June	1490	7.78	0	0.776	1.089	164.3	40599400	197.02
238	19.8	July	1550	7.93	0	0.787	1.102	164.9	40843100	197.66
239	19.9	August	1590	8.04	0	0.795	1.11	165.5	41086800	198.31
240	20	September	1600	8.1	0	0.797	1.112	166.1	41330500	198.91

Subseason Layer Modulus: Project mepdg-hma

Pavement age			AC1 (1) h=0.5					AC1 (2) h=0.5			
mo	yr	Month	1	2	3	4	5	1	2	3	4
1	0.08	October	2378540	1680050	1280360	888685	453403	1983220	1389640	1057090	766737
2	0.17	November	3261190	3261190	3119370	2375950	1601330	3165340	3165340	2801300	2071330
3	0.25	December	3261190	3261190	3261190	3261190	2949450	3165340	3165340	3165340	3165340
4	0.33	January	3261190	3261190	3261190	3261190	3156840	3165340	3165340	3165340	3165340
5	0.42	February	3261190	3261190	3261190	3261190	3261190	3165340	3165340	3165340	3165340
6	0.5	March	3261190	3261190	3261190	3261190	1947610	3165340	3165340	3165340	3165340
7	0.58	April	3261190	3261190	1983840	1183730	573661	3165340	3158000	1663460	982981
8	0.67	May	2849370	1863450	1360430	883771	362063	2388010	1500720	1095480	731357
9	0.75	June	1077780	734210	490495	295732	198991	806010	565452	395694	255841
10	0.83	July	1123940	710285	506266	325510	203225	855183	545658	401620	275379
11	0.92	August	1164540	840165	624770	366427	208562	880533	637950	490597	306259
12	1	September	1873800	1210580	854401	539911	308825	1455570	929001	662109	445591
13	1.08	October	3261190	3073540	1856770	1097360	508888	3165340	2677770	1522760	877335
14	1.17	November	3261190	3261190	3261190	3261190	3261190	3165340	3165340	3165340	3165340
15	1.25	December	3261190	3261190	3261190	3261190	3261190	3165340	3165340	3165340	3165340
16	1.33	January	3261190	3261190	3261190	3261190	3261190	3165340	3165340	3165340	3165340
17	1.42	February	3261190	3261190	3261190	3261190	3261190	3165340	3165340	3165340	3165340
18	1.5	March	3261190	3261190	3261190	3261190	3261190	3165340	3165340	3165340	3165340
19	1.58	April	3261190	2991930	2065020	1229720	512456	3165340	2590000	1695680	1011540
20	1.67	May	1957530	1255000	865221	498452	277229	1531950	957951	666338	409959
21	1.75	June	1797510	1092420	764210	496195	256147	1407400	841137	593216	401074
22	1.83	July	980926	717085	478737	292814	201675	722775	534225	373160	241456
23	1.92	August	1111150	850090	650584	362781	224762	833217	637640	495744	295560
24	2	September	1839230	1200350	856150	466520	265164	1401780	893046	644811	380118
25	2.08	October	3261190	2821310	2201420	1566390	748190	3165340	2412630	1834330	1278440
26	2.17	November	3261190	3261190	3261190	3261190	2017030	3165340	3165340	3165340	3165340
27	2.25	December	3261190	3261190	3261190	2979050	1716980	3165340	3165340	3165340	2699650
28	2.33	January	3261190	3261190	3261190	3261190	3261190	3165340	3165340	3165340	3165340
29	2.42	February	3261190	3261190	3261190	3261190	2620650	3165340	3165340	3165340	3165340
30	2.5	March	3261190	3261190	3261190	3261190	2302790	3165340	3165340	3165340	3165340
31	2.58	April	3261190	3261190	2740110	1807370	637348	3165340	3034650	2368380	1499280
32	2.67	May	2629280	1780540	1314750	823788	377748	2205240	1423000	1030960	657447
33	2.75	June	1648230	1049790	732237	473984	268973	1267740	790812	566561	380090
34	2.83	July	999514	688297	492317	322617	210342	740100	511265	377980	260651
35	2.92	August	1448060	1043740	734855	456500	249927	1087250	773576	557820	366849
36	3	September	3043840	1922550	1216800	708851	379367	2530940	1506130	942956	570621
37	3.08	October	3261190	3261190	2705460	1653940	724044	3165340	3165340	2306680	1380960
38	3.17	November	3261190	3261190	3261190	2780530	1277520	3165340	3165340	3165340	2503790
39	3.25	December	3261190	3261190	3261190	3261190	2973900	3165340	3165340	3165340	3165340
40	3.33	January	3261190	3261190	3261190	3261190	3261190	3165340	3165340	3165340	3165340
41	3.42	February	3261190	3261190	3261190	3261190	3261190	3165340	3165340	3165340	3165340
42	3.5	March	3261190	3261190	3261190	2434680	976316	3165340	3165340	3165340	2157970
43	3.58	April	3261190	3261190	2935660	1666400	543016	3165340	3165340	2556130	1392360
44	3.67	May	2866180	1854850	1304830	723651	351375	2389720	1480240	1004020	581402
45	3.75	June	2000330	1269420	830865	501028	297583	1574850	963912	641906	404264
46	3.83	July	1410640	923612	639051	391489	250231	1049560	687670	487502	316371
47	3.92	August	1414760	1024800	742286	435764	265350	1058780	765194	561460	347704
48	4	September	3138420	1829810	1204720	696539	354734	2669540	1423160	926497	555894
49	4.08	October	3261190	3173110	2344920	1628080	732674	3165340	2792000	1960500	1340400
50	4.17	November	3261190	3261190	3261190	3261190	2114780	3165340	3165340	3165340	3165340
51	4.25	December	3261190	3261190	3261190	3261190	3261190	3165340	3165340	3165340	3165340
52	4.33	January	3261190	3261190	3261190	3261190	3261190	3165340	3165340	3165340	3165340
53	4.42	February	3261190	3261190	3261190	3261190	3261190	3165340	3165340	3165340	3165340
54	4.5	March	3261190	3261190	3261190	3261190	3208760	3165340	3165340	3165340	3165340
55	4.58	April	3261190	3261190	3261190	2725980	1392300	3165340	3165340	3165340	2515170
56	4.67	May	3087070	2234870	1580350	909669	383622	2671960	1842860	1251340	725286
57	4.75	June	2085530	1181450	751269	428826	262203	1661220	901823	572532	344601

58	4.83	July	1154390	794369	551448	331990	220383	847200	580776	419385	266314
59	4.92	August	1573780	1011960	687520	405586	247841	1181490	754223	518576	324039
60	5	September	3190810	2253460	1399380	838324	407616	2723940	1838550	1088120	665590
61	5.08	October	3261190	3261190	2862680	1781320	736483	3165340	3165340	2452620	1482630
62	5.17	November	3261190	3261190	3261190	3261190	3261190	3165340	3165340	3165340	3165340
63	5.25	December	3261190	3261190	3261190	3261190	3261190	3165340	3165340	3165340	3165340
64	5.33	January	3261190	3261190	3261190	3261190	3261190	3165340	3165340	3165340	3165340
65	5.42	February	3261190	3261190	3261190	3261190	3261190	3165340	3165340	3165340	3165340
66	5.5	March	3261190	3261190	3261190	3261190	3193950	3165340	3165340	3165340	3165340
67	5.58	April	3261190	3261190	3090700	1809610	791146	3165340	3165340	2761590	1536560
68	5.67	May	3261190	2855590	2063550	1273370	474962	3165340	2445180	1711100	1050960
69	5.75	June	1552070	1008390	646095	383336	263732	1156400	750874	494993	310259
70	5.83	July	1587190	952884	657902	416073	265545	1213260	708132	497514	331672
71	5.92	August	1614610	1127080	813646	463008	268835	1229190	838886	614142	367334
72	6	September	2601000	1651090	1128600	685292	385995	2112960	1282550	862973	546976
73	6.08	October	3261190	3261190	2529750	1458900	635776	3165340	3165340	2166990	1178880
74	6.17	November	3261190	3261190	3261190	3261190	3261190	3165340	3165340	3165340	3165340
75	6.25	December	3261190	3261190	3261190	3261190	3261190	3165340	3165340	3165340	3165340
76	6.33	January	3261190	3261190	3261190	3261190	3261190	3165340	3165340	3165340	3165340
77	6.42	February	3261190	3261190	3261190	3261190	3261190	3165340	3165340	3165340	3165340
78	6.5	March	3261190	3261190	3261190	3261190	3261190	3165340	3165340	3165340	3165340
79	6.58	April	3261190	3261190	2586350	1524650	606470	3165340	3165340	2198440	1274860
80	6.67	May	2429380	1542460	1042330	585352	326431	1959930	1189160	797379	470516
81	6.75	June	2210450	1321830	911672	578916	300950	1776030	1022020	696752	457358
82	6.83	July	1171140	842874	554782	340239	239254	858997	618069	422031	271292
83	6.92	August	1324720	1000670	760088	418895	263220	995787	744326	567155	330743
84	7	September	2206580	1425570	1001670	534617	306235	1719960	1065760	748919	426552
85	7.08	October	3261190	3261190	2615930	1862570	865142	3165340	2903420	2228070	1549800
86	7.17	November	3261190	3261190	3261190	3261190	2385170	3165340	3165340	3165340	3165340
87	7.25	December	3261190	3261190	3261190	3261190	2017890	3165340	3165340	3165340	3165340
88	7.33	January	3261190	3261190	3261190	3261190	3261190	3165340	3165340	3165340	3165340
89	7.42	February	3261190	3261190	3261190	3261190	3018540	3165340	3165340	3165340	3165340
90	7.5	March	3261190	3261190	3261190	3261190	2653990	3165340	3165340	3165340	3165340
91	7.58	April	3261190	3261190	3118010	2078840	713362	3165340	3165340	2761560	1756760
92	7.67	May	2986050	2048780	1497820	925367	419178	2565630	1656450	1185240	736659
93	7.75	June	1877240	1183520	816679	524301	299962	1463470	892276	627489	415978
94	7.83	July	1120910	763843	543106	356743	236687	828854	561765	412584	282521
95	7.92	August	1632770	1167720	814224	501892	277926	1236630	865334	613599	397628
96	8	September	3261190	2164660	1361930	782308	416158	2875850	1722850	1061480	626535
97	8.08	October	3261190	3261190	3011290	1854510	797132	3165340	3165340	2620110	1570210
98	8.17	November	3261190	3261190	3261190	3080810	1421810	3165340	3165340	3165340	2823710
99	8.25	December	3261190	3261190	3261190	3261190	3261190	3165340	3165340	3165340	3165340
100	8.33	January	3261190	3261190	3261190	3261190	3261190	3165340	3165340	3165340	3165340
101	8.42	February	3261190	3261190	3261190	3261190	3261190	3165340	3165340	3165340	3165340
102	8.5	March	3261190	3261190	3261190	2680020	1067910	3165340	3165340	3165340	2412590
103	8.58	April	3261190	3261190	3199830	1834360	586465	3165340	3165340	2834270	1550840
104	8.67	May	3120560	2037260	1428330	783112	379042	2649000	1645640	1105220	626957
105	8.75	June	2191120	1385590	899562	538713	321488	1757700	1056900	696808	430751
106	8.83	July	1538580	999936	687478	420295	271300	1151200	743145	523223	335650
107	8.92	August	1539650	1109380	798862	466792	286591	1158820	828440	601428	368609
108	9	September	3261190	1990770	1305180	747522	379965	2903310	1564460	1007540	594264
109	9.08	October	3261190	3261190	2541040	1766660	785529	3165340	3024150	2152930	1468380
110	9.17	November	3261190	3261190	3261190	3261190	2290030	3165340	3165340	3165340	3165340
111	9.25	December	3261190	3261190	3261190	3261190	3261190	3165340	3165340	3165340	3165340
112	9.33	January	3261190	3261190	3261190	3261190	3261190	3165340	3165340	3165340	3165340
113	9.42	February	3261190	3261190	3261190	3261190	3261190	3165340	3165340	3165340	3165340
114	9.5	March	3261190	3261190	3261190	3261190	3261190	3165340	3165340	3165340	3165340
115	9.58	April	3261190	3261190	3261190	2912250	1492110	3165340	3165340	3165340	2715280
116	9.67	May	3261190	2393040	1692800	972505	405989	2874400	1994790	1349910	771886
117	9.75	June	2230960	1266230	796166	452985	279102	1794740	964056	604827	362416
118	9.83	July	1228810	841352	582017	351131	235631	902999	615965	439865	278832
119	9.92	August	1678100	1073870	726076	427578	263602	1266970	800382	545372	338801

120	10	September	3261190	2398520	1488680	886317	429242	2910910	1976540	1163190	703201
121	10.08	October	3261190	3261190	3028700	1895100	776560	3165340	3165340	2623970	1589940
122	10.17	November	3261190	3261190	3261190	3261190	3261190	3165340	3165340	3165340	3165340
123	10.25	December	3261190	3261190	3261190	3261190	3261190	3165340	3165340	3165340	3165340
124	10.33	January	3261190	3261190	3261190	3261190	3261190	3165340	3165340	3165340	3165340
125	10.42	February	3261190	3261190	3261190	3261190	3261190	3165340	3165340	3165340	3165340
126	10.5	March	3261190	3261190	3261190	3261190	3261190	3165340	3165340	3165340	3165340
127	10.58	April	3261190	3261190	3240630	1911130	829667	3165340	3165340	2922330	1634570
128	10.67	May	3261190	2998350	2176500	1340670	496191	3165340	2592210	1818870	1111250
129	10.75	June	1634810	1058170	675161	400479	277140	1223370	787972	515429	321863
130	10.83	July	1670280	998413	687011	434111	278756	1282970	741562	517702	343869
131	10.92	August	1697590	1181840	850446	482554	281892	1298640	880621	640834	380746
132	11	September	2726100	1734410	1182380	714668	402295	2234340	1354280	905543	569158
133	11.08	October	3261190	3261190	2650190	1530180	662188	3165340	3165340	2288430	1242180
134	11.17	November	3261190	3261190	3261190	3261190	3261190	3165340	3165340	3165340	3165340
135	11.25	December	3261190	3261190	3261190	3261190	3261190	3165340	3165340	3165340	3165340
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137	11.42	February	3261190	3261190	3261190	3261190	3261190	3165340	3165340	3165340	3165340
138	11.5	March	3261190	3261190	3261190	3261190	3261190	3165340	3165340	3165340	3165340
139	11.58	April	3261190	3261190	2695450	1591510	628900	3165340	3165340	2308080	1337110
140	11.67	May	2531950	1608960	1084370	606536	338939	2057440	1245290	830188	486105
141	11.75	June	2303860	1376640	946764	599481	312643	1863090	1067320	723360	472114
142	11.83	July	1217820	874218	574081	352681	249506	894155	640107	435109	279501
143	11.92	August	1377760	1038610	787286	433300	273755	1038040	772564	586326	340444
144	12	September	2295010	1482270	1039000	552551	317484	1799860	1111190	776916	439368
145	12.08	October	3261190	3261190	2714690	1936810	895859	3165340	3020930	2327590	1619990
146	12.17	November	3261190	3261190	3261190	3261190	2476150	3165340	3165340	3165340	3165340
147	12.25	December	3261190	3261190	3261190	3261190	2095400	3165340	3165340	3165340	3165340
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149	12.42	February	3261190	3261190	3261190	3261190	3117600	3165340	3165340	3165340	3165340
150	12.5	March	3261190	3261190	3261190	3261190	2745550	3165340	3165340	3165340	3165340
151	12.58	April	3261190	3261190	3214760	2153350	735447	3165340	3165340	2864810	1829160
152	12.67	May	3079980	2121110	1550220	955052	431652	2663300	1723500	1230700	760600
153	12.75	June	1942690	1222790	841803	539498	309625	1521080	923077	646264	426739
154	12.83	July	1157140	786675	558629	367388	245181	856241	577587	423078	289572
155	12.92	August	1687640	1205170	838484	515989	286929	1282330	893949	631234	407508
156	13	September	3261190	2235930	1406060	805079	427824	2973560	1788370	1098530	644412
157	13.08	October	3261190	3261190	3098310	1915200	820064	3165340	3165340	2711390	1628620
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163	13.58	April	3261190	3261190	3261190	1889150	601201	3165340	3165340	2921050	1603420
164	13.67	May	3199670	2097010	1469600	803342	388676	2731610	1700900	1139790	642847
165	13.75	June	2253960	1424880	923104	551796	329967	1816010	1089070	714993	440181
166	13.83	July	1582120	1026290	704353	430483	278924	1186580	762779	535237	342635
167	13.92	August	1582610	1138810	818707	477832	294322	1193990	850962	615797	376229
168	14	September	3261190	2045930	1340310	765609	389100	2985210	1613850	1036470	608192
169	14.08	October	3261190	3261190	2607590	1815000	804441	3165340	3105870	2219310	1513720
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175	14.58	April	3261190	3261190	3261190	2978390	1529230	3165340	3165340	3165340	2786810
176	14.67	May	3261190	2450880	1734770	994702	414648	2947430	2051160	1387260	789914
177	14.75	June	2284900	1296200	813408	462381	285803	1845050	988170	617475	368970
178	14.83	July	1257360	859524	593925	358699	241783	924800	628775	448005	283873
179	14.92	August	1718050	1097900	741149	436281	269966	1300260	818617	556052	344752
180	15	September	3261190	2453460	1523310	905158	437865	2980470	2029540	1192750	718220
181	15.08	October	3261190	3261190	3090700	1939160	792453	3165340	3165340	2688860	1631990

182	15.17	November	3261190	3261190	3261190	3261190	3261190	3165340	3165340	3165340	3165340
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188	15.67	May	3261190	3054870	2222320	1368470	505116	3165340	2651140	1863070	1136420
189	15.75	June	1669020	1078970	687393	407772	282919	1251450	803703	524166	326873
190	15.83	July	1704850	1017580	699338	441818	284485	1312350	755847	526387	349159
191	15.92	August	1732330	1204980	866080	490938	287585	1328090	898503	652345	386586
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200	16.67	May	2576620	1638460	1103160	616083	344645	2100380	1270450	845029	493218
201	16.75	June	2345000	1401180	962572	608803	318019	1901830	1087820	735491	478888
202	16.83	July	1238880	888431	582882	358410	254284	910209	650229	441151	283327
203	16.92	August	1401770	1055870	799703	439937	278672	1057380	785562	595189	344968
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213	17.75	June	1973640	1241550	853856	546827	314336	1548550	937926	655364	431983
214	17.83	July	1174540	797687	566146	372580	249372	869520	585301	428215	293046
215	17.92	August	1713940	1223220	850231	522854	291368	1304420	907877	639861	412369
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223	18.58	April	3261190	3261190	3261190	1916290	608614	3165340	3165340	2963500	1629610
224	18.67	May	3238160	2126650	1490240	813530	393572	2772150	1728510	1157210	650916
225	18.75	June	2285190	1444620	934992	558438	334307	1845200	1105350	724253	445010
226	18.83	July	1604050	1039640	712931	435692	282857	1204540	772808	541399	346237
227	18.92	August	1604330	1153760	828819	483490	298320	1211910	862495	623184	380169
228	19	September	3261190	2073780	1358190	774868	393814	3025860	1638950	1051300	615380
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236	19.67	May	3261190	2480840	1756700	1006380	419243	2984910	2080520	1406890	799464
237	19.75	June	2313000	1311980	822527	467377	289396	1871420	1000950	624215	372482
238	19.83	July	1272460	869164	600262	362752	245106	936407	635624	452372	286592
239	19.92	August	1739160	1110660	749183	440944	273406	1317960	828372	561788	347964

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232294	1488770	767358	492535	319205	204530	1185640	604862	408772	284514	193697
194150	685151	480315	356957	243682	170315	512529	377305	294831	220147	160515
217229	972148	626568	437706	293247	190981	718591	496314	356223	261134	178967

Modulus (psi)										
AC1 (5) h=1.0					AC1 (6) h=4.0					
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421975	333624	275616	223824	173820	330536	276192	247256	220872	184091	278198
462653	327001	270552	219222	162976	369051	279760	234445	201112	165700	308010
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418741	319267	262075	208447	158313	304560	246540	218387	192619	160455	241307
573243	418729	311401	243243	174383	397798	320466	261443	217886	168740	304347

AC1 (7) h=3.0				GB2 (8)	GB2 (9)	NSG3 (10)	NSG4 (11)	NSG4 (12)	NSG4 (13)	NSG4 (14)
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1767190	1096950	673955	581242	17342	20046	6228	7200	9824	9712	9360
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245236	227236	212102	190001	22958	28444	8544	7888	9824	9712	9360
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219746	201513	191073	177315	26910	33046	10740	9936	9824	9712	9360
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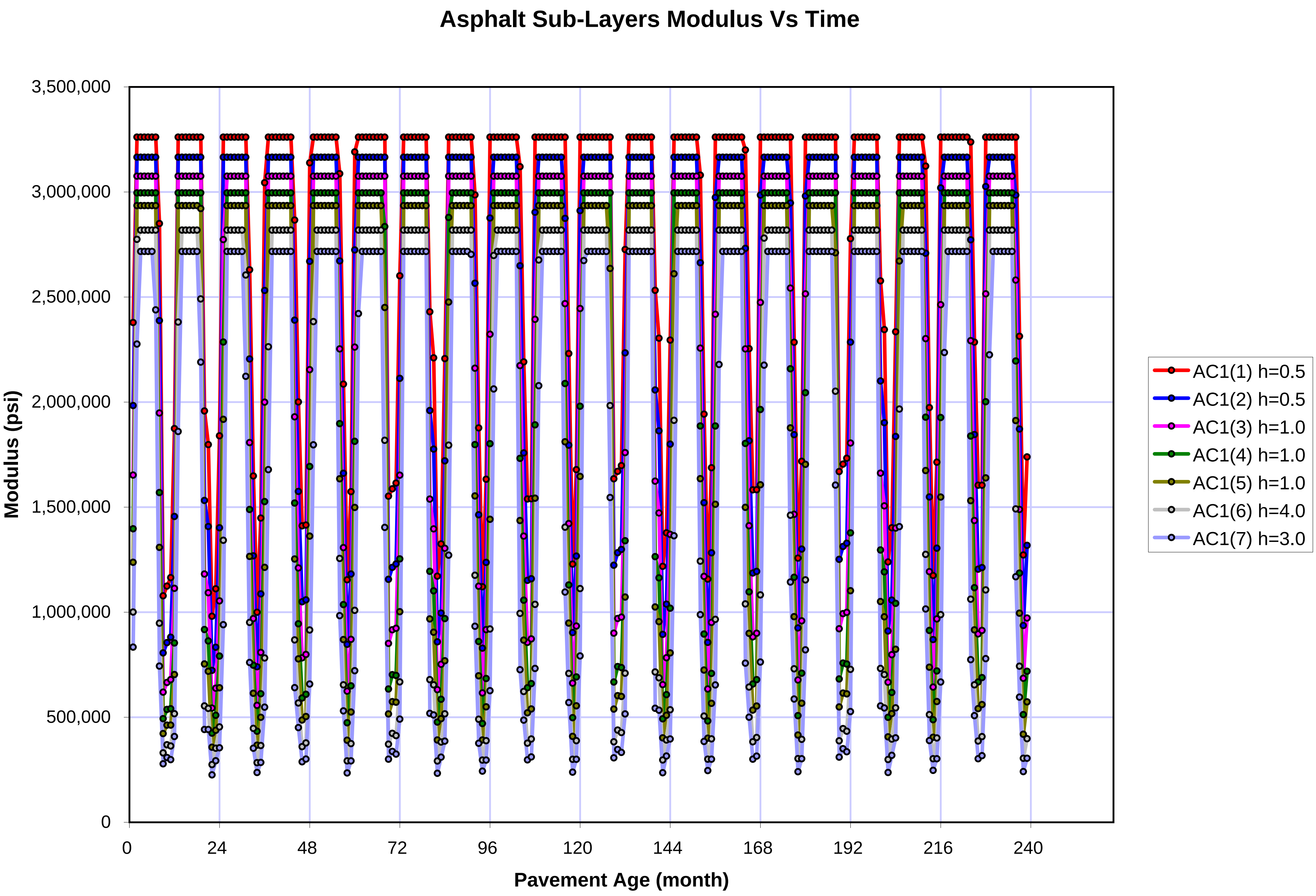
2716800	2716800	2716800	2716800	1000010	1000010	999996	38432	9824	9712	9360
2716800	2716800	2716800	2716800	1000010	1000010	999996	36640	9824	9712	9360
2716800	2663860	1305520	966322	18122	20410	6216	7024	9824	9712	9360
1123900	875906	655027	443800	21788	25220	7476	7504	9824	9712	9360
266346	244297	225315	199868	25142	29068	8448	8288	9824	9712	9360
271751	215831	193125	173112	28262	32656	9432	9024	9824	9712	9360
279338	240855	216742	190796	28964	33488	10392	9696	9824	9712	9360
374774	332325	296797	250583	29016	33488	10692	9936	9824	9712	9360
1955120	1076960	491868	320425	29068	33462	10680	9936	9824	9712	9360
2716800	2716800	2716800	2716800	29120	33462	10680	9936	9824	9712	9360
2716800	2716800	2716800	2716800	22646	33462	10680	9936	9824	9712	9360
2716800	2716800	2716800	2716800	95446	52026	11724	9936	9824	9712	9360
2716800	2716800	2716800	2716800	1000010	1000010	11820	9936	9824	9712	9360
2716800	2716800	2716800	2716800	29406	30966	7512	9936	9824	9712	9360
1931740	1196830	881147	540697	18330	21034	7524	9936	9824	9712	9360
438789	359554	300529	242825	21710	24856	8508	9936	9824	9712	9360
405730	315064	246046	190790	25116	28678	9492	9936	9824	9712	9360
206191	190993	179867	164436	28418	32370	10212	9936	9824	9712	9360
231356	210096	198710	183732	29406	33436	10608	9936	9824	9712	9360
295072	263790	244304	219550	29458	33436	10656	9936	9824	9712	9360
1082880	937118	770716	601817	29510	33436	10656	9936	9824	9712	9360
2716800	2716800	2716800	1995700	29536	33436	10644	9936	9824	9712	9360
2716800	2716800	2514920	1712340	29562	33436	10644	9936	9824	9712	9360
2716800	2716800	2716800	2716800	1000010	1000010	106848	11504	9824	9712	9360
2716800	2716800	2716800	2716920	387764	1000010	999996	9968	9824	9712	9360
2716800	2716800	2716800	2718060	338962	1000010	8568	8976	9824	9712	9360
1869690	1489650	1199130	836952	19422	21970	7260	9184	9824	9712	9360
650681	513731	421686	291910	22854	25792	8232	9504	9824	9712	9360
315756	279602	247272	205980	26312	29640	9204	9776	9824	9712	9360
211436	195219	179043	152379	29354	32994	10152	9920	9824	9712	9360
264045	241512	222464	191600	29874	33462	10608	9936	9824	9712	9360
506297	418319	340704	244057	29926	33462	10620	9936	9824	9712	9360
1565360	1220150	902199	596596	29978	33462	10608	9936	9824	9712	9360
2716800	2387400	1862850	1230150	30030	33462	10608	9936	9824	9712	9360
2716800	2716800	2716800	2716800	30056	33462	10608	9936	9824	9712	9360
2716800	2716800	2716800	2716800	1000010	147342	7440	9936	9824	9712	9360
2716800	2716800	2716800	2716800	1000010	1000010	999996	9936	9824	9712	9360
2716800	2716800	2110920	1267150	18824	20800	6372	9936	9824	9712	9360
2507180	1666500	1000060	588200	22308	24622	7344	9936	9824	9712	9360
545223	453668	358915	289682	25818	28444	8316	9936	9824	9712	9360
387285	302627	254225	220636	29224	32214	9276	9936	9824	9712	9360
252629	226029	205056	179847	30290	33436	10236	9936	9824	9712	9360
260109	235102	211398	186646	30342	33436	10584	9936	9824	9712	9360
441215	354735	309644	266192	30394	33410	10572	9936	9824	9712	9360
1301070	895858	704342	496459	30446	33410	10572	9936	9824	9712	9360
2716800	2716800	1944620	1187530	30472	33410	10572	9936	9824	9712	9360
2716800	2716800	2716800	2716800	106392	69030	13752	9936	9824	9712	9360
2716800	2716800	2716800	2716800	1000010	1000010	999996	19616	9824	9712	9360
2716800	2716800	2716800	2716800	1000010	1000010	999996	19616	9824	9712	9360
2716800	2716800	2716800	2716800	1000010	1000010	999996	28656	9824	9712	9360
2716800	2716800	2719880	2432990	20904	22698	9552	11968	9824	9712	9360
785237	551244	420104	298512	21736	23634	7044	7344	9824	9712	9360
340288	262756	228597	190617	25272	27456	8016	8128	9824	9712	9360
203595	189095	178740	160964	28808	31278	8976	8880	9824	9712	9360
258315	232876	194415	159287	30654	33358	9960	9552	9824	9712	9360


Asphalt Sub-Layers Modulus Vs Time
Modulus (psi)
3,500,000
3,000,000
2,500,000
2,000,000
1,500,000
1,000,000
500,000
0
0
24
48
72
96
120
144
168
192
216
240
Pavement Age (month)
AC1(1) h=0.5
AC1(2) h=0.5
AC1(3) h=1.0
AC1(4) h=1.0
AC1(5) h=1.0
AC1(6) h=4.0
AC1(7) h=3.0

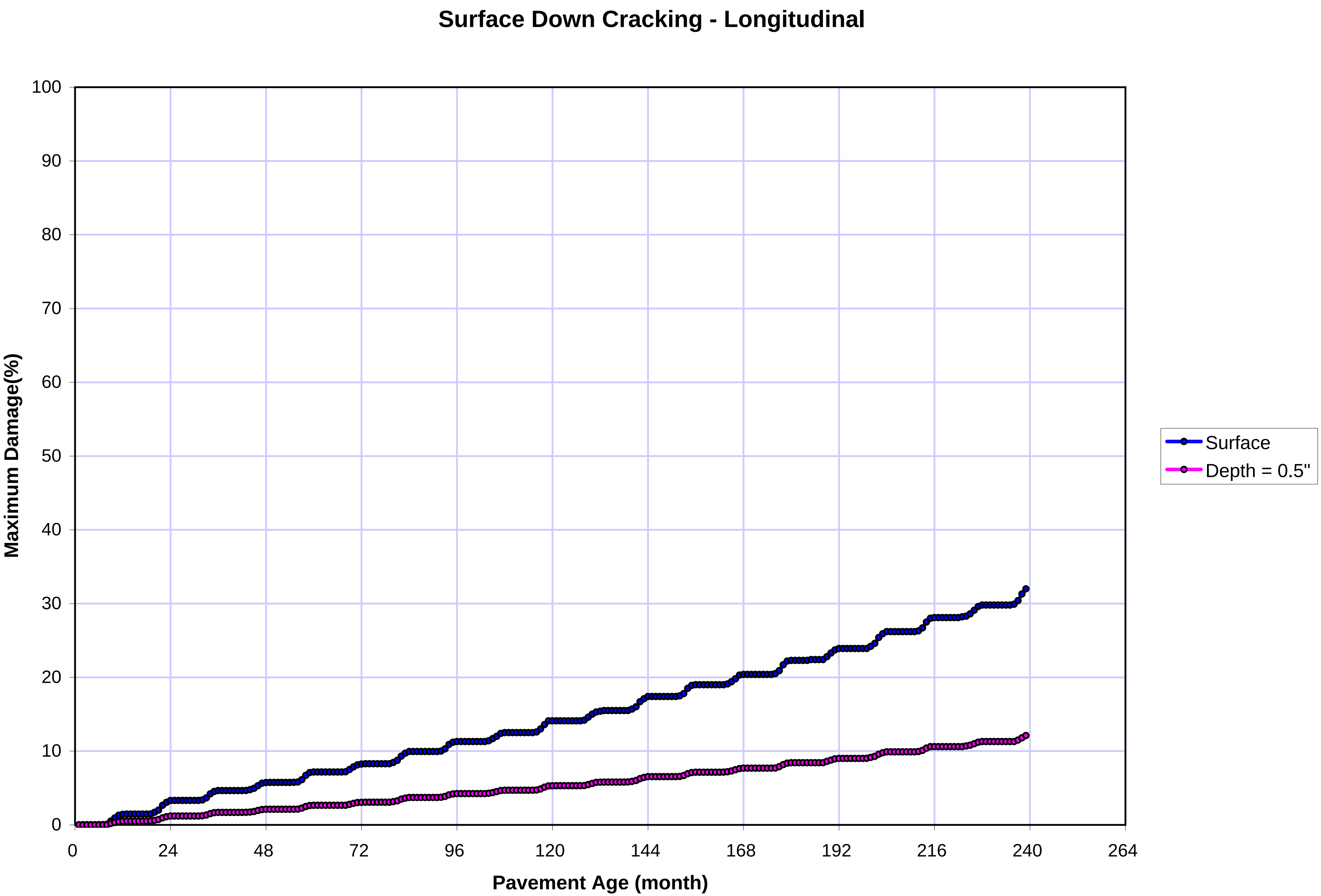
Fatigue Cracking: Project mepdg-hma

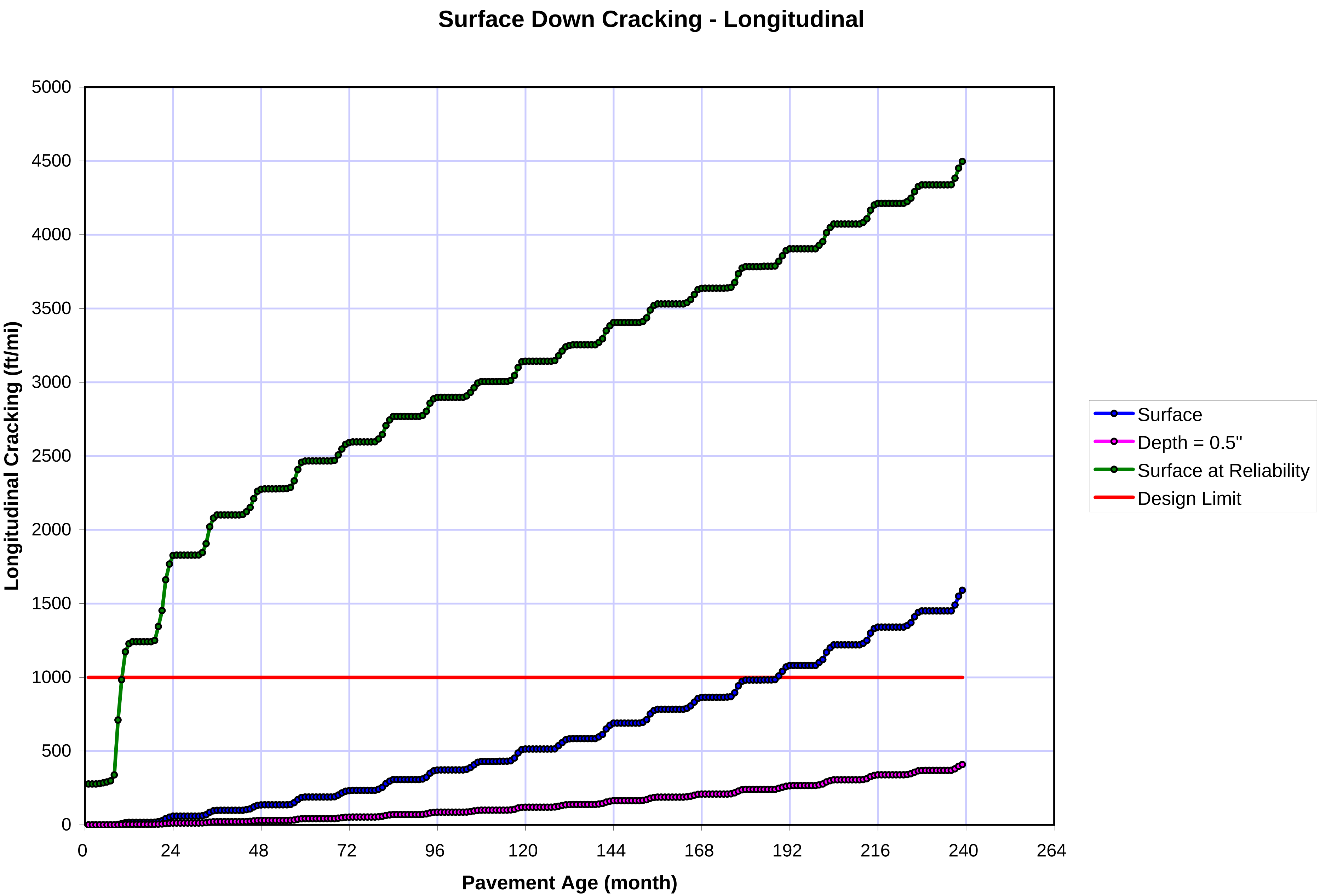
Pavement age			Top Down at Surface			Top Down at 0.5"			Bottom Up at h_{ac}			Reliability	
			Maximum Damage	Maximum Cracking	Location	Maximum Damage	Maximum Cracking	Location	Maximum Damage	Maximum Cracking	Location	Top Down Cracking	Bottom Up Cracking
mo	yr	Month	(%)	(ft/mi)	(in)	(%)	(ft/mi)	(in)	(%)	(%)	(in)	(ft/mi)	(%)
1	0.08	October	0.0161	0.02	0	0.0059	0	0	0.0251	0.02	0	277.08	0.83
2	0.17	November	0.0161	0.02	0	0.0059	0	0	0.0293	0.02	0	277.08	0.85
3	0.25	December	0.0161	0.02	0	0.0059	0	0	0.0298	0.02	0	277.08	0.85
4	0.33	January	0.0186	0.02	0	0.0059	0	0	0.0298	0.02	0	280.06	0.85
5	0.42	February	0.0228	0.03	0	0.0059	0	0	0.0298	0.02	0	285	0.85
6	0.5	March	0.0276	0.04	1.2	0.00601	0	0	0.0317	0.02	0	290.56	0.86
7	0.58	April	0.0344	0.06	0	0.00831	0.01	0	0.0641	0.04	0	298.31	1
8	0.67	May	0.071	0.17	0	0.0225	0.03	0	0.113	0.08	0	338.14	1.2
9	0.75	June	0.506	3.42	0	0.18	0.71	0	0.226	0.16	0	710.26	1.62
10	0.83	July	0.938	8.74	0	0.328	1.77	0	0.314	0.22	0	983.6	1.92
11	0.92	August	1.31	14.4	0	0.447	2.83	0	0.392	0.28	0	1173.23	2.18
12	1	September	1.43	16.6	0	0.495	3.3	0	0.44	0.32	0	1227.85	2.34
13	1.08	October	1.46	17.1	0	0.506	3.42	0	0.463	0.33	0	1240.99	2.41
14	1.17	November	1.46	17.1	0	0.506	3.42	0	0.466	0.34	0	1240.99	2.42
15	1.25	December	1.46	17.1	0	0.506	3.42	0	0.468	0.34	0	1240.99	2.43
16	1.33	January	1.46	17.1	0	0.506	3.42	0	0.469	0.34	0	1240.99	2.43
17	1.42	February	1.46	17.1	0	0.506	3.42	0	0.47	0.34	0	1240.99	2.43
18	1.5	March	1.46	17.1	0	0.506	3.42	0	0.474	0.34	0	1240.99	2.45
19	1.58	April	1.48	17.5	0	0.515	3.51	0	0.501	0.36	0	1249.73	2.53
20	1.67	May	1.71	21.7	0	0.609	4.53	0	0.573	0.42	0	1344.54	2.75
21	1.75	June	2	27.5	0	0.726	5.92	0	0.646	0.47	0	1452.5	2.97
22	1.83	July	2.66	42.4	0	0.951	8.91	0	0.745	0.55	0	1660.76	3.27
23	1.92	August	3.06	52.4	0	1.1	11	0	0.824	0.61	0	1767.62	3.49
24	2	September	3.3	58.8	0	1.19	12.5	0	0.887	0.66	0	1826.33	3.67
25	2.08	October	3.31	59	0	1.19	12.6	0	0.908	0.68	0	1828.63	3.73
26	2.17	November	3.31	59	0	1.19	12.6	0	0.911	0.68	0	1828.63	3.74
27	2.25	December	3.31	59	0	1.19	12.6	0	0.914	0.68	0	1828.63	3.75
28	2.33	January	3.31	59	0	1.19	12.6	0	0.914	0.68	0	1828.63	3.75
29	2.42	February	3.31	59	0	1.19	12.6	0	0.914	0.68	0	1828.63	3.75
30	2.5	March	3.31	59	0	1.19	12.6	0	0.919	0.69	0	1828.63	3.76
31	2.58	April	3.31	59.1	0	1.19	12.6	0	0.942	0.7	0	1828.73	3.82
32	2.67	May	3.38	61.1	0	1.22	13	0	0.991	0.74	0	1845.22	3.96
33	2.75	June	3.65	68.4	0	1.33	14.8	0	1.07	0.8	0	1905.61	4.17
34	2.83	July	4.21	85	0	1.52	18.2	0	1.16	0.88	0	2019.97	4.41
35	2.92	August	4.53	95	0	1.65	20.5	0	1.23	0.93	0	2079.5	4.6
36	3	September	4.65	98.5	0	1.69	21.4	0	1.27	0.97	0	2100.54	4.7
37	3.08	October	4.65	98.6	0	1.69	21.4	0	1.29	0.98	0	2100.64	4.75
38	3.17	November	4.65	98.6	0	1.69	21.4	0	1.3	0.99	0	2100.64	4.77
39	3.25	December	4.65	98.6	0	1.69	21.4	0	1.3	0.99	0	2100.64	4.78
40	3.33	January	4.65	98.6	0	1.69	21.4	0	1.3	0.99	0	2100.64	4.78
41	3.42	February	4.65	98.7	0	1.69	21.4	0	1.3	0.99	0	2100.74	4.78
42	3.5	March	4.65	98.7	0	1.69	21.4	0	1.31	1	0	2100.74	4.8
43	3.58	April	4.67	99.2	0	1.7	21.5	0	1.34	1.02	0	2104.11	4.88
44	3.67	May	4.77	103	0	1.74	22.3	0	1.39	1.06	0	2122.06	5
45	3.75	June	4.95	108	0	1.81	23.7	0	1.45	1.11	0	2151.65	5.16
46	3.83	July	5.31	121	0	1.95	26.5	0	1.53	1.17	0	2210.76	5.35
47	3.92	August	5.64	132	0	2.07	29.1	0	1.6	1.23	0	2260.77	5.52
48	4	September	5.74	135	0	2.11	29.9	0	1.65	1.27	0	2275.04	5.64
49	4.08	October	5.75	136	0	2.12	30	0	1.67	1.29	0	2277.15	5.7
50	4.17	November	5.75	136	0	2.12	30	0	1.67	1.29	0	2277.15	5.7
51	4.25	December	5.75	136	0	2.12	30	0	1.67	1.29	0	2277.15	5.7
52	4.33	January	5.75	136	0	2.12	30	0	1.67	1.29	0	2277.15	5.7
53	4.42	February	5.76	136	0	2.12	30	0	1.67	1.29	0	2278.26	5.7
54	4.5	March	5.76	136	0	2.12	30	0	1.67	1.29	0	2278.26	5.7
55	4.58	April	5.77	136	0	2.12	30.1	0	1.69	1.31	0	2279.37	5.75
56	4.67	May	5.82	138	0	2.14	30.5	0	1.75	1.35	0	2286.87	5.88
57	4.75	June	6.13	150	0	2.27	33.3	0	1.84	1.43	0	2331.69	6.1
58	4.83	July	6.71	171	0	2.48	38.2	0	1.96	1.52	0	2408.7	6.37
59	4.92	August	7.09	186	0	2.63	41.6	0	2.04	1.59	0	2457.04	6.56
60	5	September	7.16	189	0	2.65	42.2	0	2.08	1.62	0	2465.92	6.65
61	5.08	October	7.17	189	0	2.65	42.2	0	2.09	1.63	0	2466.75	6.67
62	5.17	November	7.17	189	0	2.65	42.2	0	2.1	1.63	0	2466.75	6.68

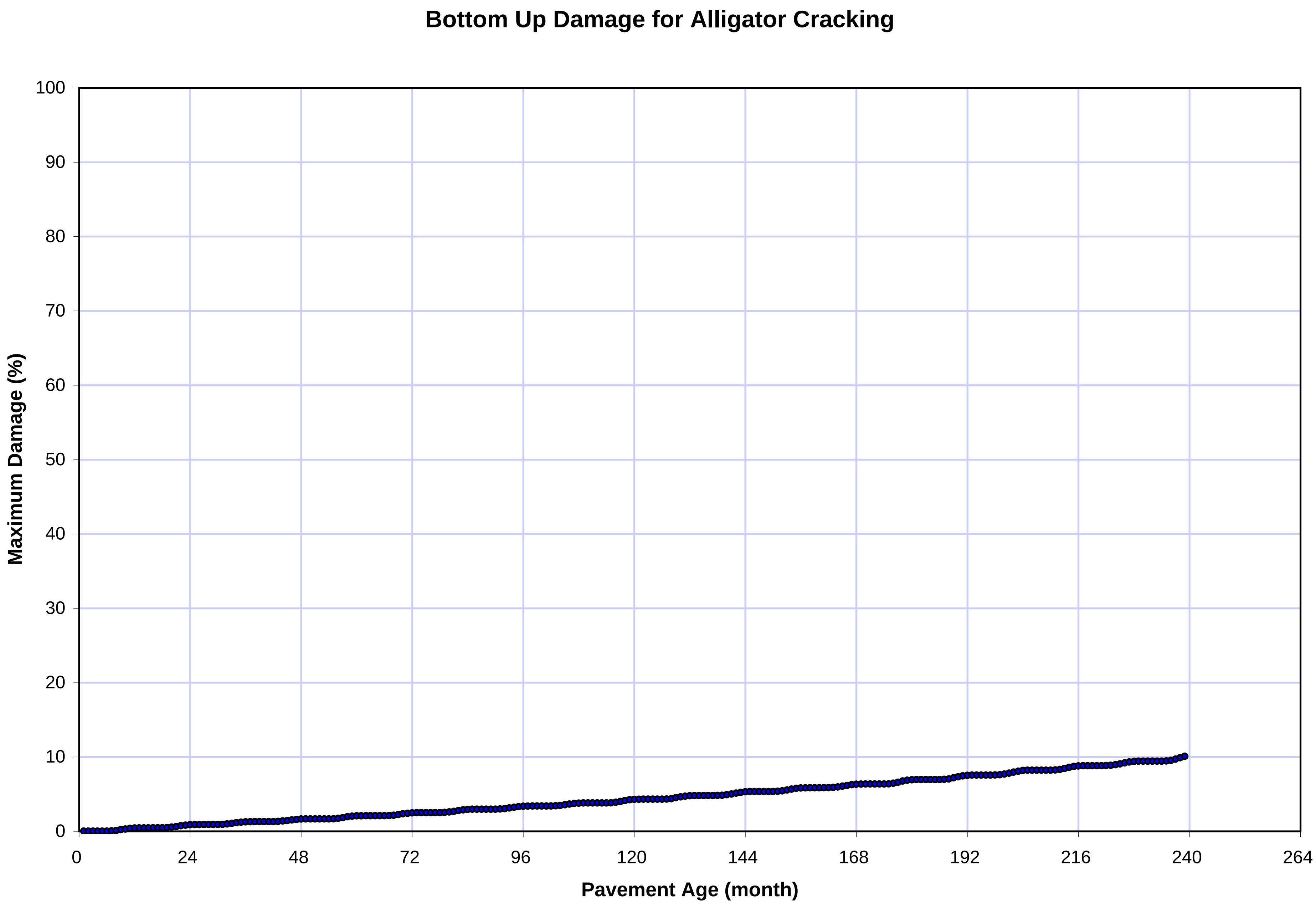
63	5.25	December	7.17	189	0	2.65	42.2	0	2.1	1.63	0	2466.75	6.68
64	5.33	January	7.17	189	0	2.65	42.2	0	2.1	1.63	0	2466.75	6.68
65	5.42	February	7.17	189	0	2.65	42.2	0	2.1	1.63	0	2466.75	6.68
66	5.5	March	7.17	189	0	2.65	42.2	0	2.1	1.63	0	2466.75	6.68
67	5.58	April	7.17	189	0	2.65	42.3	0	2.12	1.65	0	2466.75	6.73
68	5.67	May	7.2	190	0	2.66	42.5	0	2.16	1.68	0	2470.24	6.82
69	5.75	June	7.51	202	0	2.78	45.4	0	2.26	1.77	0	2507.2	7.05
70	5.83	July	7.85	216	0	2.91	48.5	0	2.36	1.85	0	2547	7.27
71	5.92	August	8.13	228	0	3.02	51.3	0	2.43	1.91	0	2579.11	7.42
72	6	September	8.24	232	0	3.06	52.3	0	2.48	1.95	0	2590.75	7.53
73	6.08	October	8.28	234	0	3.07	52.7	0	2.51	1.97	0	2595.49	7.59
74	6.17	November	8.28	234	0	3.07	52.7	0	2.51	1.97	0	2595.49	7.59
75	6.25	December	8.28	234	0	3.07	52.7	0	2.51	1.97	0	2595.49	7.59
76	6.33	January	8.28	234	0	3.07	52.7	0	2.51	1.97	0	2595.49	7.59
77	6.42	February	8.28	234	0	3.07	52.7	0	2.51	1.97	0	2595.49	7.59
78	6.5	March	8.28	234	0	3.07	52.7	0	2.52	1.98	0	2595.49	7.61
79	6.58	April	8.29	234	0	3.07	52.8	0	2.54	2	0	2596.17	7.66
80	6.67	May	8.46	242	0	3.15	54.7	0	2.61	2.05	0	2615.61	7.8
81	6.75	June	8.74	254	0	3.26	57.7	0	2.69	2.11	0	2645.74	7.96
82	6.83	July	9.32	279	0	3.48	63.6	0	2.79	2.2	0	2705.81	8.17
83	6.92	August	9.71	296	0	3.62	67.6	0	2.88	2.27	0	2744.67	8.35
84	7	September	9.94	307	0	3.71	70.1	0	2.95	2.33	0	2767.97	8.5
85	7.08	October	9.95	307	0	3.71	70.2	0	2.97	2.34	0	2768.49	8.53
86	7.17	November	9.95	307	0	3.71	70.2	0	2.97	2.34	0	2768.49	8.53
87	7.25	December	9.95	307	0	3.71	70.2	0	2.97	2.35	0	2768.49	8.54
88	7.33	January	9.95	307	0	3.71	70.2	0	2.97	2.35	0	2768.49	8.54
89	7.42	February	9.95	307	0	3.71	70.2	0	2.97	2.35	0	2768.49	8.54
90	7.5	March	9.95	307	0	3.71	70.2	0	2.98	2.35	0	2768.49	8.55
91	7.58	April	9.95	307	0	3.71	70.2	0	3	2.37	0	2768.49	8.6
92	7.67	May	10	311	0	3.74	71	0	3.05	2.41	0	2775.11	8.69
93	7.75	June	10.3	323	0	3.85	74.2	0	3.14	2.48	0	2802.4	8.87
94	7.83	July	10.9	350	0	4.06	80.4	0	3.24	2.57	0	2858.1	9.07
95	7.92	August	11.2	366	0	4.19	84.3	0	3.32	2.63	0	2887.58	9.22
96	8	September	11.3	371	0	4.23	85.6	0	3.37	2.67	0	2896.96	9.32
97	8.08	October	11.3	372	0	4.23	85.7	0	3.39	2.69	0	2897.96	9.36
98	8.17	November	11.3	372	0	4.23	85.7	0	3.4	2.69	0	2897.96	9.37
99	8.25	December	11.3	372	0	4.23	85.7	0	3.4	2.69	0	2897.96	9.37
100	8.33	January	11.3	372	0	4.23	85.7	0	3.4	2.69	0	2897.96	9.37
101	8.42	February	11.3	372	0	4.23	85.7	0	3.4	2.7	0	2897.96	9.38
102	8.5	March	11.3	372	0	4.23	85.7	0	3.41	2.7	0	2897.96	9.39
103	8.58	April	11.3	372	0	4.24	85.8	0	3.43	2.73	0	2897.96	9.44
104	8.67	May	11.4	377	0	4.28	87	0	3.49	2.77	0	2907.27	9.55
105	8.75	June	11.7	388	0	4.37	89.9	0	3.57	2.84	0	2930.88	9.71
106	8.83	July	12	407	0	4.51	94.2	0	3.66	2.91	0	2962.01	9.87
107	8.92	August	12.4	424	0	4.65	98.5	0	3.74	2.98	0	2994.48	10.02
108	9	September	12.5	430	0	4.69	99.9	0	3.79	3.02	0	3004.23	10.12
109	9.08	October	12.5	430	0	4.69	100	0	3.82	3.04	0	3004.23	10.17
110	9.17	November	12.5	430	0	4.69	100	0	3.82	3.04	0	3004.23	10.17
111	9.25	December	12.5	430	0	4.69	100	0	3.82	3.04	0	3004.23	10.17
112	9.33	January	12.5	430	0	4.69	100	0	3.82	3.04	0	3004.23	10.17
113	9.42	February	12.5	431	0	4.69	100	0	3.82	3.04	0	3005.23	10.17
114	9.5	March	12.5	431	0	4.69	100	0	3.82	3.04	0	3005.23	10.17
115	9.58	April	12.5	431	0	4.69	100	0	3.84	3.06	0	3005.23	10.21
116	9.67	May	12.6	434	0	4.72	101	0	3.91	3.11	0	3011.93	10.33
117	9.75	June	13	453	0	4.86	105	0	4.02	3.2	0	3045.3	10.53
118	9.83	July	13.6	487	0	5.11	114	0	4.15	3.31	0	3099.61	10.76
119	9.92	August	14.1	510	0	5.28	119	0	4.25	3.39	0	3138.49	10.94
120	10	September	14.1	514	0	5.3	120	0	4.29	3.43	0	3142.49	11.02
121	10.1	October	14.1	514	0	5.31	120	0	4.31	3.44	0	3142.49	11.05
122	10.2	November	14.1	514	0	5.31	120	0	4.32	3.45	0	3142.49	11.06
123	10.3	December	14.1	514	0	5.31	120	0	4.32	3.45	0	3142.49	11.06
124	10.3	January	14.1	514	0	5.31	120	0	4.32	3.45	0	3142.49	11.06
125	10.4	February	14.1	514	0	5.31	120	0	4.32	3.45	0	3142.49	11.06
126	10.5	March	14.1	514	0	5.31	120	0	4.32	3.45	0	3142.49	11.06
127	10.6	April	14.1	514	0	5.31	120	0	4.34	3.47	0	3142.49	11.1
128	10.7	May	14.2	515	0	5.32	121	0	4.39	3.51	0	3146.56	11.19
129	10.8	June	14.6	536	0	5.47	126	0	4.52	3.61	0	3179.52	11.41
130	10.8	July	15	557	0	5.61	131	0	4.63	3.7	0	3211.96	11.6

131	10.9	August	15.3	577	0	5.75	136	0	4.73	3.78	0	3240.23	11.77
132	11	September	15.4	583	0	5.79	137	0	4.78	3.83	0	3248.93	11.86
133	11.1	October	15.5	585	0	5.8	138	0	4.81	3.85	0	3253.6	11.91
134	11.2	November	15.5	585	0	5.8	138	0	4.81	3.85	0	3253.6	11.91
135	11.3	December	15.5	585	0	5.8	138	0	4.82	3.86	0	3253.6	11.93
136	11.3	January	15.5	585	0	5.8	138	0	4.82	3.86	0	3253.6	11.93
137	11.4	February	15.5	585	0	5.8	138	0	4.82	3.86	0	3253.6	11.93
138	11.5	March	15.5	585	0	5.8	138	0	4.83	3.86	0	3253.6	11.93
139	11.6	April	15.5	585	0	5.81	138	0	4.85	3.88	0	3253.6	11.97
140	11.7	May	15.7	596	0	5.89	141	0	4.93	3.95	0	3269.86	12.11
141	11.8	June	16	613	0	6.01	145	0	5.02	4.02	0	3294.56	12.26
142	11.8	July	16.7	650	0	6.26	154	0	5.14	4.12	0	3348.64	12.46
143	11.9	August	17.1	675	0	6.43	160	0	5.24	4.21	0	3382.89	12.63
144	12	September	17.4	690	0	6.53	164	0	5.33	4.27	0	3404.6	12.76
145	12.1	October	17.4	690	0	6.53	164	0	5.35	4.29	0	3404.6	12.8
146	12.2	November	17.4	690	0	6.53	164	0	5.35	4.29	0	3404.6	12.8
147	12.3	December	17.4	690	0	6.53	164	0	5.36	4.3	0	3404.6	12.82
148	12.3	January	17.4	690	0	6.53	164	0	5.36	4.3	0	3404.6	12.82
149	12.4	February	17.4	690	0	6.53	164	0	5.36	4.3	0	3404.6	12.82
150	12.5	March	17.4	690	0	6.53	164	0	5.36	4.3	0	3404.6	12.82
151	12.6	April	17.4	690	0	6.53	164	0	5.38	4.32	0	3404.6	12.85
152	12.7	May	17.5	695	0	6.57	166	0	5.45	4.37	0	3411.8	12.96
153	12.8	June	17.8	713	0	6.69	170	0	5.55	4.45	0	3436.26	13.12
154	12.8	July	18.5	752	0	6.94	180	0	5.68	4.55	0	3489.67	13.32
155	12.9	August	18.9	775	0	7.09	186	0	5.78	4.64	0	3520.52	13.48
156	13	September	19	783	0	7.14	188	0	5.83	4.68	0	3530.43	13.56
157	13.1	October	19	783	0	7.14	188	0	5.85	4.7	0	3530.43	13.6
158	13.2	November	19	783	0	7.14	188	0	5.86	4.71	0	3530.43	13.61
159	13.3	December	19	783	0	7.14	188	0	5.86	4.71	0	3530.43	13.61
160	13.3	January	19	783	0	7.14	188	0	5.86	4.71	0	3530.43	13.61
161	13.4	February	19	783	0	7.14	188	0	5.87	4.71	0	3530.43	13.62
162	13.5	March	19	783	0	7.14	188	0	5.88	4.72	0	3530.43	13.64
163	13.6	April	19	783	0	7.15	188	0	5.91	4.74	0	3530.43	13.68
164	13.7	May	19.1	790	0	7.2	190	0	5.97	4.8	0	3539.33	13.78
165	13.8	June	19.4	806	0	7.3	194	0	6.07	4.87	0	3560.94	13.93
166	13.8	July	19.8	832	0	7.47	201	0	6.17	4.96	0	3594.2	14.09
167	13.9	August	20.3	857	0	7.63	207	0	6.28	5.04	0	3627.93	14.25
168	14	September	20.4	864	0	7.68	209	0	6.34	5.09	0	3636.63	14.34
169	14.1	October	20.4	865	0	7.68	209	0	6.36	5.11	0	3637.63	14.37
170	14.2	November	20.4	865	0	7.68	209	0	6.37	5.11	0	3637.63	14.38
171	14.3	December	20.4	865	0	7.68	209	0	6.37	5.11	0	3637.63	14.38
172	14.3	January	20.4	865	0	7.68	209	0	6.37	5.11	0	3637.63	14.38
173	14.4	February	20.4	865	0	7.68	209	0	6.37	5.11	0	3637.63	14.38
174	14.5	March	20.4	865	0	7.68	209	0	6.37	5.11	0	3637.63	14.38
175	14.6	April	20.4	866	0	7.68	209	0	6.39	5.14	0	3638.63	14.42
176	14.7	May	20.5	869	0	7.71	210	0	6.47	5.19	0	3643.32	14.53
177	14.8	June	20.9	895	0	7.88	217	0	6.6	5.3	0	3675.95	14.73
178	14.8	July	21.7	942	0	8.17	229	0	6.76	5.43	0	3735.59	14.97
179	14.9	August	22.2	973	0	8.37	238	0	6.88	5.53	0	3774.09	15.14
180	15	September	22.3	981	0	8.42	240	0	6.94	5.58	0	3783.56	15.23
181	15.1	October	22.3	981	0	8.42	240	0	6.96	5.59	0	3783.56	15.26
182	15.2	November	22.3	981	0	8.42	240	0	6.96	5.6	0	3783.56	15.27
183	15.3	December	22.3	981	0	8.42	240	0	6.97	5.6	0	3783.56	15.27
184	15.3	January	22.3	981	0	8.42	240	0	6.97	5.6	0	3783.56	15.27
185	15.4	February	22.4	982	0	8.42	240	0	6.97	5.6	0	3786.02	15.27
186	15.5	March	22.4	982	0	8.42	240	0	6.97	5.6	0	3786.02	15.27
187	15.6	April	22.4	982	0	8.42	240	0	7	5.63	0	3786.02	15.32
188	15.7	May	22.4	984	0	8.43	240	0	7.05	5.67	0	3788.02	15.39
189	15.8	June	22.8	1010	0	8.61	248	0	7.2	5.79	0	3819.74	15.61
190	15.8	July	23.3	1040	0	8.78	255	0	7.34	5.9	0	3856.65	15.81
191	15.9	August	23.7	1070	0	8.94	262	0	7.46	5.99	0	3892	15.97
192	16	September	23.9	1080	0	9	265	0	7.53	6.05	0	3904.62	16.07
193	16.1	October	23.9	1080	0	9.01	266	0	7.56	6.08	0	3904.62	16.12
194	16.2	November	23.9	1080	0	9.01	266	0	7.56	6.08	0	3904.62	16.12
195	16.3	December	23.9	1080	0	9.01	266	0	7.57	6.08	0	3904.62	16.13
196	16.3	January	23.9	1080	0	9.01	266	0	7.57	6.08	0	3904.62	16.13
197	16.4	February	23.9	1080	0	9.01	266	0	7.57	6.09	0	3904.62	16.14
198	16.5	March	23.9	1080	0	9.01	266	0	7.58	6.09	0	3904.62	16.14

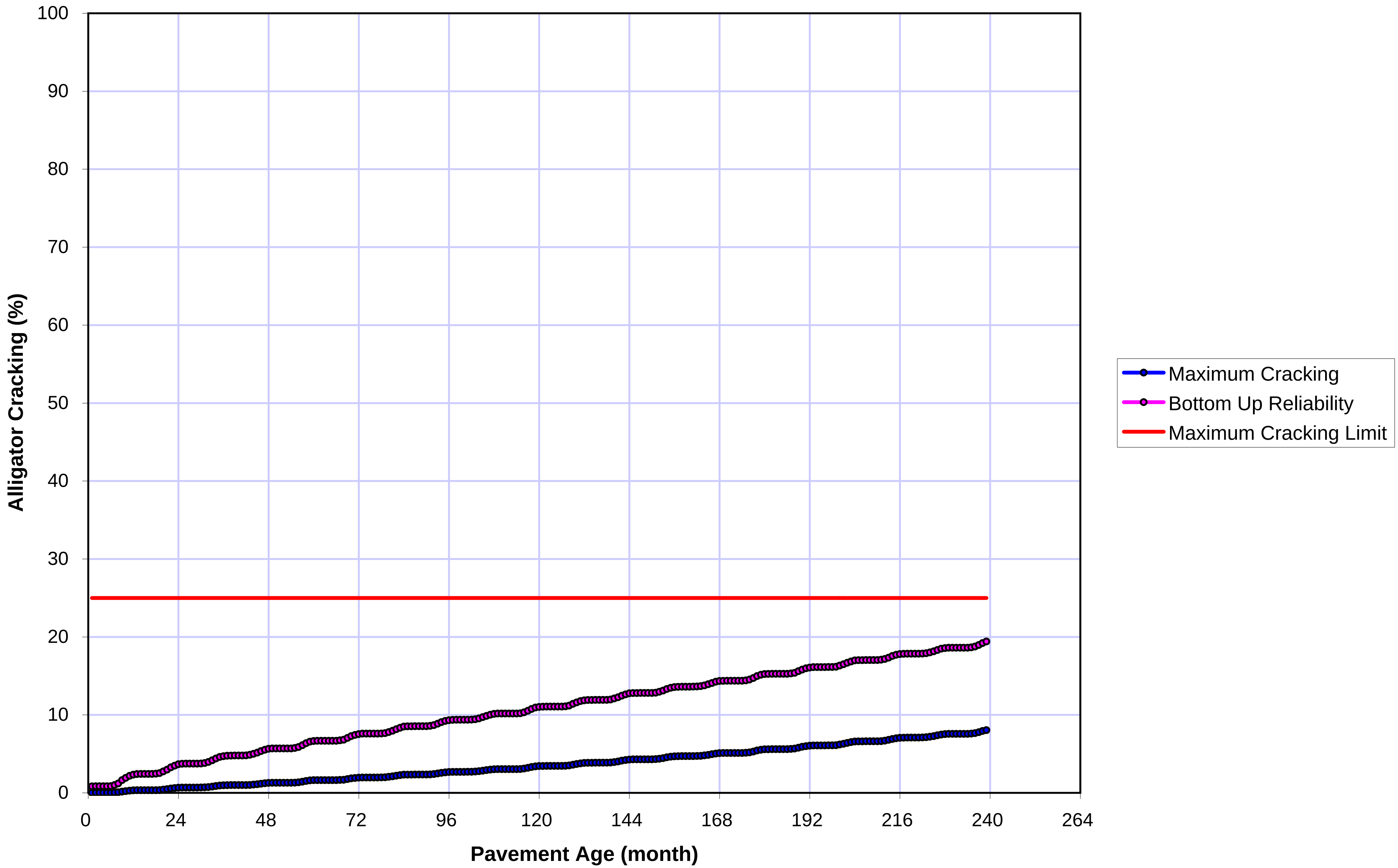
199	16.6	April	23.9	1080	0	9.02	266	0	7.61	6.11	0	3904.62	16.18
200	16.7	May	24.2	1100	0	9.14	271	0	7.71	6.2	0	3928.48	16.33
201	16.8	June	24.6	1120	0	9.29	277	0	7.82	6.29	0	3953.5	16.49
202	16.8	July	25.4	1170	0	9.58	291	0	7.97	6.4	0	4013.14	16.68
203	16.9	August	25.9	1200	0	9.78	299	0	8.09	6.5	0	4048.9	16.85
204	17	September	26.2	1220	0	9.9	305	0	8.19	6.58	0	4072.27	16.99
205	17.1	October	26.2	1220	0	9.9	305	0	8.22	6.6	0	4072.27	17.02
206	17.2	November	26.2	1220	0	9.9	305	0	8.22	6.6	0	4072.27	17.02
207	17.3	December	26.2	1220	0	9.9	305	0	8.23	6.61	0	4072.27	17.04
208	17.3	January	26.2	1220	0	9.9	305	0	8.23	6.61	0	4072.27	17.04
209	17.4	February	26.2	1220	0	9.9	305	0	8.23	6.61	0	4072.27	17.04
210	17.5	March	26.2	1220	0	9.9	305	0	8.23	6.61	0	4072.27	17.04
211	17.6	April	26.2	1220	0	9.9	305	0	8.26	6.63	0	4072.27	17.08
212	17.7	May	26.3	1230	0	9.94	307	0	8.33	6.69	0	4083.38	17.17
213	17.8	June	26.7	1250	0	10.1	313	0	8.45	6.79	0	4107.74	17.34
214	17.8	July	27.5	1300	0	10.4	327	0	8.61	6.91	0	4166.13	17.55
215	17.9	August	28	1330	0	10.6	335	0	8.73	7	0	4201.16	17.7
216	18	September	28.1	1340	0	10.6	339	0	8.8	7.06	0	4212.15	17.8
217	18.1	October	28.1	1340	0	10.6	339	0	8.82	7.08	0	4212.15	17.83
218	18.2	November	28.1	1340	0	10.6	339	0	8.83	7.09	0	4212.15	17.84
219	18.3	December	28.1	1340	0	10.6	339	0	8.83	7.09	0	4212.15	17.84
220	18.3	January	28.1	1340	0	10.6	339	0	8.83	7.09	0	4212.15	17.84
221	18.4	February	28.1	1340	0	10.6	339	0	8.83	7.09	0	4212.15	17.84
222	18.5	March	28.1	1340	0	10.6	339	0	8.85	7.1	0	4212.15	17.86
223	18.6	April	28.2	1340	0	10.6	339	0	8.88	7.13	0	4213.14	17.91
224	18.7	May	28.3	1350	0	10.7	341	0	8.96	7.19	0	4224.11	18.01
225	18.8	June	28.6	1370	0	10.8	347	0	9.07	7.27	0	4247	18.15
226	18.8	July	29.1	1410	0	11	357	0	9.2	7.38	0	4291.71	18.32
227	18.9	August	29.6	1440	0	11.2	366	0	9.33	7.48	0	4326.28	18.49
228	19	September	29.8	1450	0	11.3	368	0	9.4	7.53	0	4338.07	18.57
229	19.1	October	29.8	1450	0	11.3	369	0	9.43	7.56	0	4338.07	18.61
230	19.2	November	29.8	1450	0	11.3	369	0	9.43	7.56	0	4338.07	18.61
231	19.3	December	29.8	1450	0	11.3	369	0	9.44	7.56	0	4338.07	18.62
232	19.3	January	29.8	1450	0	11.3	369	0	9.44	7.56	0	4338.07	18.62
233	19.4	February	29.8	1450	0	11.3	369	0	9.44	7.56	0	4338.07	18.62
234	19.5	March	29.8	1450	0	11.3	369	0	9.44	7.56	0	4338.07	18.62
235	19.6	April	29.8	1450	0	11.3	369	0	9.47	7.59	0	4338.07	18.66
236	19.7	May	29.9	1450	0	11.3	370	0	9.55	7.66	0	4338.96	18.77
237	19.8	June	30.4	1490	0	11.5	380	0	9.71	7.78	0	4383.32	18.97
238	19.8	July	31.3	1550	0	11.8	397	0	9.9	7.93	0	4450.86	19.21
239	19.9	August	32	1590	0	12.1	409	0	10.1	8.04	0	4496.47	19.41
240	20	September	32.1	1600	0	12.1	412	0	10.1	8.1	0	4507.25	19.47


Surface Down Cracking - Longitudinal
Maximum Damage(%)
100
90
80
70
60
50
40
30
20
10
0
0
24
48
72
96
120
144
168
192
216
240
264
Pavement Age (month)
Surface
Depth = 0.5"


Surface Down Cracking - Longitudinal
Longitudinal Cracking (ft/mi)
5000
4500
4000
3500
3000
2500
2000
1500
1000
500
0
0
24
48
72
96
120
144
168
192
216
240
264
Pavement Age (month)
Surface
Depth = 0.5"
Surface at Reliability
Design Limit


Bottom Up Damage for Alligator Cracking
Maximum Damage (%)
100
90
80
70
60
50
40
30
20
10
0
0
24
48
72
96
120
144
168
192
216
240
264
Pavement Age (month)

Bottom Up Cracking - Alligator



Thermal Cracking: Project mepdg-hma

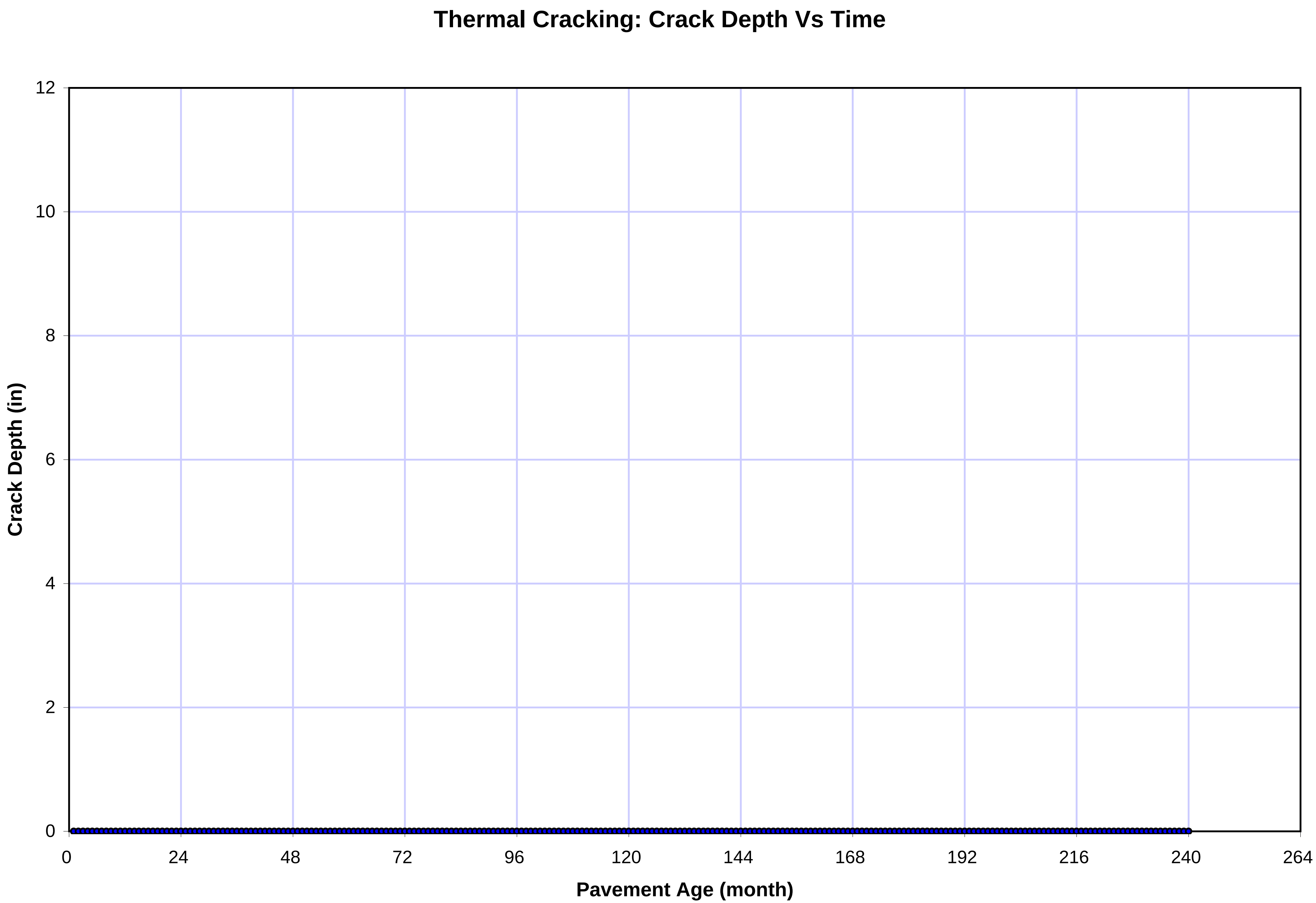
Pavement age		Month	Crack Depth C_{ave} (in)	Depth Ratio C/h_{ac}	Crack Length (ft/mi)	Average Crack Spacing (ft)	Crack Length at Reliability (ft/mi)
mo	yr						
1	0.08	October	0	0	0		14.6
2	0.17	November	0	0	0		14.6
3	0.25	December	0.0000133	0.00000121	0		14.6
4	0.33	January	0.0000313	0.00000285	0		14.6
5	0.42	February	0.0000329	0.00000299	0		14.6
6	0.5	March	0.0000329	0.00000299	0		14.6
7	0.58	April	0.0000329	0.00000299	0		14.6
8	0.67	May	0.0000329	0.00000299	0		14.6
9	0.75	June	0.0000329	0.00000299	0		14.6
10	0.83	July	0.0000329	0.00000299	0		14.6
11	0.92	August	0.0000329	0.00000299	0		14.6
12	1	September	0.0000329	0.00000299	0		14.6
13	1.08	October	0.0000329	0.00000299	0		14.6
14	1.17	November	0.0000329	0.00000299	0		14.6
15	1.25	December	0.0000329	0.00000299	0		14.6
16	1.33	January	0.0000329	0.00000299	0		14.6
17	1.42	February	0.0000329	0.00000299	0		14.6
18	1.5	March	0.0000329	0.00000299	0		14.6
19	1.58	April	0.0000329	0.00000299	0		14.6
20	1.67	May	0.0000329	0.00000299	0		14.6
21	1.75	June	0.0000329	0.00000299	0		14.6
22	1.83	July	0.0000329	0.00000299	0		14.6
23	1.92	August	0.0000329	0.00000299	0		14.6
24	2	September	0.0000329	0.00000299	0		14.6
25	2.08	October	0.0000329	0.00000299	0		14.6
26	2.17	November	0.0000329	0.00000299	0		14.6
27	2.25	December	0.0000354	0.00000322	0		14.6
28	2.33	January	0.0000585	0.00000532	0		14.6
29	2.42	February	0.0000585	0.00000532	0		14.6
30	2.5	March	0.0000585	0.00000532	0		14.6
31	2.58	April	0.0000585	0.00000532	0		14.6
32	2.67	May	0.0000585	0.00000532	0		14.6
33	2.75	June	0.0000585	0.00000532	0		14.6
34	2.83	July	0.0000585	0.00000532	0		14.6
35	2.92	August	0.0000585	0.00000532	0		14.6
36	3	September	0.0000585	0.00000532	0		14.6
37	3.08	October	0.0000585	0.00000532	0		14.6
38	3.17	November	0.0000585	0.00000532	0		14.6
39	3.25	December	0.0000621	0.00000565	0		14.6
40	3.33	January	0.0000656	0.00000596	0		14.6
41	3.42	February	0.0000656	0.00000596	0		14.6
42	3.5	March	0.0000656	0.00000596	0		14.6
43	3.58	April	0.0000656	0.00000596	0		14.6
44	3.67	May	0.0000656	0.00000596	0		14.6
45	3.75	June	0.0000656	0.00000596	0		14.6
46	3.83	July	0.0000656	0.00000596	0		14.6
47	3.92	August	0.0000656	0.00000596	0		14.6
48	4	September	0.0000656	0.00000596	0		14.6
49	4.08	October	0.0000656	0.00000596	0		14.6
50	4.17	November	0.0000656	0.00000596	0		14.6
51	4.25	December	0.000101	0.00000918	0		14.6
52	4.33	January	0.000102	0.00000928	0		14.6
53	4.42	February	0.000109	0.00000986	0		14.6

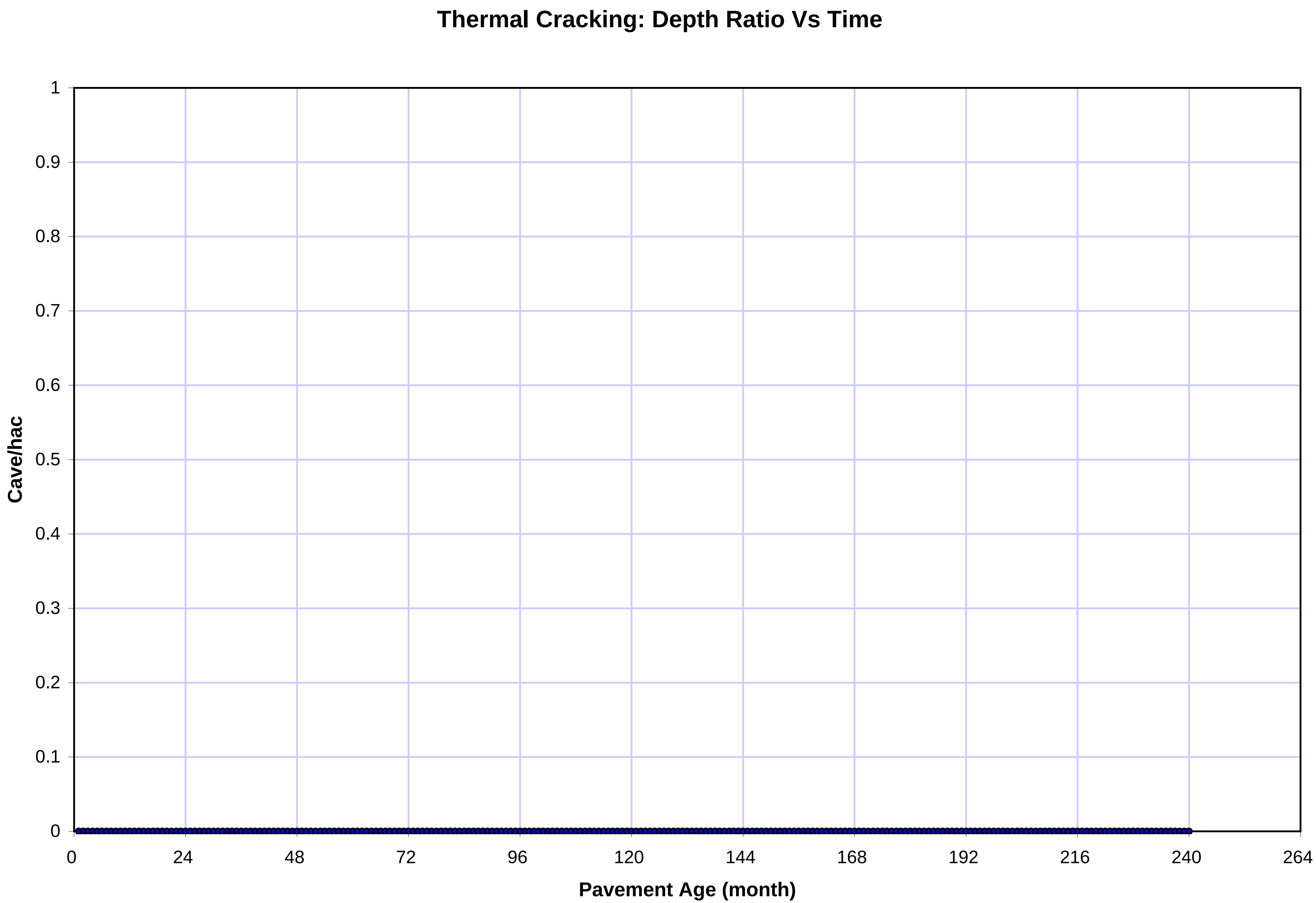
54	4.5	March	0.000109	0.00000986	0		14.6
55	4.58	April	0.000109	0.00000986	0		14.6
56	4.67	May	0.000109	0.00000986	0		14.6
57	4.75	June	0.000109	0.00000986	0		14.6
58	4.83	July	0.000109	0.00000986	0		14.6
59	4.92	August	0.000109	0.00000986	0		14.6
60	5	September	0.000109	0.00000986	0		14.6
61	5.08	October	0.000109	0.00000986	0		14.6
62	5.17	November	0.000109	0.00000986	0		14.6
63	5.25	December	0.000122	0.0000111	0		14.6
64	5.33	January	0.000141	0.0000128	0		14.6
65	5.42	February	0.000142	0.0000129	0		14.6
66	5.5	March	0.000142	0.0000129	0		14.6
67	5.58	April	0.000142	0.0000129	0		14.6
68	5.67	May	0.000142	0.0000129	0		14.6
69	5.75	June	0.000142	0.0000129	0		14.6
70	5.83	July	0.000142	0.0000129	0		14.6
71	5.92	August	0.000142	0.0000129	0		14.6
72	6	September	0.000142	0.0000129	0		14.6
73	6.08	October	0.000142	0.0000129	0		14.6
74	6.17	November	0.000142	0.0000129	0		14.6
75	6.25	December	0.000142	0.0000129	0		14.6
76	6.33	January	0.000143	0.000013	0		14.6
77	6.42	February	0.000143	0.000013	0		14.6
78	6.5	March	0.000143	0.000013	0		14.6
79	6.58	April	0.000143	0.000013	0		14.6
80	6.67	May	0.000143	0.000013	0		14.6
81	6.75	June	0.000143	0.000013	0		14.6
82	6.83	July	0.000143	0.000013	0		14.6
83	6.92	August	0.000143	0.000013	0		14.6
84	7	September	0.000143	0.000013	0		14.6
85	7.08	October	0.000143	0.000013	0		14.6
86	7.17	November	0.000143	0.000013	0		14.6
87	7.25	December	0.000143	0.000013	0		14.6
88	7.33	January	0.000171	0.0000155	0		14.6
89	7.42	February	0.000171	0.0000155	0		14.6
90	7.5	March	0.000171	0.0000155	0		14.6
91	7.58	April	0.000171	0.0000155	0		14.6
92	7.67	May	0.000171	0.0000155	0		14.6
93	7.75	June	0.000171	0.0000155	0		14.6
94	7.83	July	0.000171	0.0000155	0		14.6
95	7.92	August	0.000171	0.0000155	0		14.6
96	8	September	0.000171	0.0000155	0		14.6
97	8.08	October	0.000171	0.0000155	0		14.6
98	8.17	November	0.000171	0.0000155	0		14.6
99	8.25	December	0.000175	0.0000159	0		14.6
100	8.33	January	0.000178	0.0000162	0		14.6
101	8.42	February	0.000178	0.0000162	0		14.6
102	8.5	March	0.000178	0.0000162	0		14.6
103	8.58	April	0.000178	0.0000162	0		14.6
104	8.67	May	0.000178	0.0000162	0		14.6
105	8.75	June	0.000178	0.0000162	0		14.6
106	8.83	July	0.000178	0.0000162	0		14.6
107	8.92	August	0.000178	0.0000162	0		14.6
108	9	September	0.000178	0.0000162	0		14.6
109	9.08	October	0.000178	0.0000162	0		14.6
110	9.17	November	0.000178	0.0000162	0		14.6
111	9.25	December	0.000215	0.0000195	0		14.6

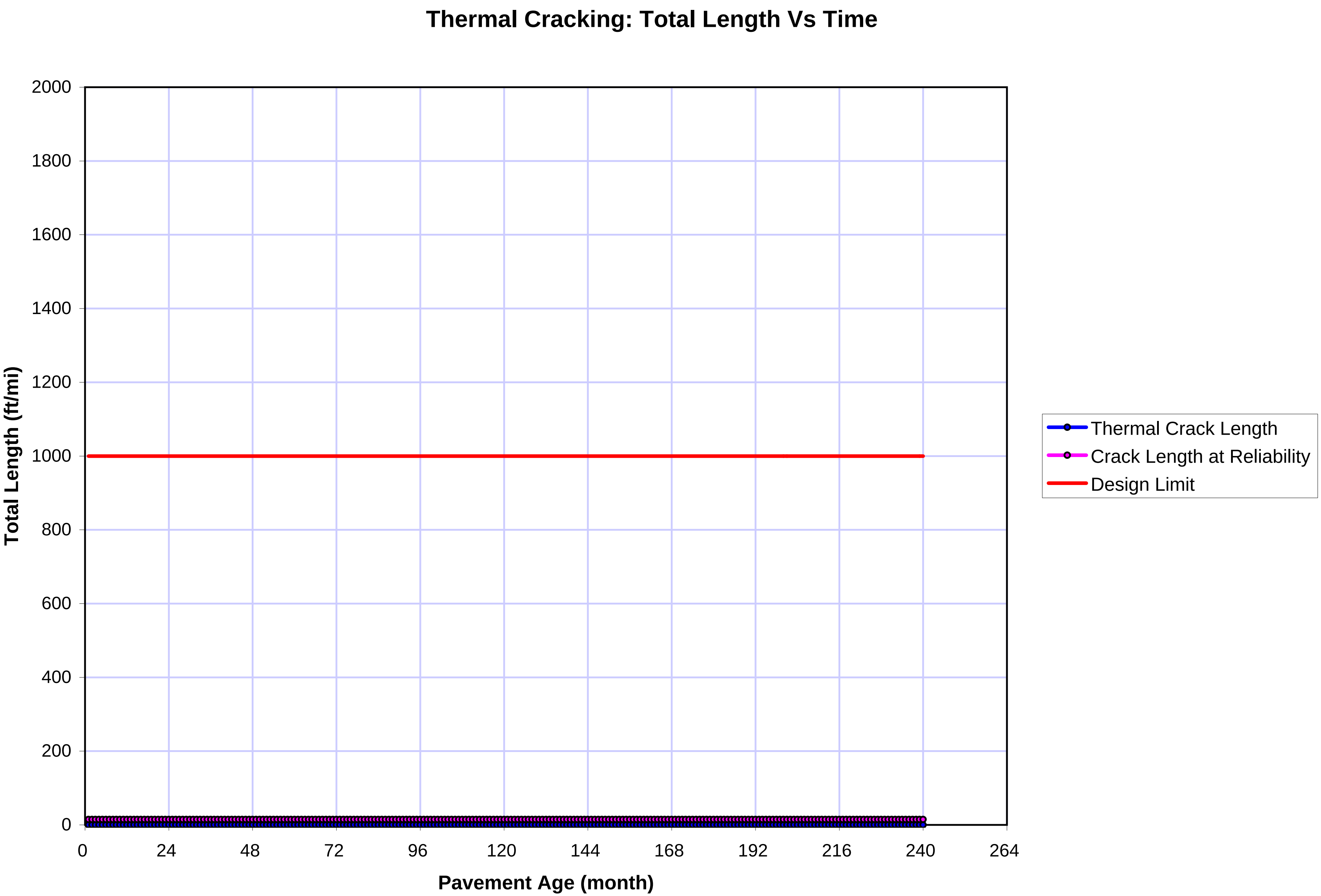
112	9.33	January	0.000217	0.0000197	0		14.6
113	9.42	February	0.000224	0.0000203	0		14.6
114	9.5	March	0.000224	0.0000203	0		14.6
115	9.58	April	0.000224	0.0000203	0		14.6
116	9.67	May	0.000224	0.0000203	0		14.6
117	9.75	June	0.000224	0.0000203	0		14.6
118	9.83	July	0.000224	0.0000203	0		14.6
119	9.92	August	0.000224	0.0000203	0		14.6
120	10	September	0.000224	0.0000203	0		14.6
121	10.1	October	0.000224	0.0000203	0		14.6
122	10.2	November	0.000229	0.0000208	0		14.6
123	10.3	December	0.000253	0.000023	0		14.6
124	10.3	January	0.000259	0.0000236	0		14.6
125	10.4	February	0.000259	0.0000236	0		14.6
126	10.5	March	0.000259	0.0000236	0		14.6
127	10.6	April	0.000259	0.0000236	0		14.6
128	10.7	May	0.000259	0.0000236	0		14.6
129	10.8	June	0.000259	0.0000236	0		14.6
130	10.8	July	0.000259	0.0000236	0		14.6
131	10.9	August	0.000259	0.0000236	0		14.6
132	11	September	0.000259	0.0000236	0		14.6
133	11.1	October	0.000259	0.0000236	0		14.6
134	11.2	November	0.000259	0.0000236	0		14.6
135	11.3	December	0.00026	0.0000237	0		14.6
136	11.3	January	0.00026	0.0000237	0		14.6
137	11.4	February	0.00026	0.0000237	0		14.6
138	11.5	March	0.00026	0.0000237	0		14.6
139	11.6	April	0.00026	0.0000237	0		14.6
140	11.7	May	0.00026	0.0000237	0		14.6
141	11.8	June	0.00026	0.0000237	0		14.6
142	11.8	July	0.00026	0.0000237	0		14.6
143	11.9	August	0.00026	0.0000237	0		14.6
144	12	September	0.00026	0.0000237	0		14.6
145	12.1	October	0.00026	0.0000237	0		14.6
146	12.2	November	0.00026	0.0000237	0		14.6
147	12.3	December	0.000288	0.0000262	0		14.6
148	12.3	January	0.000288	0.0000262	0		14.6
149	12.4	February	0.000288	0.0000262	0		14.6
150	12.5	March	0.000288	0.0000262	0		14.6
151	12.6	April	0.000288	0.0000262	0		14.6
152	12.7	May	0.000288	0.0000262	0		14.6
153	12.8	June	0.000288	0.0000262	0		14.6
154	12.8	July	0.000288	0.0000262	0		14.6
155	12.9	August	0.000288	0.0000262	0		14.6
156	13	September	0.000288	0.0000262	0		14.6
157	13.1	October	0.000288	0.0000262	0		14.6
158	13.2	November	0.000292	0.0000265	0		14.6
159	13.3	December	0.000293	0.0000267	0		14.6
160	13.3	January	0.000295	0.0000268	0		14.6
161	13.4	February	0.000295	0.0000268	0		14.6
162	13.5	March	0.000295	0.0000268	0		14.6
163	13.6	April	0.000295	0.0000268	0		14.6
164	13.7	May	0.000295	0.0000268	0		14.6
165	13.8	June	0.000295	0.0000268	0		14.6
166	13.8	July	0.000295	0.0000268	0		14.6
167	13.9	August	0.000295	0.0000268	0		14.6
168	14	September	0.000295	0.0000268	0		14.6
169	14.1	October	0.000295	0.0000268	0		14.6

170	14.2	November	0.000306	0.0000278	0		14.6
171	14.3	December	0.000334	0.0000304	0		14.6
172	14.3	January	0.000339	0.0000308	0		14.6
173	14.4	February	0.000342	0.0000311	0		14.6
174	14.5	March	0.000342	0.0000311	0		14.6
175	14.6	April	0.000342	0.0000311	0		14.6
176	14.7	May	0.000342	0.0000311	0		14.6
177	14.8	June	0.000342	0.0000311	0		14.6
178	14.8	July	0.000342	0.0000311	0		14.6
179	14.9	August	0.000342	0.0000311	0		14.6
180	15	September	0.000342	0.0000311	0		14.6
181	15.1	October	0.000342	0.0000311	0		14.6
182	15.2	November	0.000347	0.0000316	0		14.6
183	15.3	December	0.000369	0.0000335	0		14.6
184	15.3	January	0.000377	0.0000343	0		14.6
185	15.4	February	0.000377	0.0000343	0		14.6
186	15.5	March	0.000377	0.0000343	0		14.6
187	15.6	April	0.000377	0.0000343	0		14.6
188	15.7	May	0.000377	0.0000343	0		14.6
189	15.8	June	0.000377	0.0000343	0		14.6
190	15.8	July	0.000377	0.0000343	0		14.6
191	15.9	August	0.000377	0.0000343	0		14.6
192	16	September	0.000377	0.0000343	0		14.6
193	16.1	October	0.000377	0.0000343	0		14.6
194	16.2	November	0.000377	0.0000343	0		14.6
195	16.3	December	0.000379	0.0000344	0		14.6
196	16.3	January	0.000379	0.0000344	0		14.6
197	16.4	February	0.000379	0.0000344	0		14.6
198	16.5	March	0.000379	0.0000344	0		14.6
199	16.6	April	0.000379	0.0000344	0		14.6
200	16.7	May	0.000379	0.0000344	0		14.6
201	16.8	June	0.000379	0.0000344	0		14.6
202	16.8	July	0.000379	0.0000344	0		14.6
203	16.9	August	0.000379	0.0000344	0		14.6
204	17	September	0.000379	0.0000344	0		14.6
205	17.1	October	0.000379	0.0000344	0		14.6
206	17.2	November	0.000379	0.0000344	0		14.6
207	17.3	December	0.000407	0.000037	0		14.6
208	17.3	January	0.000407	0.000037	0		14.6
209	17.4	February	0.000407	0.000037	0		14.6
210	17.5	March	0.000407	0.000037	0		14.6
211	17.6	April	0.000407	0.000037	0		14.6
212	17.7	May	0.000407	0.000037	0		14.6
213	17.8	June	0.000407	0.000037	0		14.6
214	17.8	July	0.000407	0.000037	0		14.6
215	17.9	August	0.000407	0.000037	0		14.6
216	18	September	0.000407	0.000037	0		14.6
217	18.1	October	0.000407	0.000037	0		14.6
218	18.2	November	0.000411	0.0000374	0		14.6
219	18.3	December	0.000413	0.0000376	0		14.6
220	18.3	January	0.000415	0.0000377	0		14.6
221	18.4	February	0.000415	0.0000377	0		14.6
222	18.5	March	0.000415	0.0000377	0		14.6
223	18.6	April	0.000415	0.0000377	0		14.6
224	18.7	May	0.000415	0.0000377	0		14.6
225	18.8	June	0.000415	0.0000377	0		14.6
226	18.8	July	0.000415	0.0000377	0		14.6
227	18.9	August	0.000415	0.0000377	0		14.6

228	19	September	0.000415	0.0000377	0		14.6
229	19.1	October	0.000415	0.0000377	0		14.6
230	19.2	November	0.000425	0.0000386	0		14.6
231	19.3	December	0.000456	0.0000414	0		14.6
232	19.3	January	0.000461	0.0000419	0		14.6
233	19.4	February	0.000464	0.0000422	0		14.6
234	19.5	March	0.000464	0.0000422	0		14.6
235	19.6	April	0.000464	0.0000422	0		14.6
236	19.7	May	0.000464	0.0000422	0		14.6
237	19.8	June	0.000464	0.0000422	0		14.6
238	19.8	July	0.000464	0.0000422	0		14.6
239	19.9	August	0.000464	0.0000422	0		14.6
240	20	September	0.000464	0.0000422	0		14.6


Thermal Cracking: Crack Depth Vs Time
Crack Depth (in)
Pavement Age (month)
0
2
4
6
8
10
12
0
24
48
72
96
120
144
168
192
216
240
264


Thermal Cracking: Depth Ratio Vs Time
Cave/hac
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
0
24
48
72
96
120
144
168
192
216
240
264
Pavement Age (month)


Thermal Cracking: Total Length Vs Time
Total Length (ft/mi)
2000
1800
1600
1400
1200
1000
800
600
400
200
0
0
24
48
72
96
120
144
168
192
216
240
264
Pavement Age (month)
Thermal Crack Length
Crack Length at Reliability
Design Limit

Predicted Rutting: Project mepdg-hma

Pavement age		Month						
mo	yr		AC1	Location (in)	GB2	Location (in)	SG3	Location (in)
1	0.08	October	0.0253	0	0.0141	0	0.0135	0
2	0.17	November	0.0255	0	0.0141	0	0.0136	0
3	0.25	December	0.0256	0	0.0141	0	0.0137	0
4	0.33	January	0.0256	0	0.0141	0	0.0137	0
5	0.42	February	0.0257	0	0.0141	0	0.0137	0
6	0.5	March	0.0266	0	0.0143	0	0.0138	0
7	0.58	April	0.0345	0	0.0171	0	0.0187	0
8	0.67	May	0.0478	0	0.0197	0	0.021	0
9	0.75	June	0.1016	0	0.025	0	0.0247	0
10	0.83	July	0.136	0	0.0266	0	0.0262	0
11	0.92	August	0.1594	0	0.0275	0	0.027	0
12	1	September	0.167	0	0.0278	0	0.0273	0
13	1.08	October	0.1692	0	0.0278	0	0.0273	0
14	1.17	November	0.1692	0	0.0278	0	0.0273	0
15	1.25	December	0.1692	0	0.0278	0	0.0273	0
16	1.33	January	0.1692	0	0.0278	0	0.0273	0
17	1.42	February	0.1692	0	0.0278	0	0.0273	0
18	1.5	March	0.1692	0	0.0278	0	0.0274	0
19	1.58	April	0.1708	0	0.0279	0	0.0276	0
20	1.67	May	0.18	0	0.0287	0	0.0283	0
21	1.75	June	0.1919	0	0.0293	0	0.0289	0
22	1.83	July	0.2193	0	0.0303	0	0.0296	0
23	1.92	August	0.2356	0	0.0307	0	0.03	0
24	2	September	0.2441	0	0.0309	0	0.0303	0
25	2.08	October	0.2447	0	0.0309	0	0.0303	0
26	2.17	November	0.2447	0	0.0309	0	0.0303	0
27	2.25	December	0.2447	0	0.0309	0	0.0303	0
28	2.33	January	0.2447	0	0.0309	0	0.0303	0
29	2.42	February	0.2447	0	0.0309	0	0.0303	0
30	2.5	March	0.2449	0	0.0309	0	0.0303	0
31	2.58	April	0.2455	0	0.0309	0	0.0304	0
32	2.67	May	0.2484	0	0.031	0	0.0307	0
33	2.75	June	0.2575	0	0.0313	0	0.0311	0
34	2.83	July	0.2782	0	0.0319	0	0.0316	0
35	2.92	August	0.288	0	0.0321	0	0.0318	0
36	3	September	0.2908	0	0.0321	0	0.0319	0
37	3.08	October	0.2913	0	0.0321	0	0.0319	0
38	3.17	November	0.2914	0	0.0321	0	0.0319	0
39	3.25	December	0.2914	0	0.0321	0	0.0319	0
40	3.33	January	0.2914	0	0.0321	0	0.0319	0
41	3.42	February	0.2914	0	0.0321	0	0.0319	0
42	3.5	March	0.2916	0	0.0321	0	0.032	0
43	3.58	April	0.2924	0	0.0322	0	0.0321	0
44	3.67	May	0.2956	0	0.0322	0	0.0323	0
45	3.75	June	0.3017	0	0.0323	0	0.0325	0
46	3.83	July	0.3144	0	0.0326	0	0.0328	0
47	3.92	August	0.323	0	0.0328	0	0.033	0
48	4	September	0.3262	0	0.0328	0	0.0331	0
49	4.08	October	0.3266	0	0.0328	0	0.0331	0
50	4.17	November	0.3267	0	0.0328	0	0.0331	0
51	4.25	December	0.3267	0	0.0328	0	0.0331	0
52	4.33	January	0.3267	0	0.0328	0	0.0331	0
53	4.42	February	0.3267	0	0.0328	0	0.0331	0
54	4.5	March	0.3267	0	0.0328	0	0.0331	0
55	4.58	April	0.3272	0	0.0329	0	0.0332	0
56	4.67	May	0.3293	0	0.033	0	0.0335	0
57	4.75	June	0.3384	0	0.0333	0	0.0341	0

58	4.83	July	0.3563	0	0.0338	0	0.0346	0
59	4.92	August	0.3676	0	0.0341	0	0.0349	0
60	5	September	0.3696	0	0.0341	0	0.0349	0
61	5.08	October	0.3701	0	0.0341	0	0.0349	0
62	5.17	November	0.3701	0	0.0341	0	0.0349	0
63	5.25	December	0.3701	0	0.0341	0	0.0349	0
64	5.33	January	0.3701	0	0.0341	0	0.0349	0
65	5.42	February	0.3701	0	0.0341	0	0.0349	0
66	5.5	March	0.3701	0	0.0341	0	0.0349	0
67	5.58	April	0.3705	0	0.0341	0	0.035	0
68	5.67	May	0.3715	0	0.0341	0	0.0351	0
69	5.75	June	0.3799	0	0.0343	0	0.0355	0
70	5.83	July	0.3898	0	0.0346	0	0.0358	0
71	5.92	August	0.3971	0	0.0347	0	0.0359	0
72	6	September	0.3997	0	0.0347	0	0.036	0
73	6.08	October	0.4004	0	0.0347	0	0.036	0
74	6.17	November	0.4004	0	0.0347	0	0.036	0
75	6.25	December	0.4004	0	0.0347	0	0.036	0
76	6.33	January	0.4004	0	0.0347	0	0.036	0
77	6.42	February	0.4004	0	0.0347	0	0.036	0
78	6.5	March	0.4004	0	0.0347	0	0.036	0
79	6.58	April	0.401	0	0.0347	0	0.036	0
80	6.67	May	0.4046	0	0.0348	0	0.0362	0
81	6.75	June	0.4104	0	0.035	0	0.0364	0
82	6.83	July	0.4246	0	0.0353	0	0.0366	0
83	6.92	August	0.4341	0	0.0354	0	0.0367	0
84	7	September	0.4392	0	0.0355	0	0.0368	0
85	7.08	October	0.4395	0	0.0355	0	0.0369	0
86	7.17	November	0.4395	0	0.0355	0	0.0369	0
87	7.25	December	0.4395	0	0.0355	0	0.0369	0
88	7.33	January	0.4395	0	0.0355	0	0.0369	0
89	7.42	February	0.4395	0	0.0355	0	0.0369	0
90	7.5	March	0.4396	0	0.0355	0	0.0369	0
91	7.58	April	0.4399	0	0.0355	0	0.0369	0
92	7.67	May	0.4417	0	0.0355	0	0.037	0
93	7.75	June	0.4475	0	0.0356	0	0.0372	0
94	7.83	July	0.4617	0	0.0359	0	0.0374	0
95	7.92	August	0.4687	0	0.036	0	0.0375	0
96	8	September	0.4707	0	0.036	0	0.0375	0
97	8.08	October	0.471	0	0.036	0	0.0375	0
98	8.17	November	0.471	0	0.036	0	0.0375	0
99	8.25	December	0.471	0	0.036	0	0.0375	0
100	8.33	January	0.471	0	0.036	0	0.0375	0
101	8.42	February	0.471	0	0.036	0	0.0375	0
102	8.5	March	0.4711	0	0.036	0	0.0376	0
103	8.58	April	0.4716	0	0.036	0	0.0376	0
104	8.67	May	0.4736	0	0.036	0	0.0377	0
105	8.75	June	0.4783	0	0.0361	0	0.0378	0
106	8.83	July	0.4869	0	0.0362	0	0.038	0
107	8.92	August	0.4938	0	0.0363	0	0.0381	0
108	9	September	0.496	0	0.0363	0	0.0381	0
109	9.08	October	0.4963	0	0.0363	0	0.0381	0
110	9.17	November	0.4963	0	0.0363	0	0.0381	0
111	9.25	December	0.4963	0	0.0363	0	0.0381	0
112	9.33	January	0.4963	0	0.0363	0	0.0381	0
113	9.42	February	0.4963	0	0.0363	0	0.0381	0
114	9.5	March	0.4963	0	0.0363	0	0.0381	0
115	9.58	April	0.4967	0	0.0363	0	0.0382	0
116	9.67	May	0.4981	0	0.0364	0	0.0384	0
117	9.75	June	0.5048	0	0.0367	0	0.0387	0
118	9.83	July	0.518	0	0.037	0	0.039	0
119	9.92	August	0.5267	0	0.0372	0	0.0392	0

120	10	September	0.5282	0	0.0372	0	0.0392	0
121	10.08	October	0.5285	0	0.0372	0	0.0392	0
122	10.17	November	0.5285	0	0.0372	0	0.0392	0
123	10.25	December	0.5285	0	0.0372	0	0.0392	0
124	10.33	January	0.5285	0	0.0372	0	0.0392	0
125	10.42	February	0.5285	0	0.0372	0	0.0392	0
126	10.5	March	0.5286	0	0.0372	0	0.0392	0
127	10.58	April	0.5288	0	0.0372	0	0.0392	0
128	10.67	May	0.5296	0	0.0372	0	0.0393	0
129	10.75	June	0.537	0	0.0374	0	0.0396	0
130	10.83	July	0.5449	0	0.0375	0	0.0397	0
131	10.92	August	0.5515	0	0.0376	0	0.0398	0
132	11	September	0.5535	0	0.0376	0	0.0399	0
133	11.08	October	0.5541	0	0.0376	0	0.0399	0
134	11.17	November	0.5541	0	0.0376	0	0.0399	0
135	11.25	December	0.5541	0	0.0376	0	0.0399	0
136	11.33	January	0.5541	0	0.0376	0	0.0399	0
137	11.42	February	0.5541	0	0.0376	0	0.0399	0
138	11.5	March	0.5541	0	0.0376	0	0.0399	0
139	11.58	April	0.5545	0	0.0376	0	0.0399	0
140	11.67	May	0.5574	0	0.0377	0	0.04	0
141	11.75	June	0.5621	0	0.0377	0	0.0401	0
142	11.83	July	0.574	0	0.0379	0	0.0403	0
143	11.92	August	0.5819	0	0.038	0	0.0404	0
144	12	September	0.5862	0	0.0381	0	0.0404	0
145	12.08	October	0.5864	0	0.0381	0	0.0404	0
146	12.17	November	0.5864	0	0.0381	0	0.0404	0
147	12.25	December	0.5864	0	0.0381	0	0.0404	0
148	12.33	January	0.5864	0	0.0381	0	0.0404	0
149	12.42	February	0.5864	0	0.0381	0	0.0404	0
150	12.5	March	0.5865	0	0.0381	0	0.0404	0
151	12.58	April	0.5867	0	0.0381	0	0.0405	0
152	12.67	May	0.5883	0	0.0381	0	0.0405	0
153	12.75	June	0.5932	0	0.0382	0	0.0406	0
154	12.83	July	0.6058	0	0.0383	0	0.0408	0
155	12.92	August	0.6118	0	0.0384	0	0.0409	0
156	13	September	0.6136	0	0.0384	0	0.0409	0
157	13.08	October	0.6138	0	0.0384	0	0.0409	0
158	13.17	November	0.6138	0	0.0384	0	0.0409	0
159	13.25	December	0.6138	0	0.0384	0	0.0409	0
160	13.33	January	0.6138	0	0.0384	0	0.0409	0
161	13.42	February	0.6138	0	0.0384	0	0.0409	0
162	13.5	March	0.6139	0	0.0384	0	0.0409	0
163	13.58	April	0.6143	0	0.0384	0	0.041	0
164	13.67	May	0.6161	0	0.0384	0	0.041	0
165	13.75	June	0.6202	0	0.0385	0	0.0411	0
166	13.83	July	0.628	0	0.0386	0	0.0412	0
167	13.92	August	0.6342	0	0.0386	0	0.0413	0
168	14	September	0.6361	0	0.0386	0	0.0413	0
169	14.08	October	0.6363	0	0.0386	0	0.0413	0
170	14.17	November	0.6363	0	0.0386	0	0.0413	0
171	14.25	December	0.6363	0	0.0386	0	0.0413	0
172	14.33	January	0.6363	0	0.0386	0	0.0413	0
173	14.42	February	0.6363	0	0.0386	0	0.0413	0
174	14.5	March	0.6363	0	0.0386	0	0.0413	0
175	14.58	April	0.6366	0	0.0386	0	0.0414	0
176	14.67	May	0.6379	0	0.0387	0	0.0415	0
177	14.75	June	0.644	0	0.0389	0	0.0417	0
178	14.83	July	0.6559	0	0.0391	0	0.042	0
179	14.92	August	0.6639	0	0.0392	0	0.0421	0
180	15	September	0.6654	0	0.0393	0	0.0421	0
181	15.08	October	0.6657	0	0.0393	0	0.0421	0

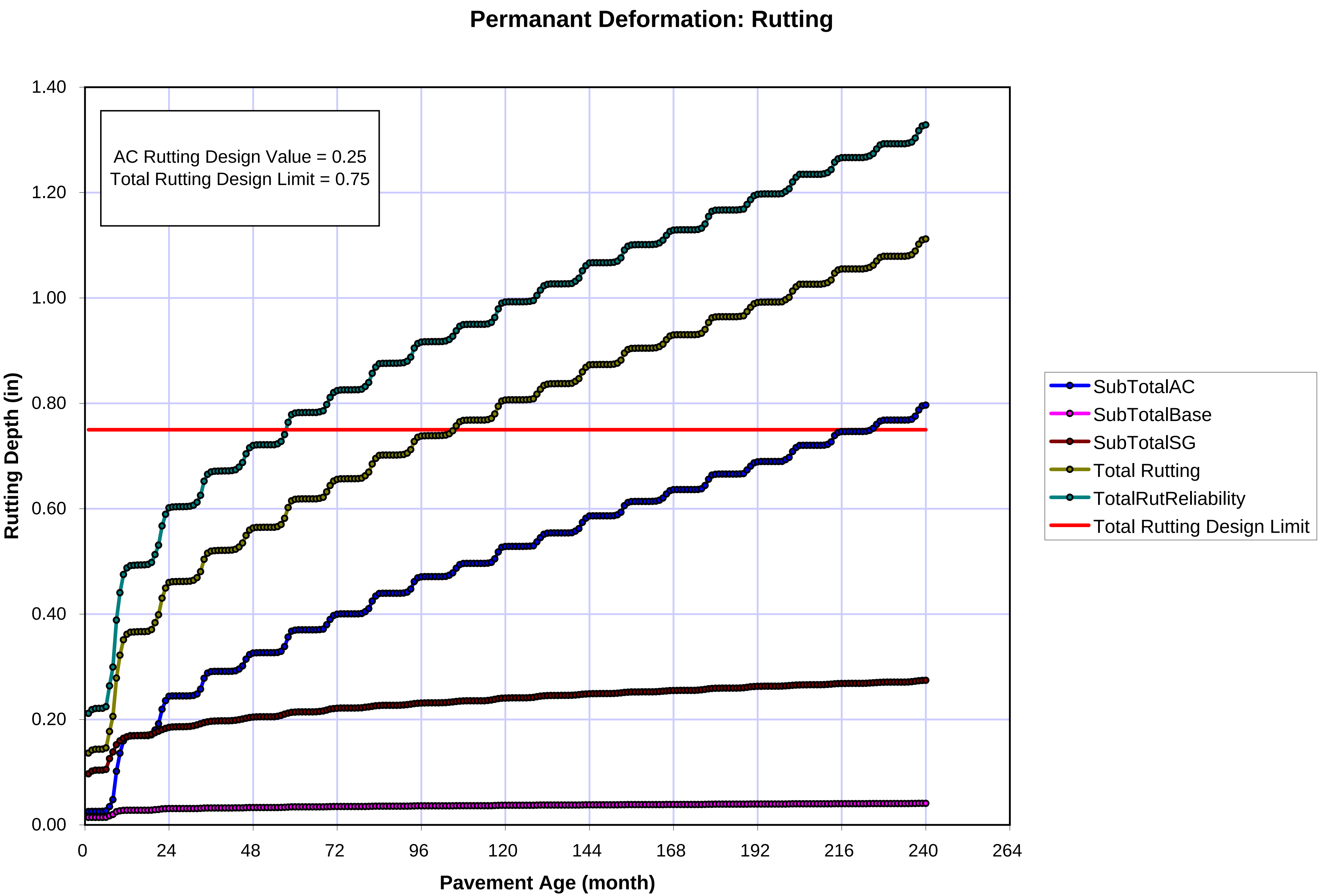
182	15.17	November	0.6657	0	0.0393	0	0.0421	0
183	15.25	December	0.6657	0	0.0393	0	0.0421	0
184	15.33	January	0.6657	0	0.0393	0	0.0421	0
185	15.42	February	0.6657	0	0.0393	0	0.0421	0
186	15.5	March	0.6657	0	0.0393	0	0.0421	0
187	15.58	April	0.666	0	0.0393	0	0.0422	0
188	15.67	May	0.6666	0	0.0393	0	0.0422	0
189	15.75	June	0.6734	0	0.0394	0	0.0424	0
190	15.83	July	0.6808	0	0.0395	0	0.0426	0
191	15.92	August	0.6869	0	0.0396	0	0.0426	0
192	16	September	0.689	0	0.0396	0	0.0427	0
193	16.08	October	0.6895	0	0.0396	0	0.0427	0
194	16.17	November	0.6895	0	0.0396	0	0.0427	0
195	16.25	December	0.6895	0	0.0396	0	0.0427	0
196	16.33	January	0.6895	0	0.0396	0	0.0427	0
197	16.42	February	0.6895	0	0.0396	0	0.0427	0
198	16.5	March	0.6895	0	0.0396	0	0.0427	0
199	16.58	April	0.6899	0	0.0396	0	0.0427	0
200	16.67	May	0.693	0	0.0396	0	0.0428	0
201	16.75	June	0.6974	0	0.0397	0	0.0429	0
202	16.83	July	0.7085	0	0.0399	0	0.043	0
203	16.92	August	0.7161	0	0.0399	0	0.0431	0
204	17	September	0.7201	0	0.04	0	0.0431	0
205	17.08	October	0.7203	0	0.04	0	0.0431	0
206	17.17	November	0.7203	0	0.04	0	0.0431	0
207	17.25	December	0.7203	0	0.04	0	0.0431	0
208	17.33	January	0.7203	0	0.04	0	0.0431	0
209	17.42	February	0.7203	0	0.04	0	0.0431	0
210	17.5	March	0.7204	0	0.04	0	0.0431	0
211	17.58	April	0.7206	0	0.04	0	0.0431	0
212	17.67	May	0.722	0	0.04	0	0.0432	0
213	17.75	June	0.7267	0	0.04	0	0.0433	0
214	17.83	July	0.7388	0	0.0402	0	0.0434	0
215	17.92	August	0.7446	0	0.0402	0	0.0435	0
216	18	September	0.7462	0	0.0402	0	0.0435	0
217	18.08	October	0.7464	0	0.0402	0	0.0435	0
218	18.17	November	0.7465	0	0.0402	0	0.0435	0
219	18.25	December	0.7465	0	0.0402	0	0.0435	0
220	18.33	January	0.7465	0	0.0402	0	0.0435	0
221	18.42	February	0.7465	0	0.0402	0	0.0435	0
222	18.5	March	0.7466	0	0.0402	0	0.0435	0
223	18.58	April	0.747	0	0.0402	0	0.0435	0
224	18.67	May	0.7486	0	0.0403	0	0.0436	0
225	18.75	June	0.7526	0	0.0403	0	0.0437	0
226	18.83	July	0.7601	0	0.0403	0	0.0437	0
227	18.92	August	0.7661	0	0.0404	0	0.0438	0
228	19	September	0.7679	0	0.0404	0	0.0438	0
229	19.08	October	0.7682	0	0.0404	0	0.0438	0
230	19.17	November	0.7682	0	0.0404	0	0.0438	0
231	19.25	December	0.7682	0	0.0404	0	0.0438	0
232	19.33	January	0.7682	0	0.0404	0	0.0438	0
233	19.42	February	0.7682	0	0.0404	0	0.0438	0
234	19.5	March	0.7682	0	0.0404	0	0.0438	0
235	19.58	April	0.7685	0	0.0404	0	0.0439	0
236	19.67	May	0.7697	0	0.0405	0	0.044	0
237	19.75	June	0.7756	0	0.0406	0	0.0442	0
238	19.83	July	0.7873	0	0.0408	0	0.0444	0
239	19.92	August	0.7951	0	0.0409	0	0.0445	0
240	20	September	0.7966	0	0.0409	0	0.0445	0

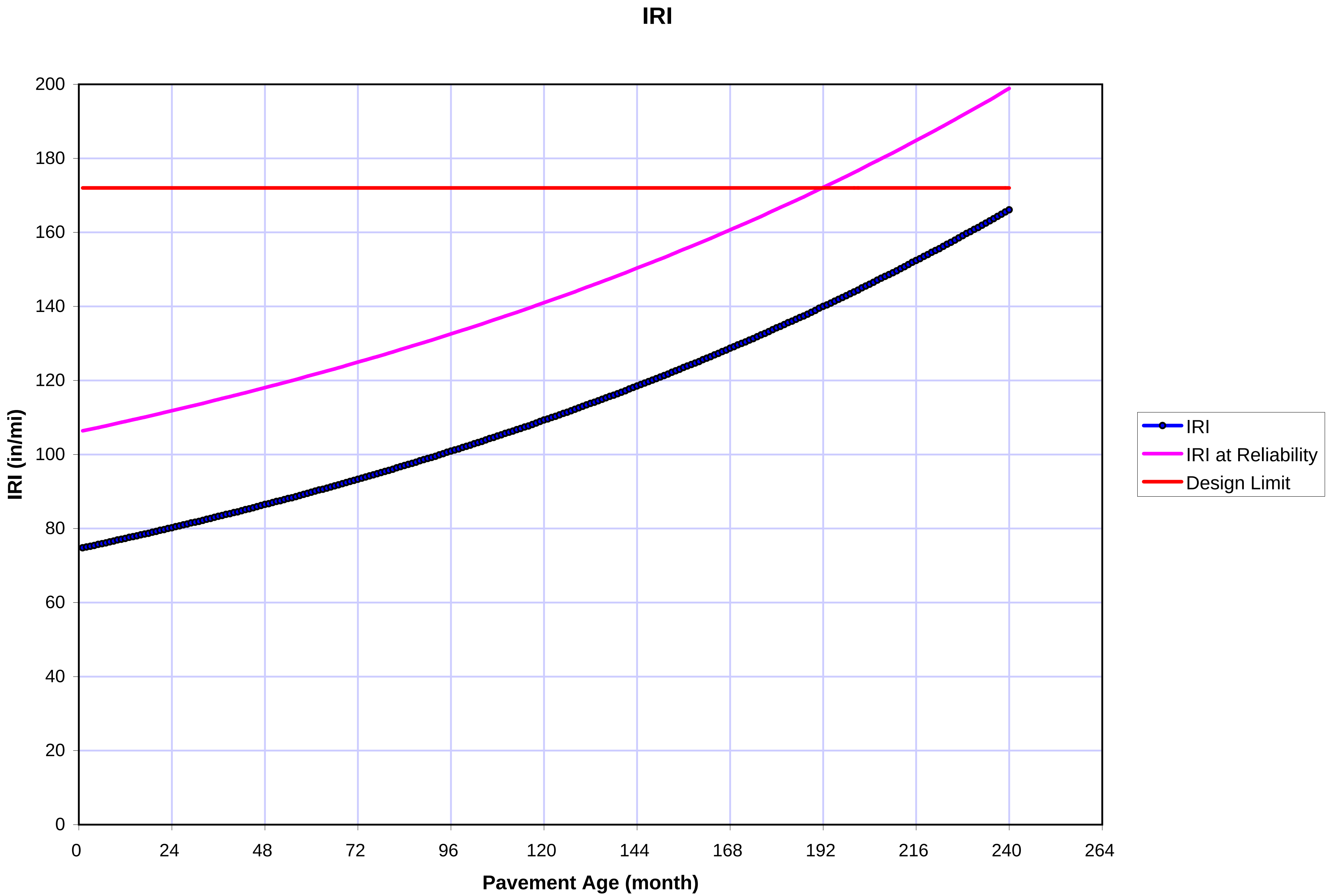
Maximum Rutting (inch)							
SG4	Location (in)	SubTotalAC	SubTotalBase	SubTotalSG	Total	Location (in)	TotalRutReliability
0.0833	0	0.0253	0.0141	0.0968	0.1362	0	0.2116
0.0884	0	0.0255	0.0141	0.102	0.1417	0	0.2186
0.0901	0	0.0256	0.0141	0.1037	0.1434	0	0.2208
0.0901	0	0.0256	0.0141	0.1038	0.1436	0	0.2211
0.0902	0	0.0257	0.0141	0.1039	0.1437	0	0.2212
0.0913	0	0.0266	0.0143	0.1052	0.146	0	0.2242
0.1069	0	0.0345	0.0171	0.1256	0.1772	0	0.2637
0.1174	0	0.0478	0.0197	0.1384	0.2058	0	0.2995
0.1274	0	0.1016	0.025	0.1521	0.2786	0	0.3886
0.1331	0	0.136	0.0266	0.1593	0.322	0	0.4405
0.1373	0	0.1594	0.0275	0.1643	0.3512	0	0.4751
0.1398	0	0.167	0.0278	0.1671	0.3618	0	0.4876
0.1413	0	0.1692	0.0278	0.1687	0.3656	0	0.492
0.1417	0	0.1692	0.0278	0.169	0.366	0	0.4925
0.1421	0	0.1692	0.0278	0.1694	0.3664	0	0.493
0.1423	0	0.1692	0.0278	0.1697	0.3666	0	0.4932
0.1425	0	0.1692	0.0278	0.1699	0.3668	0	0.4935
0.143	0	0.1692	0.0278	0.1704	0.3674	0	0.4942
0.1443	0	0.1708	0.0279	0.1719	0.3706	0	0.4979
0.1466	0	0.18	0.0287	0.1749	0.3836	0	0.5131
0.1487	0	0.1919	0.0293	0.1776	0.3988	0	0.5308
0.1511	0	0.2193	0.0303	0.1807	0.4303	0	0.5674
0.1531	0	0.2356	0.0307	0.1831	0.4494	0	0.5895
0.1547	0	0.2441	0.0309	0.185	0.46	0	0.6017
0.1555	0	0.2447	0.0309	0.1858	0.4614	0	0.6033
0.1558	0	0.2447	0.0309	0.1861	0.4617	0	0.6037
0.156	0	0.2447	0.0309	0.1863	0.4619	0	0.6039
0.156	0	0.2447	0.0309	0.1863	0.4619	0	0.6039
0.1561	0	0.2447	0.0309	0.1864	0.462	0	0.604
0.1565	0	0.2449	0.0309	0.1868	0.4626	0	0.6047
0.1576	0	0.2455	0.0309	0.188	0.4643	0	0.6067
0.159	0	0.2484	0.031	0.1897	0.4692	0	0.6123
0.1607	0	0.2575	0.0313	0.1918	0.4805	0	0.6253
0.1623	0	0.2782	0.0319	0.1939	0.504	0	0.6522
0.1637	0	0.288	0.0321	0.1955	0.5155	0	0.6654
0.1646	0	0.2908	0.0321	0.1965	0.5194	0	0.6698
0.1651	0	0.2913	0.0321	0.197	0.5204	0	0.671
0.1653	0	0.2914	0.0321	0.1972	0.5208	0	0.6714
0.1655	0	0.2914	0.0321	0.1974	0.5209	0	0.6716
0.1655	0	0.2914	0.0321	0.1974	0.521	0	0.6717
0.1656	0	0.2914	0.0321	0.1975	0.5211	0	0.6718
0.1659	0	0.2916	0.0321	0.1979	0.5216	0	0.6724
0.1664	0	0.2924	0.0322	0.1984	0.523	0	0.674
0.1673	0	0.2956	0.0322	0.1996	0.5274	0	0.679
0.1684	0	0.3017	0.0323	0.2009	0.535	0	0.6877
0.1696	0	0.3144	0.0326	0.2024	0.5494	0	0.7041
0.1707	0	0.323	0.0328	0.2037	0.5595	0	0.7155
0.1715	0	0.3262	0.0328	0.2046	0.5635	0	0.7201
0.1719	0	0.3266	0.0328	0.205	0.5645	0	0.7212
0.172	0	0.3267	0.0328	0.2051	0.5646	0	0.7213
0.1721	0	0.3267	0.0328	0.2052	0.5647	0	0.7214
0.1721	0	0.3267	0.0328	0.2052	0.5647	0	0.7214
0.1721	0	0.3267	0.0328	0.2052	0.5647	0	0.7214
0.1721	0	0.3267	0.0328	0.2052	0.5647	0	0.7214
0.1728	0	0.3272	0.0329	0.206	0.5661	0	0.723
0.1742	0	0.3293	0.033	0.2077	0.57	0	0.7275
0.1759	0	0.3384	0.0333	0.21	0.5817	0	0.7407

0.1774	0	0.3563	0.0338	0.212	0.6022	0	0.7639
0.1786	0	0.3676	0.0341	0.2135	0.6151	0	0.7785
0.1791	0	0.3696	0.0341	0.214	0.6178	0	0.7815
0.1794	0	0.3701	0.0341	0.2143	0.6185	0	0.7823
0.1795	0	0.3701	0.0341	0.2144	0.6186	0	0.7824
0.1796	0	0.3701	0.0341	0.2145	0.6187	0	0.7825
0.1796	0	0.3701	0.0341	0.2145	0.6187	0	0.7825
0.1796	0	0.3701	0.0341	0.2145	0.6187	0	0.7825
0.1797	0	0.3701	0.0341	0.2146	0.6187	0	0.7826
0.1802	0	0.3705	0.0341	0.2152	0.6198	0	0.7838
0.181	0	0.3715	0.0341	0.2161	0.6217	0	0.7859
0.1824	0	0.3799	0.0343	0.2179	0.6321	0	0.7977
0.1839	0	0.3898	0.0346	0.2197	0.644	0	0.8111
0.1847	0	0.3971	0.0347	0.2206	0.6524	0	0.8205
0.1852	0	0.3997	0.0347	0.2212	0.6556	0	0.8241
0.1856	0	0.4004	0.0347	0.2216	0.6567	0	0.8254
0.1856	0	0.4004	0.0347	0.2216	0.6568	0	0.8255
0.1857	0	0.4004	0.0347	0.2217	0.6569	0	0.8256
0.1858	0	0.4004	0.0347	0.2218	0.6569	0	0.8256
0.1858	0	0.4004	0.0347	0.2218	0.657	0	0.8257
0.1859	0	0.4004	0.0347	0.2219	0.6571	0	0.8258
0.1862	0	0.401	0.0347	0.2222	0.658	0	0.8268
0.1869	0	0.4046	0.0348	0.2231	0.6625	0	0.8319
0.1875	0	0.4104	0.035	0.2239	0.6693	0	0.8395
0.1884	0	0.4246	0.0353	0.225	0.6849	0	0.857
0.1891	0	0.4341	0.0354	0.2259	0.6954	0	0.8687
0.1897	0	0.4392	0.0355	0.2265	0.7012	0	0.8752
0.1899	0	0.4395	0.0355	0.2268	0.7018	0	0.8759
0.19	0	0.4395	0.0355	0.2269	0.7018	0	0.8759
0.1901	0	0.4395	0.0355	0.2269	0.7019	0	0.876
0.1901	0	0.4395	0.0355	0.2269	0.7019	0	0.876
0.1901	0	0.4395	0.0355	0.2269	0.7019	0	0.876
0.1903	0	0.4396	0.0355	0.2271	0.7022	0	0.8764
0.1906	0	0.4399	0.0355	0.2275	0.7029	0	0.8771
0.1912	0	0.4417	0.0355	0.2282	0.7054	0	0.8799
0.1919	0	0.4475	0.0356	0.2291	0.7122	0	0.8876
0.1927	0	0.4617	0.0359	0.2301	0.7277	0	0.9048
0.1933	0	0.4687	0.036	0.2308	0.7355	0	0.9135
0.1937	0	0.4707	0.036	0.2312	0.7379	0	0.9162
0.1939	0	0.471	0.036	0.2314	0.7384	0	0.9168
0.194	0	0.471	0.036	0.2315	0.7385	0	0.9169
0.1941	0	0.471	0.036	0.2316	0.7386	0	0.917
0.1941	0	0.471	0.036	0.2316	0.7386	0	0.917
0.1941	0	0.471	0.036	0.2316	0.7387	0	0.9171
0.1943	0	0.4711	0.036	0.2319	0.7389	0	0.9174
0.1945	0	0.4716	0.036	0.2321	0.7397	0	0.9183
0.1949	0	0.4736	0.036	0.2326	0.7423	0	0.9211
0.1955	0	0.4783	0.0361	0.2333	0.7477	0	0.9272
0.1961	0	0.4869	0.0362	0.2341	0.7572	0	0.9378
0.1967	0	0.4938	0.0363	0.2348	0.7649	0	0.9463
0.1971	0	0.496	0.0363	0.2352	0.7675	0	0.9492
0.1973	0	0.4963	0.0363	0.2354	0.768	0	0.9498
0.1974	0	0.4963	0.0363	0.2355	0.7681	0	0.9499
0.1974	0	0.4963	0.0363	0.2355	0.7681	0	0.9499
0.1974	0	0.4963	0.0363	0.2355	0.7681	0	0.9499
0.1974	0	0.4963	0.0363	0.2355	0.7681	0	0.9499
0.1974	0	0.4963	0.0363	0.2355	0.7681	0	0.9499
0.1978	0	0.4967	0.0363	0.236	0.769	0	0.9509
0.1986	0	0.4981	0.0364	0.2369	0.7714	0	0.9536
0.1996	0	0.5048	0.0367	0.2383	0.7797	0	0.9628
0.2005	0	0.518	0.037	0.2395	0.7945	0	0.9792
0.2012	0	0.5267	0.0372	0.2404	0.8043	0	0.9901

0.2015	0	0.5282	0.0372	0.2407	0.8062	0	0.9922
0.2017	0	0.5285	0.0372	0.2409	0.8066	0	0.9927
0.2018	0	0.5285	0.0372	0.241	0.8067	0	0.9928
0.2018	0	0.5285	0.0372	0.241	0.8067	0	0.9928
0.2018	0	0.5285	0.0372	0.241	0.8067	0	0.9928
0.2018	0	0.5285	0.0372	0.241	0.8067	0	0.9928
0.2018	0	0.5286	0.0372	0.241	0.8068	0	0.9929
0.2022	0	0.5288	0.0372	0.2414	0.8074	0	0.9936
0.2026	0	0.5296	0.0372	0.2419	0.8087	0	0.995
0.2036	0	0.537	0.0374	0.2432	0.8175	0	1.0048
0.2045	0	0.5449	0.0375	0.2442	0.8266	0	1.0149
0.2051	0	0.5515	0.0376	0.2449	0.8339	0	1.023
0.2054	0	0.5535	0.0376	0.2453	0.8364	0	1.0257
0.2056	0	0.5541	0.0376	0.2455	0.8372	0	1.0266
0.2057	0	0.5541	0.0376	0.2456	0.8372	0	1.0266
0.2057	0	0.5541	0.0376	0.2456	0.8373	0	1.0267
0.2058	0	0.5541	0.0376	0.2457	0.8373	0	1.0267
0.2058	0	0.5541	0.0376	0.2457	0.8374	0	1.0268
0.2059	0	0.5541	0.0376	0.2458	0.8374	0	1.0269
0.2061	0	0.5545	0.0376	0.246	0.8381	0	1.0276
0.2065	0	0.5574	0.0377	0.2465	0.8416	0	1.0315
0.2069	0	0.5621	0.0377	0.247	0.8469	0	1.0374
0.2075	0	0.574	0.0379	0.2478	0.8597	0	1.0515
0.208	0	0.5819	0.038	0.2484	0.8683	0	1.061
0.2084	0	0.5862	0.0381	0.2488	0.8731	0	1.0663
0.2086	0	0.5864	0.0381	0.249	0.8735	0	1.0668
0.2086	0	0.5864	0.0381	0.249	0.8735	0	1.0668
0.2087	0	0.5864	0.0381	0.2491	0.8736	0	1.0669
0.2087	0	0.5864	0.0381	0.2491	0.8736	0	1.0669
0.2087	0	0.5864	0.0381	0.2491	0.8736	0	1.0669
0.2088	0	0.5865	0.0381	0.2492	0.8737	0	1.067
0.209	0	0.5867	0.0381	0.2495	0.8743	0	1.0677
0.2094	0	0.5883	0.0381	0.2499	0.8763	0	1.0699
0.2099	0	0.5932	0.0382	0.2505	0.8819	0	1.076
0.2105	0	0.6058	0.0383	0.2513	0.8954	0	1.0909
0.2109	0	0.6118	0.0384	0.2518	0.902	0	1.0982
0.2112	0	0.6136	0.0384	0.2521	0.9041	0	1.1005
0.2113	0	0.6138	0.0384	0.2522	0.9044	0	1.1009
0.2114	0	0.6138	0.0384	0.2523	0.9046	0	1.1011
0.2115	0	0.6138	0.0384	0.2524	0.9046	0	1.1011
0.2115	0	0.6138	0.0384	0.2524	0.9046	0	1.1011
0.2115	0	0.6138	0.0384	0.2524	0.9046	0	1.1011
0.2116	0	0.6139	0.0384	0.2525	0.9048	0	1.1013
0.2118	0	0.6143	0.0384	0.2527	0.9055	0	1.1021
0.2121	0	0.6161	0.0384	0.2531	0.9076	0	1.1044
0.2125	0	0.6202	0.0385	0.2536	0.9122	0	1.1095
0.2129	0	0.628	0.0386	0.2541	0.9207	0	1.1188
0.2134	0	0.6342	0.0386	0.2547	0.9275	0	1.1263
0.2137	0	0.6361	0.0386	0.255	0.9297	0	1.1287
0.2138	0	0.6363	0.0386	0.2551	0.9301	0	1.1292
0.2139	0	0.6363	0.0386	0.2552	0.9302	0	1.1293
0.2139	0	0.6363	0.0386	0.2552	0.9302	0	1.1293
0.2139	0	0.6363	0.0386	0.2552	0.9302	0	1.1293
0.2139	0	0.6363	0.0386	0.2552	0.9302	0	1.1293
0.2139	0	0.6363	0.0386	0.2552	0.9302	0	1.1293
0.2142	0	0.6366	0.0386	0.2556	0.9308	0	1.13
0.2148	0	0.6379	0.0387	0.2563	0.9329	0	1.1323
0.2155	0	0.644	0.0389	0.2572	0.9401	0	1.1402
0.2163	0	0.6559	0.0391	0.2583	0.9533	0	1.1547
0.2168	0	0.6639	0.0392	0.2589	0.9621	0	1.1644
0.2171	0	0.6654	0.0393	0.2592	0.9639	0	1.1664
0.2172	0	0.6657	0.0393	0.2593	0.9643	0	1.1668

0.2173	0	0.6657	0.0393	0.2594	0.9644	0	1.1669
0.2173	0	0.6657	0.0393	0.2594	0.9644	0	1.1669
0.2173	0	0.6657	0.0393	0.2594	0.9644	0	1.1669
0.2173	0	0.6657	0.0393	0.2594	0.9644	0	1.1669
0.2173	0	0.6657	0.0393	0.2594	0.9644	0	1.1669
0.2176	0	0.666	0.0393	0.2598	0.9649	0	1.1675
0.2179	0	0.6666	0.0393	0.2601	0.966	0	1.1687
0.2187	0	0.6734	0.0394	0.2611	0.9739	0	1.1774
0.2194	0	0.6808	0.0395	0.262	0.9822	0	1.1865
0.2199	0	0.6869	0.0396	0.2625	0.9889	0	1.1939
0.2202	0	0.689	0.0396	0.2629	0.9914	0	1.1966
0.2203	0	0.6895	0.0396	0.263	0.9921	0	1.1973
0.2204	0	0.6895	0.0396	0.2631	0.9921	0	1.1974
0.2204	0	0.6895	0.0396	0.2631	0.9922	0	1.1975
0.2204	0	0.6895	0.0396	0.2631	0.9922	0	1.1975
0.2204	0	0.6895	0.0396	0.2631	0.9922	0	1.1975
0.2205	0	0.6895	0.0396	0.2632	0.9922	0	1.1975
0.2206	0	0.6899	0.0396	0.2633	0.9928	0	1.1981
0.221	0	0.693	0.0396	0.2638	0.9965	0	1.2022
0.2213	0	0.6974	0.0397	0.2642	1.001	0	1.2071
0.2218	0	0.7085	0.0399	0.2648	1.013	0	1.2203
0.2222	0	0.7161	0.0399	0.2653	1.021	0	1.2291
0.2225	0	0.7201	0.04	0.2656	1.026	0	1.2345
0.2227	0	0.7203	0.04	0.2658	1.026	0	1.2345
0.2227	0	0.7203	0.04	0.2658	1.026	0	1.2345
0.2228	0	0.7203	0.04	0.2659	1.026	0	1.2345
0.2228	0	0.7203	0.04	0.2659	1.026	0	1.2345
0.2228	0	0.7203	0.04	0.2659	1.026	0	1.2345
0.2228	0	0.7204	0.04	0.2659	1.026	0	1.2345
0.223	0	0.7206	0.04	0.2661	1.027	0	1.2356
0.2234	0	0.722	0.04	0.2666	1.029	0	1.2378
0.2238	0	0.7267	0.04	0.2671	1.034	0	1.2433
0.2242	0	0.7388	0.0402	0.2676	1.047	0	1.2575
0.2246	0	0.7446	0.0402	0.2681	1.053	0	1.2641
0.2248	0	0.7462	0.0402	0.2683	1.055	0	1.2662
0.2249	0	0.7464	0.0402	0.2684	1.055	0	1.2663
0.225	0	0.7465	0.0402	0.2685	1.055	0	1.2663
0.225	0	0.7465	0.0402	0.2685	1.055	0	1.2663
0.225	0	0.7465	0.0402	0.2685	1.055	0	1.2663
0.2251	0	0.7465	0.0402	0.2686	1.055	0	1.2663
0.2251	0	0.7466	0.0402	0.2686	1.055	0	1.2663
0.2253	0	0.747	0.0402	0.2688	1.056	0	1.2674
0.2255	0	0.7486	0.0403	0.2691	1.058	0	1.2696
0.2259	0	0.7526	0.0403	0.2696	1.062	0	1.274
0.2263	0	0.7601	0.0403	0.2701	1.07	0	1.2827
0.2266	0	0.7661	0.0404	0.2704	1.077	0	1.2903
0.2269	0	0.7679	0.0404	0.2707	1.079	0	1.2925
0.227	0	0.7682	0.0404	0.2708	1.079	0	1.2925
0.227	0	0.7682	0.0404	0.2708	1.079	0	1.2925
0.227	0	0.7682	0.0404	0.2708	1.079	0	1.2925
0.227	0	0.7682	0.0404	0.2708	1.079	0	1.2925
0.227	0	0.7682	0.0404	0.2708	1.079	0	1.2925
0.227	0	0.7682	0.0404	0.2708	1.079	0	1.2925
0.2273	0	0.7685	0.0404	0.2712	1.08	0	1.2936
0.2278	0	0.7697	0.0405	0.2718	1.082	0	1.2958
0.2285	0	0.7756	0.0406	0.2727	1.089	0	1.3034
0.2291	0	0.7873	0.0408	0.2735	1.102	0	1.3176
0.2296	0	0.7951	0.0409	0.2741	1.11	0	1.3264
0.2298	0	0.7966	0.0409	0.2743	1.112	0	1.3285


Permanant Deformation: Rutting
AC Rutting Design Value = 0.25
Total Rutting Design Limit = 0.75
Rutting Depth (in)
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
0
24
48
72
96
120
144
168
192
216
240
264
Pavement Age (month)
SubTotalAC
SubTotalBase
SubTotalSG
Total Rutting
TotalRutReliability
Total Rutting Design Limit


IRI
IRI (in/mi)
0
20
40
60
80
100
120
140
160
180
200
0
24
48
72
96
120
144
168
192
216
240
264
Pavement Age (month)
IRI
IRI at Reliability
Design Limit

APPENDIX B: PORTLAND CEMENT CONCRETE DATA

Project: mepdg-pcc

General Information

Design Life	20 years
Pavement construction:	September, 2003
Traffic open:	October, 2003
Type of design	JPCP

Description:

Analysis Parameters

Analysis type	Probabilistic

Performance Criteria

	Limit	Reliability
Initial IRI (in/mi)	63	
Terminal IRI (in/mi)	172	90
Transverse Cracking (% slabs cracked)	15	90
Mean Joint Faulting (in)	0.12	90

Location:	SAMPLE FOR DOT REPORT
Project ID:	Project ID here
Section ID:	Section ID here
Date:	2/18/2005
Station/milepost format:	Miles: 0.000
Station/milepost begin:	25
Station/milepost end:	26
Traffic direction:	East bound

Default Input Level

Default input level	Level 3, Default and historical agency values.

Traffic

Initial two-way aadtt:	8000
Number of lanes in design direction:	2
Percent of trucks in design direction (%):	50
Percent of trucks in design lane (%):	95
Operational speed (mph):	60

Traffic -- Volume Adjustment Factors

Monthly Adjustment Factors (Level 3, Default MAF)

	Vehicle Class									
Month	Class 4	Class 5	Class 6	Class 7	Class 8	Class 9	Class 10	Class 11	Class 12	Class 13
January	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
February	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
March	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
April	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
May	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
June	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
July	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
August	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
September	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
October	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
November	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
December	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Vehicle Class Distribution
(Level 3, Default Distribution)

AADTT distribution by vehicle class

Class 4	1.8%
Class 5	24.6%
Class 6	7.6%
Class 7	0.5%
Class 8	5.0%
Class 9	31.3%
Class 10	9.8%
Class 11	0.8%
Class 12	3.3%
Class 13	15.3%

Hourly truck traffic distribution
by period beginning:

Midnight	2.3%	Noon	5.9%
1:00 am	2.3%	1:00 pm	5.9%
2:00 am	2.3%	2:00 pm	5.9%
3:00 am	2.3%	3:00 pm	5.9%
4:00 am	2.3%	4:00 pm	4.6%
5:00 am	2.3%	5:00 pm	4.6%
6:00 am	5.0%	6:00 pm	4.6%
7:00 am	5.0%	7:00 pm	4.6%
8:00 am	5.0%	8:00 pm	3.1%
9:00 am	5.0%	9:00 pm	3.1%
10:00 am	5.9%	10:00 pm	3.1%
11:00 am	5.9%	11:00 pm	3.1%

Traffic Growth Factor

Vehicle Class	Growth Rate	Growth Function
Class 4	4.0%	Compound
Class 5	4.0%	Compound
Class 6	4.0%	Compound
Class 7	4.0%	Compound
Class 8	4.0%	Compound
Class 9	4.0%	Compound
Class 10	4.0%	Compound
Class 11	4.0%	Compound
Class 12	4.0%	Compound
Class 13	4.0%	Compound

Traffic -- Axle Load Distribution Factors
Level 3: Default

Traffic -- General Traffic Inputs

Mean wheel location (inches from the lane marking):	18
Traffic wander standard deviation (in):	10
Design lane width (ft):	12

Number of Axles per Truck

Vehicle Class	Single Axle	Tandem Axle	Tridem Axle	Quad Axle
Class 4	1.62	0.39	0.00	0.00
Class 5	2.00	0.00	0.00	0.00
Class 6	1.02	0.99	0.00	0.00
Class 7	1.00	0.26	0.83	0.00
Class 8	2.38	0.67	0.00	0.00
Class 9	1.13	1.93	0.00	0.00
Class 10	1.19	1.09	0.89	0.00
Class 11	4.29	0.26	0.06	0.00
Class 12	3.52	1.14	0.06	0.00
Class 13	2.15	2.13	0.35	0.00

Axle Configuration

Average axle width (edge-to-edge) outside dimensions,ft): 8.5
Dual tire spacing (in): 12

Axle Configuration
Single Tire (psi): 120
Dual Tire (psi): 120

Average Axle Spacing
Tandem axle(psi): 51.6
Tridem axle(psi): 49.2
Quad axle(psi): 49.2

Wheelbase Truck Tractor

	Short	Medium	Long
Average Axle Spacing (ft)	12	15	18
Percent of trucks	33%	33%	34%

Climate

icm file: estherville
Latitude (degrees.minutes) 43.25
Longitude (degrees.minutes) -94.45
Elevation (ft) 1316
Depth of water table (ft) 12

Structure--Design Features

Permanent curl/warp effective temperature difference (°F): -10

Joint Design

Joint spacing (ft): 15
Sealant type: Liquid
Dowel diameter (in): 1
Dowel bar spacing (in): 12

Edge Support

None
Long-term LTE(%): n/a
Widened Slab (ft): n/a

Base Properties

Base type: Granular
Erodibility index: Erosion Resistant (3)
Base/slab friction coefficient: 0.85
PCC-Base Interface Bonded
Loss of bond age (months): 60

Structure--ICM Properties

Surface shortwave absorptivity: 0.85

Drainage Parameters
Infiltration: Neglible (0%)
Drainage path length (ft): 12
Pavement cross slope (%): 2

Structure--Layers

Layer 1 -- JPCP

General Properties

PCC material	JPCP
Layer thickness (in):	11
Unit weight (pcf):	150
Poisson's ratio	0.2

Thermal Properties

Coefficient of thermal expansion (per F° x 10- 6):	5.5
Thermal conductivity (BTU/hr-ft-F°) :	1.25
Heat capacity (BTU/lb-F°):	0.28

Mix Properties

Cement type:	Type I
Cementitious material content (lb/yd^3):	600
Water/cement ratio:	0.42
Aggregate type:	Limestone
PCC zero-stress temperature (F°)	Derived
Ultimate shrinkage at 40% R.H (microstrain)	Derived
Reversible shrinkage (% of ultimate shrinkage):	50
Time to develop 50% of ultimate shrinkage (days):	35
Curing method:	Curing compound

Strength Properties

Input level:	Level 3
28-day PCC modulus of rupture (psi):	690
28-day PCC compressive strength (psi):	n/a

Layer 2 -- A-2-6

Unbound Material:	A-2-6
Thickness(in):	6

Strength Properties

Input Level:	Level 3
Analysis Type:	ICM inputs (ICM Calculated Modulus)
Poisson's ratio:	0.35
Coefficient of lateral pressure,Ko:	0.5
Modulus (input) (psi):	26000

ICM Inputs

<u>Gradation and Plasticity Index</u>

Plasticity Index, PI:	15
Passing #200 sieve (%):	20
Passing #4 sieve (%):	95
D60 (mm):	0.1

<u>Calculated/Derived Parameters</u>

Maximum dry unit weight (pcf):	117.5 (derived)
Specific gravity of solids, Gs:	2.71 (derived)
Saturated hydraulic conductivity (ft/hr):	3.25e-005 (derived)
Optimum gravimetric water content (%):	13.9 (derived)
Calculated degree of saturation (%):	85.9 (calculated)

Soil water characteristic curve parameters: Default values

Parameters	Value
a	23.1
b	1.35
c	0.586
Hr.	794

Layer 3 -- A-7-5

Unbound Material: A-7-5
Thickness(in): 9

Strength Properties

Input Level: Level 3
Analysis Type: ICM inputs (ICM Calculated Modulus)
Poisson's ratio: 0.35
Coefficient of lateral pressure,Ko: 0.5
Modulus (input) (psi): 12000

ICM Inputs

Gradation and Plasticity Index

Plasticity Index, PI: 30
Passing #200 sieve (%): 85
Passing #4 sieve (%): 99
D60 (mm): 0.01

Calculated/Derived Parameters

Maximum dry unit weight (pcf): 97.1 (user input)
Specific gravity of solids, Gs: 2.75 (user input)
Saturated hydraulic conductivity (ft/hr): 2.53e-007 (user input)
Optimum gravimetric water content (%): 24.8 (user input)
Calculated degree of saturation (%): 88.9 (calculated)

Soil water characteristic curve parameters: Default values

Parameters	Value
a	301
b	0.995
c	0.732
Hr.	15700

Layer 4 -- CL

Unbound Material: CL
Thickness(in): Semi-infinite

Strength Properties

Input Level: Level 3
Analysis Type: ICM inputs (ICM Calculated Modulus)
Poisson's ratio: 0.35
Coefficient of lateral pressure,Ko: 0.5
Modulus (input) (psi): 16000

ICM Inputs

Gradation and Plasticity Index

Plasticity Index, PI: 15
Passing #200 sieve (%): 75
Passing #4 sieve (%): 95
D60 (mm): 0.1

Calculated/Derived Parameters

Maximum dry unit weight (pcf):	97.1 (user input)
Specific gravity of solids, Gs:	2.73 (user input)
Saturated hydraulic conductivity (ft/hr):	3.25e-005 (user input)
Optimum gravimetric water content (%):	18.6 (user input)
Calculated degree of saturation (%):	87.6 (calculated)

Soil water characteristic curve parameters: Default values

Parameters	Value
a	68.1
b	1.15
c	0.658
Hr.	2720

Distress Model Calibration Settings - Rigid (new)

Faulting

Faulting Coefficients

C1	1.29
C2	1.1
C3	0.001725
C4	0.0008
C5	250
C6	0.4
C7	1.2
C8	400

Reliability (FAULT)

Std. Dev. POWER((0.03261*FAULT+ 0.00009799),0.5)

Cracking

Fatigue Coefficients

C1	2
C2	1.22

Cracking Coefficients

C4	1
C5	-1.68

Reliability (CRACK)

Std. Dev. -0.00172*POWER(CRACK,2) + 0.3447*CRACK + 4.6772

IRI(jpcp)

C1	0.8203
C2	0.4417
C3	20.37
C4	1.4929
C5	25.24
Standard deviation in initial IRI (in/mile):	5.4

Project: mepdg-pcc
Reliability Summary

Performance Criteria	Distress Target	Reliablity Target	Distress Predicted	Reliability Predicted	Acceptable
Terminal IRI (in/mi)	172	90	208.6	23.93	Fail
Transverse Cracking (% slabs cracked)	15	90	2.8	98.49	Pass
Mean Joint Faulting (in)	0.12	90	0.207	14.66	Fail

Predicted distress: Project mepdg-pcc

Pavement age mo	Pavement age yr	Month	Epcc Mpsi	Ebase ksi	Dyn. k psi/in	Faulting in	Percent slabs cracked	IRI in/mile	Heavy Trucks (cumulative)	IRI at specified reliability
1	0.08	October	4.5	31.88	208	0	0	63	115663	99.3
2	0.17	November	4.62	33.41	208	0.001	0	63.4	231325	99.8
3	0.25	December	4.69	197.2	229	0.001	0	63.9	346988	100.5
4	0.33	January	4.75	830.3	320	0.002	0	64.2	462650	100.8
5	0.42	February	4.78	739.3	378	0.002	0	64.5	578313	101.1
6	0.5	March	4.82	312.6	336	0.004	0	64.8	693975	101.5
7	0.58	April	4.84	21.2	186	0.004	0	65.8	809638	102.8
8	0.67	May	4.87	24.95	192	0.005	0	66.4	925300	103.6
9	0.75	June	4.89	28.61	198	0.006	0	67.1	1040960	104.4
10	0.83	July	4.9	31.29	204	0.007	0	67.6	1156630	105.2
11	0.92	August	4.92	32	207	0.008	0	68.1	1272290	105.7
12	1	September	4.93	31.8	208	0.009	0	68.6	1387950	106.5
13	1.08	October	4.95	31.88	208	0.012	0	69.7	1508240	107.9
14	1.17	November	4.96	33.41	208	0.015	0	71.2	1628530	109.8
15	1.25	December	4.97	197.2	229	0.015	0	72.8	1748820	112
16	1.33	January	4.98	830.3	320	0.015	0	73.1	1869110	112.3
17	1.42	February	4.99	739.3	378	0.016	0	73.4	1989400	112.6
18	1.5	March	5	312.6	336	0.02	0	73.7	2109680	113
19	1.58	April	5.01	21.2	186	0.023	0	76.4	2229970	116.6
20	1.67	May	5.02	24.95	192	0.025	0	77.7	2350260	118.4
21	1.75	June	5.02	28.61	198	0.027	0	79	2470550	120.1
22	1.83	July	5.03	31.29	204	0.028	0	80.1	2590840	121.4
23	1.92	August	5.04	32	207	0.029	0	80.8	2711130	122.3
24	2	September	5.04	31.8	208	0.032	0	81.7	2831420	123.5
25	2.08	October	5.05	31.88	208	0.036	0	83.4	2956520	125.8
26	2.17	November	5.05	33.41	208	0.04	0	85.5	3081620	128.4
27	2.25	December	5.06	197.2	229	0.04	0	87.6	3206720	131.2
28	2.33	January	5.06	830.3	320	0.04	0	87.8	3331820	131.5
29	2.42	February	5.07	739.3	378	0.04	0	88.1	3456920	131.9
30	2.5	March	5.07	312.6	336	0.046	0	88.4	3582020	132.2
31	2.58	April	5.08	21.2	186	0.049	0	91.7	3707120	136.4
32	2.67	May	5.08	24.95	192	0.051	0	93.1	3832220	138.3
33	2.75	June	5.09	28.61	198	0.053	0.1	94.6	3957320	140.1
34	2.83	July	5.09	31.29	204	0.054	0.1	95.6	4082420	141.4
35	2.92	August	5.1	32	207	0.056	0.1	96.3	4207520	142.3
36	3	September	5.1	31.8	208	0.058	0.1	97.3	4332620	143.6
37	3.08	October	5.1	31.88	208	0.062	0.1	98.9	4462730	145.6
38	3.17	November	5.11	33.41	208	0.065	0.1	100.9	4592830	148.1
39	3.25	December	5.11	197.2	229	0.065	0.1	102.7	4722940	150.5
40	3.33	January	5.11	830.3	320	0.066	0.1	103	4853040	150.8
41	3.42	February	5.12	739.3	378	0.066	0.1	103.3	4983150	151.1
42	3.5	March	5.12	312.6	336	0.071	0.1	103.6	5113250	151.4
43	3.58	April	5.12	21.2	186	0.073	0.1	106.5	5243360	155.1
44	3.67	May	5.13	24.95	192	0.075	0.1	107.8	5373460	156.8
45	3.75	June	5.13	28.61	198	0.077	0.1	108.9	5503570	158.2
46	3.83	July	5.13	31.29	204	0.077	0.1	109.8	5633670	159.3
47	3.92	August	5.14	32	207	0.079	0.1	110.5	5763780	160.1
48	4	September	5.14	31.8	208	0.081	0.2	111.4	5893880	161.3
49	4.08	October	5.14	31.88	208	0.084	0.2	112.8	6029190	163
50	4.17	November	5.14	33.41	208	0.087	0.2	114.4	6164500	165
51	4.25	December	5.15	197.2	229	0.087	0.2	116	6299810	167
52	4.33	January	5.15	830.3	320	0.087	0.2	116.2	6435110	167.3
53	4.42	February	5.15	739.3	378	0.087	0.2	116.5	6570420	167.6

54	4.5	March	5.15	312.6	336	0.092	0.2	116.8	6705730	167.9
55	4.58	April	5.16	21.2	186	0.094	0.2	119.2	6841040	170.9
56	4.67	May	5.16	24.95	192	0.095	0.2	120.2	6976350	172.2
57	4.75	June	5.16	28.61	198	0.096	0.2	121.2	7111660	173.4
58	4.83	July	5.16	31.29	204	0.097	0.2	122	7246970	174.3
59	4.92	August	5.17	32	207	0.098	0.2	122.5	7382280	175
60	5	September	5.17	31.8	208	0.1	0.2	123.3	7517580	176
61	5.08	October	5.17	31.88	208	0.102	0.2	124.5	7658310	177.4
62	5.17	November	5.17	33.41	208	0.105	0.2	125.8	7799030	179
63	5.25	December	5.17	197.2	229	0.105	0.2	127.2	7939750	180.7
64	5.33	January	5.18	830.3	320	0.105	0.2	127.4	8080470	180.9
65	5.42	February	5.18	739.3	378	0.105	0.2	127.6	8221190	181.2
66	5.5	March	5.18	312.6	336	0.109	0.2	127.9	8361910	181.5
67	5.58	April	5.18	21.2	186	0.11	0.3	129.9	8502630	184
68	5.67	May	5.18	24.95	192	0.112	0.3	130.9	8643350	185.2
69	5.75	June	5.19	28.61	198	0.113	0.3	131.7	8784070	186.2
70	5.83	July	5.19	31.29	204	0.113	0.3	132.3	8924800	187
71	5.92	August	5.19	32	207	0.114	0.3	132.9	9065520	187.6
72	6	September	5.19	31.8	208	0.116	0.3	133.5	9206240	188.3
73	6.08	October	5.19	31.88	208	0.118	0.3	134.5	9352590	189.5
74	6.17	November	5.2	33.41	208	0.12	0.3	135.6	9498940	190.9
75	6.25	December	5.2	197.2	229	0.12	0.3	136.7	9645290	192.3
76	6.33	January	5.2	830.3	320	0.12	0.3	136.9	9791640	192.5
77	6.42	February	5.2	739.3	378	0.12	0.3	137.2	9937990	192.8
78	6.5	March	5.2	312.6	336	0.123	0.3	137.4	10084300	193
79	6.58	April	5.2	21.2	186	0.124	0.3	139.1	10230700	195.1
80	6.67	May	5.21	24.95	192	0.125	0.4	140	10377000	196.1
81	6.75	June	5.21	28.61	198	0.126	0.4	140.7	10523400	197
82	6.83	July	5.21	31.29	204	0.127	0.4	141.2	10669700	197.7
83	6.92	August	5.21	32	207	0.128	0.4	141.7	10816100	198.2
84	7	September	5.21	31.8	208	0.129	0.4	142.3	10962400	198.9
85	7.08	October	5.21	31.88	208	0.13	0.4	143.1	11114600	199.9
86	7.17	November	5.21	33.41	208	0.132	0.4	144.1	11266800	201.1
87	7.25	December	5.22	197.2	229	0.132	0.4	145.1	11419000	202.2
88	7.33	January	5.22	830.3	320	0.132	0.4	145.3	11571300	202.5
89	7.42	February	5.22	739.3	378	0.132	0.4	145.5	11723500	202.7
90	7.5	March	5.22	312.6	336	0.135	0.4	145.7	11875700	202.9
91	7.58	April	5.22	21.2	186	0.136	0.4	147.1	12027900	204.7
92	7.67	May	5.22	24.95	192	0.137	0.5	147.9	12180100	205.5
93	7.75	June	5.22	28.61	198	0.138	0.5	148.5	12332300	206.3
94	7.83	July	5.23	31.29	204	0.138	0.5	149	12484500	206.9
95	7.92	August	5.23	32	207	0.139	0.5	149.4	12636700	207.4
96	8	September	5.23	31.8	208	0.14	0.5	150	12788900	208
97	8.08	October	5.23	31.88	208	0.141	0.5	150.7	12947200	208.9
98	8.17	November	5.23	33.41	208	0.142	0.5	151.6	13105500	209.9
99	8.25	December	5.23	197.2	229	0.143	0.5	152.4	13263800	210.9
100	8.33	January	5.23	830.3	320	0.143	0.5	152.6	13422100	211.1
101	8.42	February	5.23	739.3	378	0.143	0.5	152.8	13580300	211.3
102	8.5	March	5.23	312.6	336	0.145	0.6	153.1	13738600	211.6
103	8.58	April	5.24	21.2	186	0.146	0.6	154.3	13896900	213.1
104	8.67	May	5.24	24.95	192	0.147	0.6	154.9	14055200	213.9
105	8.75	June	5.24	28.61	198	0.147	0.6	155.5	14213500	214.5
106	8.83	July	5.24	31.29	204	0.148	0.6	155.9	14371800	215.1
107	8.92	August	5.24	32	207	0.148	0.6	156.3	14530100	215.5
108	9	September	5.24	31.8	208	0.149	0.7	156.8	14688400	216.1
109	9.08	October	5.24	31.88	208	0.15	0.7	157.5	14853000	216.9
110	9.17	November	5.24	33.41	208	0.152	0.7	158.3	15017600	217.8
111	9.25	December	5.24	197.2	229	0.152	0.7	159.1	15182300	218.7

112	9.33	January	5.24	830.3	320	0.152	0.7	159.2	15346900	218.9
113	9.42	February	5.25	739.3	378	0.152	0.7	159.4	15511500	219.1
114	9.5	March	5.25	312.6	336	0.154	0.7	159.6	15676100	219.3
115	9.58	April	5.25	21.2	186	0.154	0.7	160.7	15840800	220.7
116	9.67	May	5.25	24.95	192	0.155	0.7	161.2	16005400	221.3
117	9.75	June	5.25	28.61	198	0.156	0.7	161.8	16170000	221.9
118	9.83	July	5.25	31.29	204	0.156	0.7	162.2	16334600	222.4
119	9.92	August	5.25	32	207	0.157	0.8	162.6	16499300	222.8
120	10	September	5.25	31.8	208	0.157	0.8	163.1	16663900	223.4
121	10.1	October	5.25	31.88	208	0.159	0.8	163.6	16835100	224
122	10.2	November	5.25	33.41	208	0.16	0.8	164.3	17006300	224.9
123	10.3	December	5.25	197.2	229	0.16	0.8	165	17177500	225.7
124	10.3	January	5.25	830.3	320	0.16	0.8	165.2	17348700	225.9
125	10.4	February	5.25	739.3	378	0.16	0.8	165.4	17519900	226
126	10.5	March	5.25	312.6	336	0.161	0.8	165.6	17691100	226.2
127	10.6	April	5.26	21.2	186	0.162	0.8	166.5	17862300	227.4
128	10.7	May	5.26	24.95	192	0.163	0.8	167.1	18033500	228
129	10.8	June	5.26	28.61	198	0.163	0.9	167.6	18204800	228.6
130	10.8	July	5.26	31.29	204	0.163	0.9	168	18376000	229.1
131	10.9	August	5.26	32	207	0.164	0.9	168.3	18547200	229.4
132	11	September	5.26	31.8	208	0.165	0.9	168.7	18718400	229.9
133	11.1	October	5.26	31.88	208	0.166	0.9	169.3	18896400	230.6
134	11.2	November	5.26	33.41	208	0.167	0.9	169.9	19074500	231.3
135	11.3	December	5.26	197.2	229	0.167	0.9	170.5	19252600	232
136	11.3	January	5.26	830.3	320	0.167	0.9	170.7	19430600	232.2
137	11.4	February	5.26	739.3	378	0.167	0.9	170.9	19608700	232.4
138	11.5	March	5.26	312.6	336	0.168	1	171.1	19786700	232.7
139	11.6	April	5.26	21.2	186	0.169	1	172	19964800	233.7
140	11.7	May	5.26	24.95	192	0.169	1	172.5	20142800	234.2
141	11.8	June	5.26	28.61	198	0.17	1	172.9	20320900	234.8
142	11.8	July	5.26	31.29	204	0.17	1	173.3	20499000	235.2
143	11.9	August	5.26	32	207	0.17	1.1	173.7	20677000	235.6
144	12	September	5.26	31.8	208	0.171	1.1	174	20855100	236
145	12.1	October	5.27	31.88	208	0.172	1.1	174.5	21040200	236.6
146	12.2	November	5.27	33.41	208	0.173	1.1	175.1	21225400	237.3
147	12.3	December	5.27	197.2	229	0.173	1.1	175.7	21410600	238
148	12.3	January	5.27	830.3	320	0.173	1.1	175.9	21595800	238.1
149	12.4	February	5.27	739.3	378	0.173	1.1	176.1	21781000	238.3
150	12.5	March	5.27	312.6	336	0.174	1.1	176.2	21966100	238.5
151	12.6	April	5.27	21.2	186	0.175	1.1	177	22151300	239.5
152	12.7	May	5.27	24.95	192	0.175	1.1	177.5	22336500	240
153	12.8	June	5.27	28.61	198	0.176	1.2	178	22521700	240.6
154	12.8	July	5.27	31.29	204	0.176	1.2	178.3	22706900	241
155	12.9	August	5.27	32	207	0.176	1.2	178.6	22892000	241.2
156	13	September	5.27	31.8	208	0.177	1.2	179	23077200	241.6
157	13.1	October	5.27	31.88	208	0.178	1.3	179.5	23269800	242.3
158	13.2	November	5.27	33.41	208	0.178	1.3	180.1	23462400	242.9
159	13.3	December	5.27	197.2	229	0.178	1.3	180.6	23655000	243.5
160	13.3	January	5.27	830.3	320	0.178	1.3	180.8	23847600	243.7
161	13.4	February	5.27	739.3	378	0.179	1.3	180.9	24040200	243.9
162	13.5	March	5.27	312.6	336	0.18	1.3	181.1	24232700	244.1
163	13.6	April	5.27	21.2	186	0.18	1.3	181.9	24425300	245
164	13.7	May	5.27	24.95	192	0.181	1.3	182.3	24617900	245.5
165	13.8	June	5.27	28.61	198	0.181	1.3	182.7	24810500	245.9
166	13.8	July	5.27	31.29	204	0.181	1.4	183.1	25003100	246.3
167	13.9	August	5.27	32	207	0.182	1.4	183.3	25195700	246.6
168	14	September	5.27	31.8	208	0.182	1.4	183.7	25388300	247
169	14.1	October	5.27	31.88	208	0.183	1.4	184.1	25588500	247.5

170	14.2	November	5.27	33.41	208	0.184	1.4	184.6	25788800	248.1
171	14.3	December	5.28	197.2	229	0.184	1.4	185.1	25989100	248.7
172	14.3	January	5.28	830.3	320	0.184	1.5	185.4	26189400	248.9
173	14.4	February	5.28	739.3	378	0.184	1.5	185.6	26389700	249.1
174	14.5	March	5.28	312.6	336	0.185	1.5	185.7	26590000	249.3
175	14.6	April	5.28	21.2	186	0.185	1.5	186.4	26790300	250.1
176	14.7	May	5.28	24.95	192	0.186	1.5	186.8	26990600	250.6
177	14.8	June	5.28	28.61	198	0.186	1.5	187.2	27190900	251
178	14.8	July	5.28	31.29	204	0.186	1.6	187.6	27391200	251.4
179	14.9	August	5.28	32	207	0.187	1.6	187.8	27591400	251.7
180	15	September	5.28	31.8	208	0.187	1.6	188.2	27791700	252.1
181	15.1	October	5.28	31.88	208	0.188	1.6	188.6	28000000	252.6
182	15.2	November	5.28	33.41	208	0.188	1.6	189.1	28208300	253.1
183	15.3	December	5.28	197.2	229	0.188	1.6	189.5	28416600	253.6
184	15.3	January	5.28	830.3	320	0.188	1.6	189.7	28624900	253.8
185	15.4	February	5.28	739.3	378	0.189	1.6	189.9	28833200	254
186	15.5	March	5.28	312.6	336	0.19	1.7	190.2	29041500	254.3
187	15.6	April	5.28	21.2	186	0.19	1.7	190.8	29249800	255.1
188	15.7	May	5.28	24.95	192	0.19	1.7	191.2	29458200	255.5
189	15.8	June	5.28	28.61	198	0.191	1.7	191.5	29666500	255.9
190	15.8	July	5.28	31.29	204	0.191	1.8	191.9	29874800	256.3
191	15.9	August	5.28	32	207	0.191	1.8	192.2	30083100	256.6
192	16	September	5.28	31.8	208	0.192	1.8	192.5	30291400	256.9
193	16.1	October	5.28	31.88	208	0.192	1.8	192.9	30508000	257.4
194	16.2	November	5.28	33.41	208	0.193	1.8	193.4	30724600	257.9
195	16.3	December	5.29	197.2	229	0.193	1.8	193.8	30941300	258.4
196	16.3	January	5.29	830.3	320	0.193	1.9	194.1	31157900	258.7
197	16.4	February	5.29	739.3	378	0.193	1.9	194.2	31374500	258.8
198	16.5	March	5.29	312.6	336	0.194	1.9	194.4	31591200	259
199	16.6	April	5.29	21.2	186	0.194	1.9	195	31807800	259.8
200	16.7	May	5.29	24.95	192	0.195	1.9	195.4	32024400	260.2
201	16.8	June	5.29	28.61	198	0.195	1.9	195.7	32241100	260.6
202	16.8	July	5.29	31.29	204	0.195	2	196.1	32457700	260.9
203	16.9	August	5.29	32	207	0.195	2	196.3	32674300	261.2
204	17	September	5.29	31.8	208	0.196	2	196.6	32891000	261.5
205	17.1	October	5.29	31.88	208	0.196	2.1	197.1	33116300	262.1
206	17.2	November	5.29	33.41	208	0.197	2.1	197.5	33341600	262.6
207	17.3	December	5.29	197.2	229	0.197	2.1	198	33566900	263.1
208	17.3	January	5.29	830.3	320	0.197	2.1	198.2	33792200	263.2
209	17.4	February	5.29	739.3	378	0.197	2.1	198.4	34017500	263.5
210	17.5	March	5.29	312.6	336	0.198	2.1	198.5	34242800	263.6
211	17.6	April	5.29	21.2	186	0.198	2.1	199.1	34468100	264.3
212	17.7	May	5.29	24.95	192	0.199	2.1	199.4	34693400	264.7
213	17.8	June	5.3	28.61	198	0.199	2.2	199.9	34918700	265.2
214	17.8	July	5.3	31.29	204	0.199	2.2	200.1	35144000	265.4
215	17.9	August	5.3	32	207	0.199	2.2	200.4	35369300	265.7
216	18	September	5.3	31.8	208	0.2	2.3	200.8	35594600	266.1
217	18.1	October	5.3	31.88	208	0.2	2.3	201.1	35828900	266.5
218	18.2	November	5.3	33.41	208	0.201	2.3	201.5	36063200	267
219	18.3	December	5.3	197.2	229	0.201	2.3	202	36297500	267.5
220	18.3	January	5.3	830.3	320	0.201	2.3	202.2	36531800	267.7
221	18.4	February	5.3	739.3	378	0.201	2.3	202.3	36766100	267.8
222	18.5	March	5.3	312.6	336	0.202	2.3	202.5	37000400	268.1
223	18.6	April	5.3	21.2	186	0.202	2.3	203.1	37234700	268.7
224	18.7	May	5.3	24.95	192	0.202	2.4	203.5	37469000	269.1
225	18.8	June	5.3	28.61	198	0.203	2.4	203.8	37703300	269.5
226	18.8	July	5.31	31.29	204	0.203	2.5	204.2	37937700	269.9
227	18.9	August	5.31	32	207	0.203	2.5	204.4	38172000	270.2

228	19	September	5.31	31.8	208	0.203	2.5	204.7	38406300	270.5
229	19.1	October	5.31	31.88	208	0.204	2.6	205.2	38650000	271
230	19.2	November	5.31	33.41	208	0.204	2.6	205.6	38893600	271.5
231	19.3	December	5.31	197.2	229	0.204	2.6	206	39137300	272
232	19.3	January	5.31	830.3	320	0.204	2.6	206.1	39381000	272.1
233	19.4	February	5.31	739.3	378	0.205	2.6	206.3	39624700	272.3
234	19.5	March	5.31	312.6	336	0.205	2.6	206.5	39868400	272.5
235	19.6	April	5.31	21.2	186	0.206	2.6	207	40112100	273.1
236	19.7	May	5.31	24.95	192	0.206	2.6	207.4	40355800	273.5
237	19.8	June	5.32	28.61	198	0.206	2.7	207.8	40599400	273.9
238	19.8	July	5.32	31.29	204	0.206	2.7	208	40843100	274.2
239	19.9	August	5.32	32	207	0.207	2.8	208.4	41086800	274.5
240	20	September	5.32	31.8	208	0.207	2.8	208.6	41330500	274.8

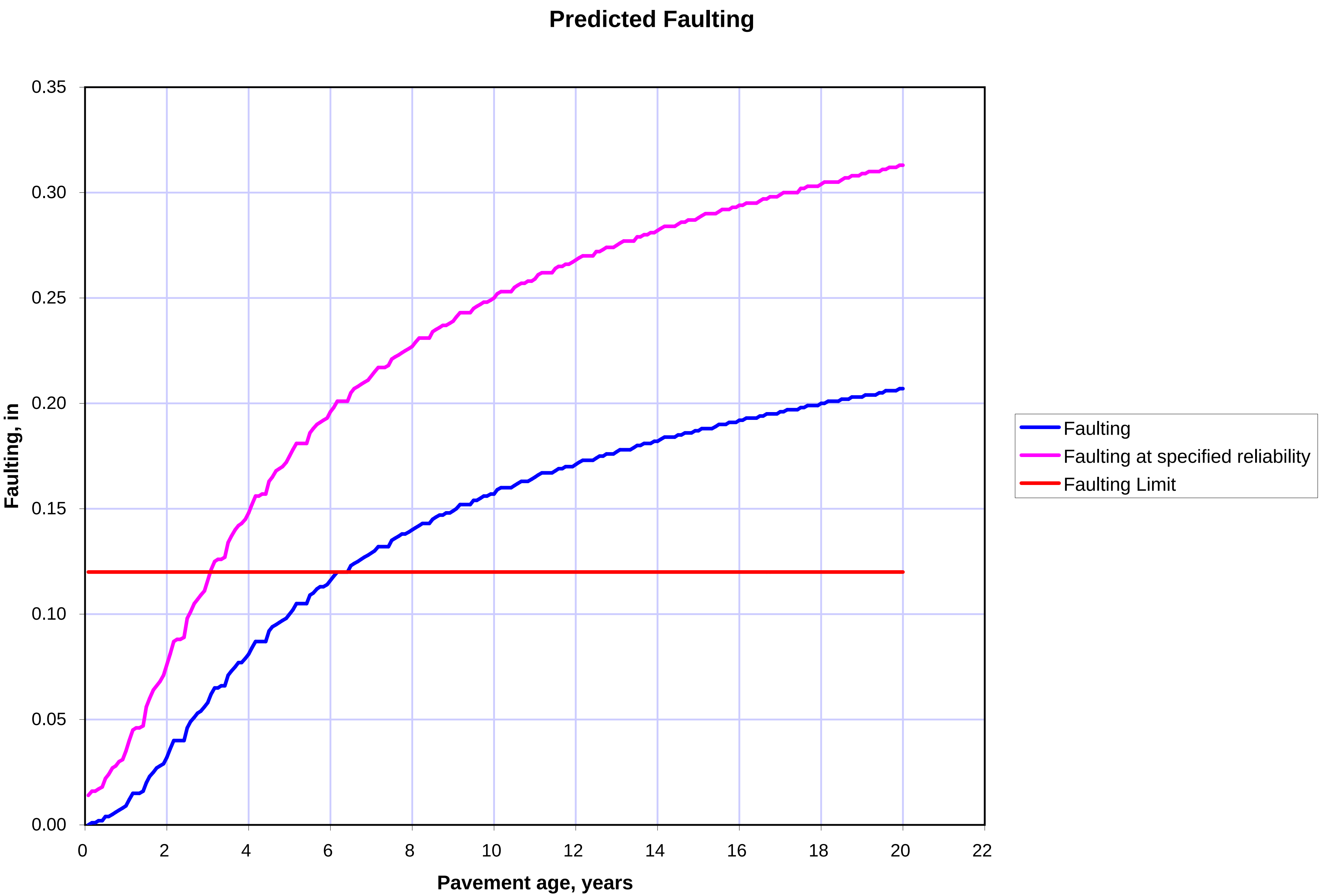
Predicted faulting: Project mepdg-pcc

Pavement age			Epcc	Ebase	Dyn. k	Ave. R.H.	Ave. ΔT	Joint open.	LTE	18-kip single deflection (in)		36-kip tandem deflection (in)		D.E.	Faulting	Faulting at specified reliability
mo	yr	Month	Mpsi	ksi	psi/in	%	°F	in	%	Loaded	Unloaded	Loaded	Unloaded	in-lb	in	
1	0.08	October	4.5	31.88	208	70.1	-19.7	0.051	91.9	0.018	0.018	0.022	0.022	3.6	0	0.014
2	0.17	November	4.62	33.41	208	78	-18	0.069	88	0.017	0.017	0.021	0.02	5.6	0.001	0.016
3	0.25	December	4.69	197.2	229	80.8	-19.1	0.081	95	0.018	0.018	0.022	0.021	2	0.001	0.016
4	0.33	January	4.75	830.3	320	84.5	-18	0.085	95	0.018	0.018	0.021	0.021	2.4	0.002	0.017
5	0.42	February	4.78	739.3	378	85.1	-14.9	0.081	95	0.017	0.017	0.019	0.019	2.3	0.002	0.018
6	0.5	March	4.82	312.6	336	77.5	-14.1	0.075	83.1	0.016	0.015	0.019	0.018	13.6	0.004	0.022
7	0.58	April	4.84	21.2	186	70.6	-15.4	0.063	81	0.015	0.014	0.019	0.017	8.1	0.004	0.024
8	0.67	May	4.87	24.95	192	65.7	-16.4	0.052	80.9	0.016	0.015	0.02	0.018	8.9	0.005	0.027
9	0.75	June	4.89	28.61	198	67.5	-17	0.043	84.4	0.016	0.015	0.02	0.019	7.2	0.006	0.028
10	0.83	July	4.9	31.29	204	75.2	-19.1	0.036	89.9	0.018	0.017	0.022	0.021	4.5	0.007	0.03
11	0.92	August	4.92	32	207	81.7	-21.5	0.039	86.9	0.019	0.019	0.024	0.023	7.3	0.008	0.031
12	1	September	4.93	31.8	208	72.5	-21.2	0.049	77.6	0.02	0.018	0.024	0.022	16	0.009	0.035
13	1.08	October	4.95	31.88	208	70.1	-19.4	0.061	70.2	0.018	0.017	0.023	0.02	22.8	0.012	0.04
14	1.17	November	4.96	33.41	208	78	-18	0.077	65.1	0.018	0.015	0.022	0.018	26.7	0.015	0.045
15	1.25	December	4.97	197.2	229	80.8	-19.2	0.086	95	0.018	0.018	0.022	0.021	2.1	0.015	0.046
16	1.33	January	4.98	830.3	320	84.5	-18.3	0.089	95	0.018	0.018	0.022	0.021	2.6	0.015	0.046
17	1.42	February	4.99	739.3	378	85.1	-15.1	0.084	95	0.017	0.017	0.019	0.019	2.4	0.016	0.047
18	1.5	March	5	312.6	336	77.5	-14.1	0.078	61.7	0.017	0.014	0.02	0.016	47.7	0.02	0.056
19	1.58	April	5.01	21.2	186	70.6	-15.3	0.065	61.4	0.016	0.013	0.02	0.016	23	0.023	0.06
20	1.67	May	5.02	24.95	192	65.7	-16.3	0.054	64.1	0.016	0.014	0.02	0.017	22.6	0.025	0.064
21	1.75	June	5.02	28.61	198	67.5	-17	0.045	71.3	0.017	0.015	0.021	0.018	17.7	0.027	0.066
22	1.83	July	5.03	31.29	204	75.2	-19.1	0.038	81.1	0.018	0.017	0.022	0.021	11.3	0.028	0.068
23	1.92	August	5.04	32	207	81.7	-21.5	0.04	77.2	0.02	0.018	0.025	0.023	17.2	0.029	0.071
24	2	September	5.04	31.8	208	72.5	-21.2	0.05	64.5	0.02	0.018	0.025	0.021	32.2	0.032	0.076
25	2.08	October	5.05	31.88	208	70.1	-19.3	0.062	56.6	0.019	0.016	0.024	0.019	41.1	0.036	0.081
26	2.17	November	5.05	33.41	208	78	-18	0.078	52.6	0.018	0.014	0.023	0.017	44	0.04	0.087
27	2.25	December	5.06	197.2	229	80.8	-19.2	0.087	93.8	0.018	0.018	0.022	0.021	2.9	0.04	0.088
28	2.33	January	5.06	830.3	320	84.5	-18.4	0.09	93.8	0.018	0.018	0.022	0.021	3.8	0.04	0.088
29	2.42	February	5.07	739.3	378	85.1	-15.2	0.085	93.9	0.017	0.017	0.019	0.019	3.7	0.04	0.089
30	2.5	March	5.07	312.6	336	77.5	-14.1	0.079	51.3	0.018	0.013	0.021	0.015	72.5	0.046	0.098
31	2.58	April	5.08	21.2	186	70.6	-15.3	0.066	52.7	0.016	0.012	0.02	0.015	32.5	0.049	0.101
32	2.67	May	5.08	24.95	192	65.7	-16.2	0.055	57.1	0.017	0.013	0.021	0.016	30.5	0.051	0.105
33	2.75	June	5.09	28.61	198	67.5	-16.9	0.045	66	0.017	0.014	0.021	0.018	23.5	0.053	0.107
34	2.83	July	5.09	31.29	204	75.2	-19.1	0.039	77.3	0.018	0.017	0.022	0.02	15.3	0.054	0.109
35	2.92	August	5.1	32	207	81.7	-21.5	0.041	73.2	0.02	0.018	0.025	0.022	22.6	0.056	0.111
36	3	September	5.1	31.8	208	72.5	-21.1	0.05	59.6	0.02	0.017	0.025	0.021	40.4	0.058	0.116
37	3.08	October	5.1	31.88	208	70.1	-19.3	0.063	51.7	0.019	0.015	0.024	0.019	50.2	0.062	0.121
38	3.17	November	5.11	33.41	208	78	-18	0.078	48.2	0.019	0.014	0.023	0.017	52.5	0.065	0.125
39	3.25	December	5.11	197.2	229	80.8	-19.2	0.088	93.4	0.018	0.018	0.022	0.021	3.3	0.065	0.126
40	3.33	January	5.11	830.3	320	84.5	-18.4	0.09	93.4	0.018	0.018	0.022	0.021	4.4	0.066	0.126
41	3.42	February	5.12	739.3	378	85.1	-15.2	0.085	93.4	0.017	0.017	0.019	0.019	4.3	0.066	0.127
42	3.5	March	5.12	312.6	336	77.5	-14.1	0.079	47.7	0.018	0.013	0.021	0.015	84.7	0.071	0.134
43	3.58	April	5.12	21.2	186	70.6	-15.3	0.066	49.6	0.016	0.012	0.021	0.015	37.2	0.073	0.137
44	3.67	May	5.13	24.95	192	65.7	-16.2	0.055	54.6	0.017	0.013	0.021	0.016	34.6	0.075	0.14
45	3.75	June	5.13	28.61	198	67.5	-16.9	0.046	63.9	0.017	0.014	0.021	0.017	26.6	0.077	0.142
46	3.83	July	5.13	31.29	204	75.2	-19.1	0.039	75.7	0.018	0.016	0.022	0.02	17.5	0.077	0.143
47	3.92	August	5.14	32	207	81.7	-21.5	0.041	71.5	0.02	0.018	0.025	0.022	25.6	0.079	0.145
48	4	September	5.14	31.8	208	72.5	-21.1	0.051	57.8	0.02	0.017	0.025	0.021	44.9	0.081	0.148
49	4.08	October	5.14	31.88	208	70.1	-19.3	0.063	49.9	0.02	0.015	0.024	0.018	55.2	0.084	0.152
50	4.17	November	5.14	33.41	208	78	-18	0.078	46.6	0.019	0.014	0.023	0.017	57.3	0.087	0.156
51	4.25	December	5.15	197.2	229	80.8	-19.2	0.088	93.2	0.018	0.018	0.022	0.021	3.5	0.087	0.156
52	4.33	January	5.15	830.3	320	84.5	-18.4	0.09	93.2	0.018	0.018	0.022	0.021	4.7	0.087	0.157
53	4.42	February	5.15	739.3	378	85.1	-15.2	0.085	93.2	0.017	0.017	0.019	0.019	4.7	0.087	0.157
54	4.5	March	5.15	312.6	336	77.5	-14.1	0.08	46.3	0.018	0.013	0.021	0.015	91.6	0.092	0.163
55	4.58	April	5.16	21.2	186	70.6	-15.3	0.067	48.5	0.016	0.012	0.021	0.015	40.1	0.094	0.165
56	4.67	May	5.16	24.95	192	65.7	-16.2	0.055	53.6	0.017	0.013	0.021	0.016	37.2	0.095	0.168
57	4.75	June	5.16	28.61	198	67.5	-16.9	0.046	63	0.017	0.014	0.021	0.017	28.7	0.096	0.169
58	4.83	July	5.16	31.29	204	75.2	-19.1	0.039	75	0.018	0.016	0.022	0.02	19	0.097	0.17
59	4.92	August	5.17	32	207	81.7	-21.5	0.041	70.7	0.02	0.018	0.025	0.022	27.7	0.098	0.172
60	5	September	5.17	31.8	208	72.5	-21.1	0.051	57	0.02	0.017	0.026	0.021	47.9	0.1	0.175
61	5.08	October	5.17	31.88	208	70.1	-19.3	0.063	49.3	0.02	0.015	0.024	0.018	58.6	0.102	0.178

62	5.17	November	5.17	33.41	208	78	-18	0.079	46	0.019	0.014	0.023	0.017	60.6	0.105	0.181
63	5.25	December	5.17	197.2	229	80.8	-19.2	0.088	93.1	0.018	0.017	0.022	0.021	3.7	0.105	0.181
64	5.33	January	5.18	830.3	320	84.5	-18.4	0.091	93.1	0.018	0.018	0.022	0.021	5	0.105	0.181
65	5.42	February	5.18	739.3	378	85.1	-15.2	0.085	93.2	0.017	0.017	0.019	0.019	5	0.105	0.181
66	5.5	March	5.18	312.6	336	77.5	-14.1	0.08	45.8	0.018	0.013	0.021	0.014	96.6	0.109	0.186
67	5.58	April	5.18	21.2	186	70.6	-15.3	0.067	48	0.016	0.012	0.021	0.015	42.2	0.11	0.188
68	5.67	May	5.18	24.95	192	65.7	-16.2	0.055	53.1	0.017	0.013	0.021	0.016	39.1	0.112	0.19
69	5.75	June	5.19	28.61	198	67.5	-16.9	0.046	62.5	0.017	0.014	0.021	0.017	30.3	0.113	0.191
70	5.83	July	5.19	31.29	204	75.2	-19.1	0.039	74.5	0.018	0.016	0.022	0.02	20.2	0.113	0.192
71	5.92	August	5.19	32	207	81.7	-21.5	0.041	70.3	0.02	0.018	0.025	0.022	29.4	0.114	0.193
72	6	September	5.19	31.8	208	72.5	-21.1	0.051	56.6	0.02	0.017	0.026	0.021	50.4	0.116	0.196
73	6.08	October	5.19	31.88	208	70.1	-19.3	0.063	49	0.02	0.015	0.024	0.018	61.4	0.118	0.198
74	6.17	November	5.2	33.41	208	78	-18	0.079	45.8	0.019	0.014	0.023	0.017	63.3	0.12	0.201
75	6.25	December	5.2	197.2	229	80.8	-19.2	0.088	93.1	0.018	0.017	0.022	0.021	3.9	0.12	0.201
76	6.33	January	5.2	830.3	320	84.5	-18.4	0.091	93.1	0.018	0.018	0.022	0.021	5.2	0.12	0.201
77	6.42	February	5.2	739.3	378	85.1	-15.3	0.086	93.1	0.017	0.017	0.019	0.019	5.2	0.12	0.201
78	6.5	March	5.2	312.6	336	77.5	-14.1	0.08	45.6	0.018	0.013	0.021	0.014	100.9	0.123	0.205
79	6.58	April	5.2	21.2	186	70.6	-15.3	0.067	47.8	0.016	0.012	0.021	0.015	44.1	0.124	0.207
80	6.67	May	5.21	24.95	192	65.7	-16.2	0.055	52.9	0.017	0.013	0.021	0.016	40.9	0.125	0.208
81	6.75	June	5.21	28.61	198	67.5	-16.9	0.046	62.3	0.017	0.014	0.021	0.017	31.8	0.126	0.209
82	6.83	July	5.21	31.29	204	75.2	-19.1	0.039	74.3	0.018	0.016	0.022	0.02	21.3	0.127	0.21
83	6.92	August	5.21	32	207	81.7	-21.5	0.041	70.1	0.02	0.018	0.025	0.022	30.9	0.128	0.211
84	7	September	5.21	31.8	208	72.5	-21.1	0.051	56.4	0.02	0.017	0.026	0.021	52.7	0.129	0.213
85	7.08	October	5.21	31.88	208	70.1	-19.3	0.063	48.8	0.02	0.015	0.024	0.018	64.1	0.13	0.215
86	7.17	November	5.21	33.41	208	78	-18	0.079	45.7	0.019	0.014	0.023	0.017	66	0.132	0.217
87	7.25	December	5.22	197.2	229	80.8	-19.2	0.088	93.1	0.018	0.017	0.022	0.021	4.1	0.132	0.217
88	7.33	January	5.22	830.3	320	84.5	-18.4	0.091	93.1	0.018	0.018	0.022	0.021	5.5	0.132	0.217
89	7.42	February	5.22	739.3	378	85.1	-15.3	0.086	93.1	0.017	0.017	0.019	0.019	5.4	0.132	0.218
90	7.5	March	5.22	312.6	336	77.5	-14.1	0.08	45.5	0.018	0.012	0.021	0.014	105.1	0.135	0.221
91	7.58	April	5.22	21.2	186	70.6	-15.3	0.067	47.8	0.016	0.012	0.021	0.015	45.9	0.136	0.222
92	7.67	May	5.22	24.95	192	65.7	-16.2	0.055	52.8	0.017	0.013	0.021	0.016	42.7	0.137	0.223
93	7.75	June	5.22	28.61	198	67.5	-16.9	0.046	62.1	0.017	0.014	0.021	0.017	33.2	0.138	0.224
94	7.83	July	5.23	31.29	204	75.2	-19.1	0.039	74.1	0.018	0.016	0.022	0.02	22.4	0.138	0.225
95	7.92	August	5.23	32	207	81.7	-21.5	0.042	69.9	0.02	0.018	0.025	0.022	32.4	0.139	0.226
96	8	September	5.23	31.8	208	72.5	-21.1	0.051	56.3	0.02	0.017	0.026	0.021	55	0.14	0.227
97	8.08	October	5.23	31.88	208	70.1	-19.3	0.064	48.8	0.02	0.015	0.024	0.018	66.7	0.141	0.229
98	8.17	November	5.23	33.41	208	78	-18	0.079	45.6	0.019	0.014	0.023	0.017	68.7	0.142	0.231
99	8.25	December	5.23	197.2	229	80.8	-19.2	0.088	93.1	0.018	0.017	0.022	0.021	4.2	0.143	0.231
100	8.33	January	5.23	830.3	320	84.5	-18.4	0.091	93.1	0.018	0.018	0.022	0.021	5.7	0.143	0.231
101	8.42	February	5.23	739.3	378	85.1	-15.3	0.086	93.1	0.017	0.016	0.019	0.019	5.6	0.143	0.231
102	8.5	March	5.23	312.6	336	77.5	-14.1	0.08	45.5	0.018	0.012	0.021	0.014	109.3	0.145	0.234
103	8.58	April	5.24	21.2	186	70.6	-15.3	0.067	47.7	0.016	0.012	0.021	0.015	47.8	0.146	0.235
104	8.67	May	5.24	24.95	192	65.7	-16.2	0.055	52.7	0.017	0.013	0.021	0.016	44.5	0.147	0.236
105	8.75	June	5.24	28.61	198	67.5	-16.9	0.046	62	0.017	0.014	0.021	0.017	34.7	0.147	0.237
106	8.83	July	5.24	31.29	204	75.2	-19.1	0.039	73.9	0.018	0.016	0.022	0.02	23.5	0.148	0.237
107	8.92	August	5.24	32	207	81.7	-21.6	0.042	69.7	0.02	0.018	0.025	0.022	33.9	0.148	0.238
108	9	September	5.24	31.8	208	72.5	-21.1	0.051	56.2	0.02	0.017	0.026	0.021	57.4	0.149	0.239
109	9.08	October	5.24	31.88	208	70.1	-19.3	0.064	48.7	0.02	0.015	0.024	0.018	69.4	0.15	0.241
110	9.17	November	5.24	33.41	208	78	-18	0.079	45.6	0.019	0.014	0.023	0.017	71.4	0.152	0.243
111	9.25	December	5.24	197.2	229	80.8	-19.2	0.088	93.1	0.018	0.017	0.022	0.021	4.4	0.152	0.243
112	9.33	January	5.24	830.3	320	84.5	-18.4	0.091	93.1	0.018	0.018	0.022	0.021	5.9	0.152	0.243
113	9.42	February	5.25	739.3	378	85.1	-15.3	0.086	93.1	0.017	0.016	0.019	0.019	5.9	0.152	0.243
114	9.5	March	5.25	312.6	336	77.5	-14.1	0.08	45.5	0.018	0.012	0.021	0.014	113.6	0.154	0.245
115	9.58	April	5.25	21.2	186	70.6	-15.3	0.067	47.7	0.016	0.012	0.021	0.015	49.7	0.154	0.246
116	9.67	May	5.25	24.95	192	65.7	-16.2	0.055	52.7	0.017	0.013	0.021	0.016	46.3	0.155	0.247
117	9.75	June	5.25	28.61	198	67.5	-16.9	0.046	61.9	0.017	0.014	0.021	0.017	36.2	0.156	0.248
118	9.83	July	5.25	31.29	204	75.2	-19.1	0.039	73.8	0.018	0.016	0.022	0.02	24.6	0.156	0.248
119	9.92	August	5.25	32	207	81.7	-21.6	0.042	69.6	0.02	0.018	0.025	0.022	35.5	0.157	0.249
120	10	September	5.25	31.8	208	72.5	-21.1	0.051	56.1	0.02	0.017	0.026	0.021	59.8	0.157	0.25
121	10.1	October	5.25	31.88	208	70.1	-19.3	0.064	48.7	0.02	0.015	0.024	0.018	72.2	0.159	0.252
122	10.2	November	5.25	33.41	208	78	-18	0.079	45.6	0.019	0.014	0.023	0.017	74.3	0.16	0.253
123	10.3	December	5.25	197.2	229	80.8	-19.2	0.088	93.1	0.018	0.017	0.022	0.021	4.6	0.16	0.253
124	10.3	January	5.25	830.3	320	84.5	-18.4	0.091	93.1	0.018	0.018	0.022	0.021	6.2	0.16	0.253
125	10.4	February	5.25	739.3	378	85.1	-15.3	0.086	93.1	0.017	0.016	0.019	0.019	6.1	0.16	0.253
126	10.5	March	5.25	312.6	336	77.5	-14.1	0.08	45.5	0.018	0.012	0.021	0.014	118.2	0.161	0.255

127	10.6	April	5.26	21.2	186	70.6	-15.3	0.067	47.6	0.016	0.012	0.021	0.015	51.7	0.162	0.256
128	10.7	May	5.26	24.95	192	65.7	-16.2	0.055	52.6	0.017	0.013	0.021	0.016	48.2	0.163	0.257
129	10.8	June	5.26	28.61	198	67.5	-16.9	0.046	61.8	0.017	0.014	0.021	0.017	37.8	0.163	0.257
130	10.8	July	5.26	31.29	204	75.2	-19.1	0.039	73.7	0.018	0.016	0.022	0.02	25.7	0.163	0.258
131	10.9	August	5.26	32	207	81.7	-21.6	0.042	69.5	0.02	0.018	0.025	0.022	37.1	0.164	0.258
132	11	September	5.26	31.8	208	72.5	-21.1	0.051	56.1	0.02	0.017	0.026	0.021	62.3	0.165	0.259
133	11.1	October	5.26	31.88	208	70.1	-19.3	0.064	48.7	0.02	0.015	0.024	0.018	75.2	0.166	0.261
134	11.2	November	5.26	33.41	208	78	-18	0.079	45.6	0.019	0.014	0.023	0.017	77.2	0.167	0.262
135	11.3	December	5.26	197.2	229	80.8	-19.2	0.088	93.1	0.018	0.017	0.022	0.021	4.8	0.167	0.262
136	11.3	January	5.26	830.3	320	84.5	-18.4	0.091	93.1	0.018	0.018	0.022	0.021	6.4	0.167	0.262
137	11.4	February	5.26	739.3	378	85.1	-15.3	0.086	93.1	0.017	0.016	0.019	0.019	6.4	0.167	0.262
138	11.5	March	5.26	312.6	336	77.5	-14.1	0.08	45.4	0.018	0.012	0.021	0.014	122.9	0.168	0.264
139	11.6	April	5.26	21.2	186	70.6	-15.3	0.067	47.6	0.016	0.012	0.021	0.015	53.8	0.169	0.265
140	11.7	May	5.26	24.95	192	65.7	-16.2	0.056	52.6	0.017	0.013	0.021	0.016	50.2	0.169	0.265
141	11.8	June	5.26	28.61	198	67.5	-16.9	0.046	61.7	0.017	0.014	0.021	0.017	39.4	0.17	0.266
142	11.8	July	5.26	31.29	204	75.2	-19.1	0.04	73.5	0.018	0.016	0.022	0.02	26.9	0.17	0.266
143	11.9	August	5.26	32	207	81.7	-21.6	0.042	69.4	0.02	0.018	0.025	0.022	38.8	0.17	0.267
144	12	September	5.26	31.8	208	72.5	-21.1	0.051	56	0.02	0.017	0.026	0.021	65	0.171	0.268
145	12.1	October	5.27	31.88	208	70.1	-19.3	0.064	48.6	0.02	0.015	0.024	0.018	78.2	0.172	0.269
146	12.2	November	5.27	33.41	208	78	-18	0.079	45.6	0.019	0.014	0.023	0.017	80.3	0.173	0.27
147	12.3	December	5.27	197.2	229	80.8	-19.2	0.088	93.1	0.018	0.017	0.022	0.021	5	0.173	0.27
148	12.3	January	5.27	830.3	320	84.5	-18.4	0.091	93.1	0.018	0.018	0.022	0.021	6.7	0.173	0.27
149	12.4	February	5.27	739.3	378	85.1	-15.3	0.086	93.1	0.017	0.016	0.019	0.019	6.6	0.173	0.27
150	12.5	March	5.27	312.6	336	77.5	-14.1	0.08	45.4	0.018	0.012	0.021	0.014	127.8	0.174	0.272
151	12.6	April	5.27	21.2	186	70.6	-15.3	0.067	47.6	0.016	0.012	0.021	0.015	56	0.175	0.272
152	12.7	May	5.27	24.95	192	65.7	-16.2	0.056	52.5	0.017	0.013	0.021	0.016	52.3	0.175	0.273
153	12.8	June	5.27	28.61	198	67.5	-16.9	0.046	61.6	0.017	0.014	0.021	0.017	41.1	0.176	0.274
154	12.8	July	5.27	31.29	204	75.2	-19.1	0.04	73.4	0.018	0.016	0.022	0.02	28.2	0.176	0.274
155	12.9	August	5.27	32	207	81.7	-21.6	0.042	69.3	0.02	0.018	0.025	0.022	40.5	0.176	0.274
156	13	September	5.27	31.8	208	72.5	-21.1	0.051	55.9	0.02	0.017	0.026	0.021	67.7	0.177	0.275
157	13.1	October	5.27	31.88	208	70.1	-19.3	0.064	48.6	0.02	0.015	0.024	0.018	81.4	0.178	0.276
158	13.2	November	5.27	33.41	208	78	-18	0.079	45.5	0.019	0.014	0.023	0.017	83.5	0.178	0.277
159	13.3	December	5.27	197.2	229	80.8	-19.2	0.088	93.1	0.018	0.017	0.022	0.021	5.1	0.178	0.277
160	13.3	January	5.27	830.3	320	84.5	-18.4	0.091	93.1	0.018	0.018	0.022	0.021	6.9	0.178	0.277
161	13.4	February	5.27	739.3	378	85.1	-15.3	0.086	93.1	0.017	0.016	0.019	0.019	6.9	0.179	0.277
162	13.5	March	5.27	312.6	336	77.5	-14.1	0.08	45.4	0.018	0.012	0.021	0.014	132.9	0.18	0.279
163	13.6	April	5.27	21.2	186	70.6	-15.3	0.067	47.6	0.016	0.012	0.021	0.015	58.2	0.18	0.279
164	13.7	May	5.27	24.95	192	65.7	-16.2	0.056	52.5	0.017	0.013	0.021	0.016	54.4	0.181	0.28
165	13.8	June	5.27	28.61	198	67.5	-16.9	0.046	61.5	0.017	0.014	0.021	0.017	42.8	0.181	0.28
166	13.8	July	5.27	31.29	204	75.2	-19.1	0.04	73.4	0.018	0.016	0.022	0.02	29.4	0.181	0.281
167	13.9	August	5.27	32	207	81.7	-21.6	0.042	69.2	0.02	0.018	0.025	0.022	42.3	0.182	0.281
168	14	September	5.27	31.8	208	72.5	-21.1	0.051	55.9	0.02	0.017	0.026	0.021	70.5	0.182	0.282
169	14.1	October	5.27	31.88	208	70.1	-19.3	0.064	48.6	0.02	0.015	0.024	0.018	84.7	0.183	0.283
170	14.2	November	5.27	33.41	208	78	-18	0.079	45.5	0.019	0.014	0.023	0.017	86.9	0.184	0.284
171	14.3	December	5.28	197.2	229	80.8	-19.2	0.088	93.1	0.018	0.017	0.022	0.021	5.4	0.184	0.284
172	14.3	January	5.28	830.3	320	84.5	-18.4	0.091	93.1	0.018	0.018	0.022	0.021	7.2	0.184	0.284
173	14.4	February	5.28	739.3	378	85.1	-15.3	0.086	93.1	0.017	0.016	0.019	0.019	7.2	0.184	0.284
174	14.5	March	5.28	312.6	336	77.5	-14.1	0.08	45.4	0.018	0.012	0.021	0.014	138.2	0.185	0.285
175	14.6	April	5.28	21.2	186	70.6	-15.3	0.067	47.6	0.016	0.012	0.021	0.015	60.6	0.185	0.286
176	14.7	May	5.28	24.95	192	65.7	-16.2	0.056	52.4	0.017	0.013	0.021	0.016	56.7	0.186	0.286
177	14.8	June	5.28	28.61	198	67.5	-16.9	0.046	61.5	0.017	0.014	0.021	0.017	44.7	0.186	0.287
178	14.8	July	5.28	31.29	204	75.2	-19.1	0.04	73.3	0.018	0.016	0.022	0.02	30.7	0.186	0.287
179	14.9	August	5.28	32	207	81.7	-21.6	0.042	69.1	0.02	0.018	0.025	0.022	44.2	0.187	0.287
180	15	September	5.28	31.8	208	72.5	-21.1	0.051	55.8	0.02	0.017	0.026	0.021	73.4	0.187	0.288
181	15.1	October	5.28	31.88	208	70.1	-19.3	0.064	48.6	0.02	0.015	0.024	0.018	88.1	0.188	0.289
182	15.2	November	5.28	33.41	208	78	-18	0.079	45.5	0.019	0.014	0.023	0.017	90.4	0.188	0.29
183	15.3	December	5.28	197.2	229	80.8	-19.2	0.088	93.1	0.018	0.017	0.022	0.021	5.6	0.188	0.29
184	15.3	January	5.28	830.3	320	84.5	-18.4	0.091	93.1	0.018	0.018	0.022	0.021	7.5	0.188	0.29
185	15.4	February	5.28	739.3	378	85.1	-15.3	0.086	93.1	0.017	0.016	0.019	0.019	7.5	0.189	0.29
186	15.5	March	5.28	312.6	336	77.5	-14.1	0.08	45.4	0.018	0.012	0.021	0.014	143.7	0.19	0.291
187	15.6	April	5.28	21.2	186	70.6	-15.3	0.067	47.5	0.016	0.012	0.021	0.015	63	0.19	0.292
188	15.7	May	5.28	24.95	192	65.7	-16.2	0.056	52.4	0.017	0.013	0.021	0.016	59	0.19	0.292
189	15.8	June	5.28	28.61	198	67.5	-16.9	0.046	61.4	0.017	0.014	0.021	0.017	46.6	0.191	0.292
190	15.8	July	5.28	31.29	204	75.2	-19.1	0.04	73.2	0.018	0.016	0.022	0.02	32.1	0.191	0.293
191	15.9	August	5.28	32	207	81.7	-21.6	0.042	69	0.02	0.018	0.025	0.022	46.1	0.191	0.293

192	16	September	5.28	31.8	208	72.5	-21.1	0.051	55.8	0.02	0.017	0.026	0.021	76.5	0.192	0.294
193	16.1	October	5.28	31.88	208	70.1	-19.3	0.064	48.5	0.02	0.015	0.024	0.018	91.7	0.192	0.294
194	16.2	November	5.28	33.41	208	78	-18	0.079	45.5	0.019	0.014	0.023	0.017	94	0.193	0.295
195	16.3	December	5.29	197.2	229	80.8	-19.2	0.088	93.1	0.018	0.017	0.022	0.021	5.8	0.193	0.295
196	16.3	January	5.29	830.3	320	84.5	-18.4	0.091	93.1	0.018	0.018	0.022	0.021	7.8	0.193	0.295
197	16.4	February	5.29	739.3	378	85.1	-15.3	0.086	93.1	0.017	0.016	0.019	0.019	7.8	0.193	0.295
198	16.5	March	5.29	312.6	336	77.5	-14.1	0.08	45.4	0.018	0.012	0.021	0.014	149.5	0.194	0.296
199	16.6	April	5.29	21.2	186	70.6	-15.3	0.067	47.5	0.016	0.012	0.021	0.015	65.6	0.194	0.297
200	16.7	May	5.29	24.95	192	65.7	-16.2	0.056	52.4	0.017	0.013	0.021	0.016	61.4	0.195	0.297
201	16.8	June	5.29	28.61	198	67.5	-16.9	0.046	61.3	0.017	0.014	0.021	0.017	48.5	0.195	0.298
202	16.8	July	5.29	31.29	204	75.2	-19.1	0.04	73.1	0.018	0.016	0.022	0.02	33.5	0.195	0.298
203	16.9	August	5.29	32	207	81.7	-21.6	0.042	69	0.02	0.018	0.025	0.022	48.1	0.195	0.298
204	17	September	5.29	31.8	208	72.5	-21.1	0.051	55.7	0.02	0.017	0.026	0.021	79.7	0.196	0.299
205	17.1	October	5.29	31.88	208	70.1	-19.3	0.064	48.5	0.02	0.015	0.024	0.018	95.4	0.196	0.3
206	17.2	November	5.29	33.41	208	78	-18	0.079	45.5	0.019	0.014	0.023	0.017	97.8	0.197	0.3
207	17.3	December	5.29	197.2	229	80.8	-19.2	0.088	93.1	0.018	0.017	0.022	0.021	6	0.197	0.3
208	17.3	January	5.29	830.3	320	84.5	-18.4	0.091	93.1	0.018	0.018	0.022	0.021	8.1	0.197	0.3
209	17.4	February	5.29	739.3	378	85.1	-15.3	0.086	93.1	0.017	0.016	0.019	0.019	8.1	0.197	0.3
210	17.5	March	5.29	312.6	336	77.5	-14.1	0.08	45.4	0.018	0.012	0.021	0.014	155.4	0.198	0.302
211	17.6	April	5.29	21.2	186	70.6	-15.3	0.067	47.5	0.016	0.012	0.021	0.015	68.2	0.198	0.302
212	17.7	May	5.29	24.95	192	65.7	-16.2	0.056	52.3	0.017	0.013	0.021	0.016	63.9	0.199	0.303
213	17.8	June	5.3	28.61	198	67.5	-16.9	0.046	61.3	0.017	0.014	0.021	0.017	50.6	0.199	0.303
214	17.8	July	5.3	31.29	204	75.2	-19.1	0.04	73	0.018	0.016	0.022	0.02	35	0.199	0.303
215	17.9	August	5.3	32	207	81.7	-21.6	0.042	68.9	0.02	0.018	0.025	0.022	50.2	0.199	0.303
216	18	September	5.3	31.8	208	72.5	-21.1	0.051	55.7	0.02	0.017	0.026	0.021	83	0.2	0.304
217	18.1	October	5.3	31.88	208	70.1	-19.3	0.064	48.5	0.02	0.015	0.024	0.018	99.2	0.2	0.305
218	18.2	November	5.3	33.41	208	78	-18	0.079	45.5	0.019	0.014	0.023	0.017	101.6	0.201	0.305
219	18.3	December	5.3	197.2	229	80.8	-19.2	0.088	93.1	0.018	0.017	0.022	0.021	6.3	0.201	0.305
220	18.3	January	5.3	830.3	320	84.5	-18.4	0.091	93.1	0.018	0.018	0.022	0.021	8.4	0.201	0.305
221	18.4	February	5.3	739.3	378	85.1	-15.3	0.086	93.1	0.017	0.016	0.019	0.019	8.4	0.201	0.305
222	18.5	March	5.3	312.6	336	77.5	-14.1	0.08	45.4	0.018	0.012	0.021	0.014	161.6	0.202	0.306
223	18.6	April	5.3	21.2	186	70.6	-15.3	0.067	47.5	0.016	0.012	0.021	0.015	70.9	0.202	0.307
224	18.7	May	5.3	24.95	192	65.7	-16.2	0.056	52.3	0.017	0.013	0.021	0.016	66.5	0.202	0.307
225	18.8	June	5.3	28.61	198	67.5	-16.9	0.047	61.2	0.017	0.014	0.021	0.017	52.7	0.203	0.308
226	18.8	July	5.31	31.29	204	75.2	-19.1	0.04	72.9	0.018	0.016	0.022	0.02	36.5	0.203	0.308
227	18.9	August	5.31	32	207	81.7	-21.6	0.042	68.8	0.02	0.018	0.025	0.022	52.4	0.203	0.308
228	19	September	5.31	31.8	208	72.5	-21.1	0.051	55.6	0.02	0.017	0.026	0.021	86.4	0.203	0.309
229	19.1	October	5.31	31.88	208	70.1	-19.3	0.064	48.5	0.02	0.015	0.024	0.018	103.2	0.204	0.309
230	19.2	November	5.31	33.41	208	78	-18	0.079	45.5	0.019	0.014	0.023	0.017	105.7	0.204	0.31
231	19.3	December	5.31	197.2	229	80.8	-19.2	0.088	93.1	0.018	0.017	0.022	0.021	6.5	0.204	0.31
232	19.3	January	5.31	830.3	320	84.5	-18.5	0.091	93.1	0.018	0.018	0.022	0.021	8.8	0.204	0.31
233	19.4	February	5.31	739.3	378	85.1	-15.3	0.086	93.1	0.017	0.016	0.019	0.019	8.7	0.205	0.31
234	19.5	March	5.31	312.6	336	77.5	-14.1	0.08	45.4	0.018	0.012	0.021	0.014	168	0.205	0.311
235	19.6	April	5.31	21.2	186	70.6	-15.3	0.067	47.5	0.016	0.012	0.021	0.015	73.7	0.206	0.311
236	19.7	May	5.31	24.95	192	65.7	-16.2	0.056	52.3	0.017	0.013	0.021	0.016	69.2	0.206	0.312
237	19.8	June	5.32	28.61	198	67.5	-16.9	0.047	61.1	0.017	0.014	0.021	0.017	54.9	0.206	0.312
238	19.8	July	5.32	31.29	204	75.2	-19.1	0.04	72.9	0.018	0.016	0.022	0.02	38.1	0.206	0.312
239	19.9	August	5.32	32	207	81.7	-21.6	0.042	68.7	0.02	0.018	0.025	0.022	54.6	0.207	0.313
240	20	September	5.32	31.8	208	72.5	-21.1	0.051	55.6	0.02	0.017	0.026	0.021	89.9	0.207	0.313
															0.207	


Predicted Faulting
Faulting, in
0.00
0.05
0.10
0.15
0.20
0.25
0.30
0.35
Pavement age, years
0
2
4
6
8
10
12
14
16
18
20
22
Faulting
Faulting at specified reliability
Faulting Limit

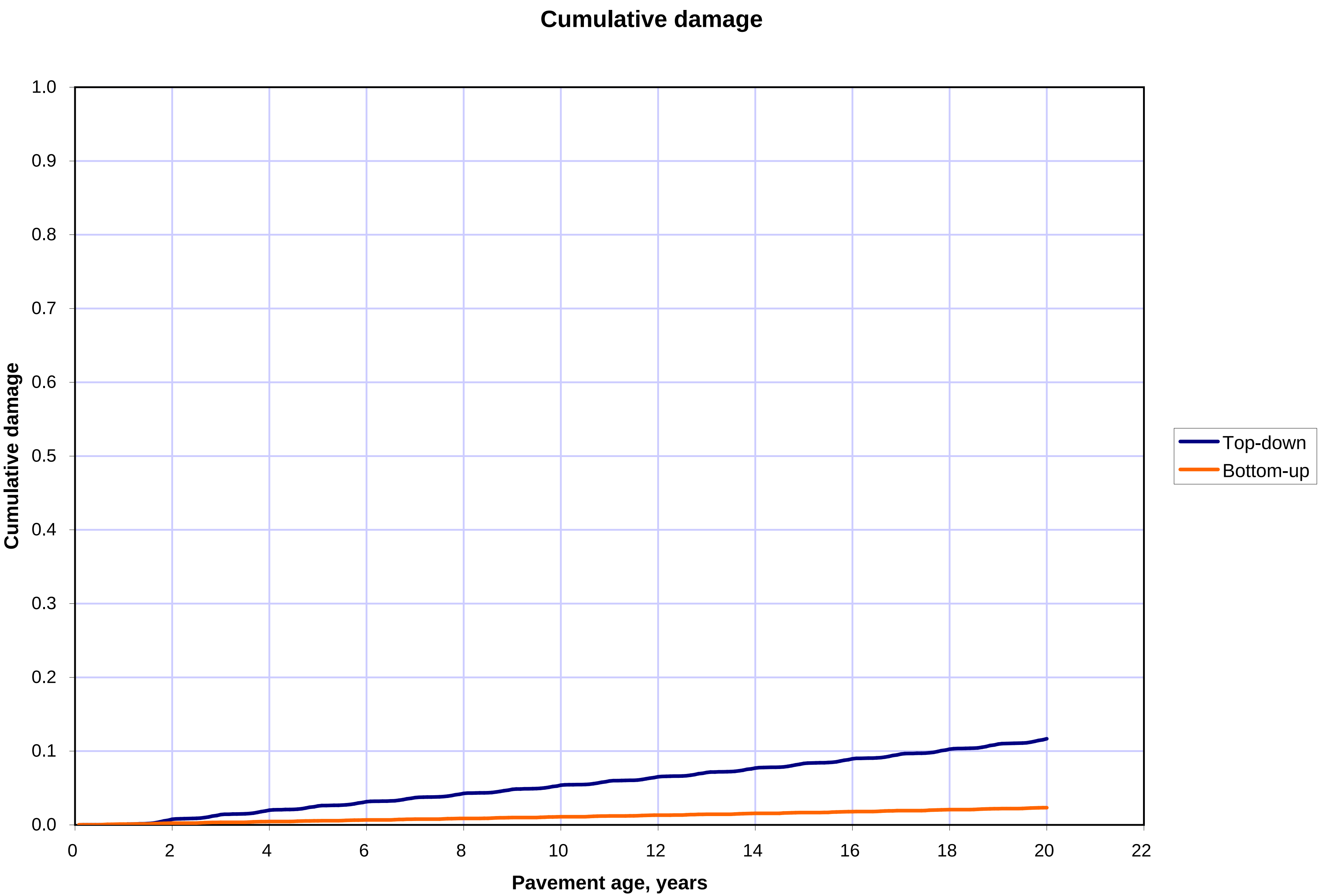
Predicted cracking: Project mepdg-pcc

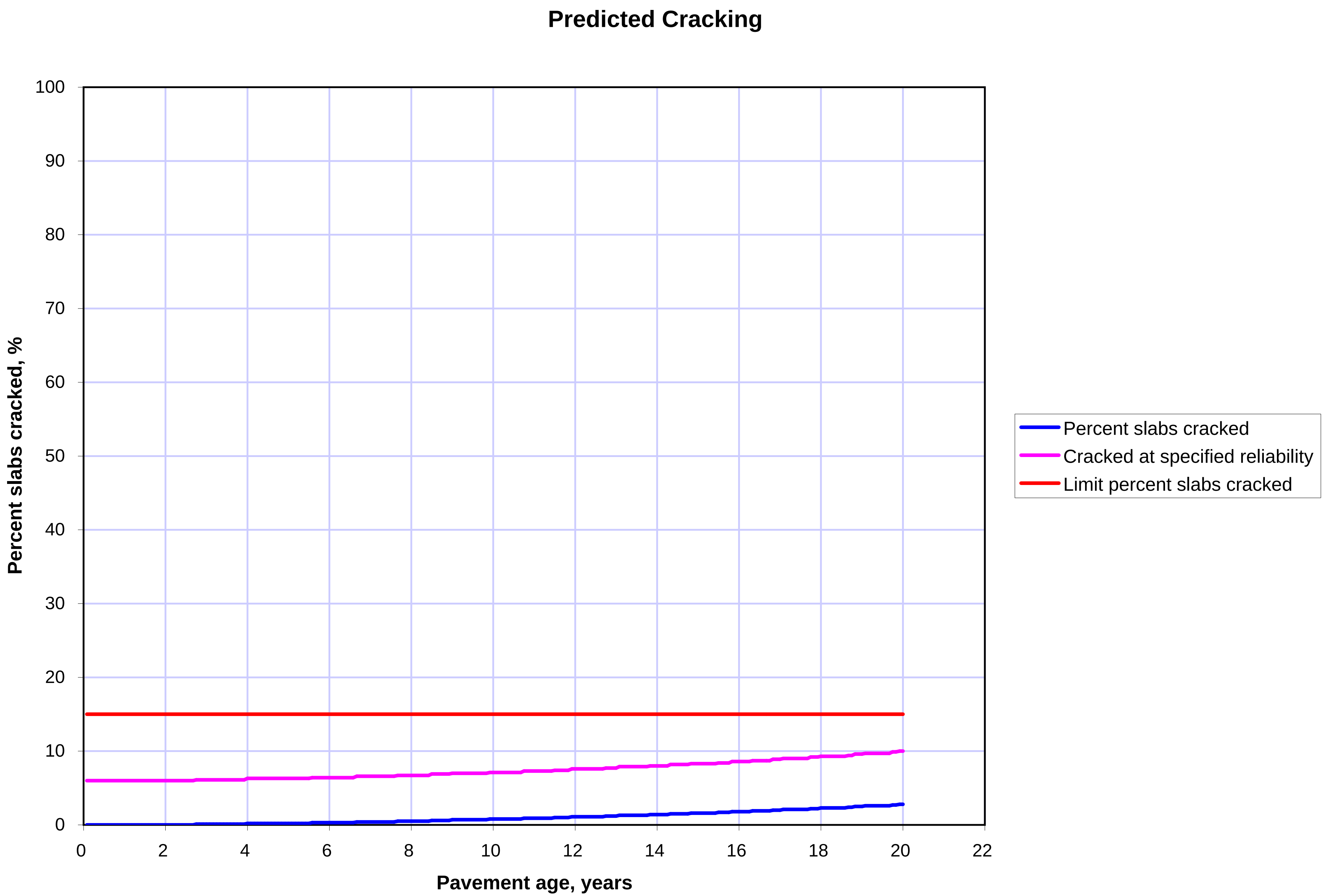
Pavement age			PCC		Base	Dyn.	Cumulative Fatigue Damage									Percent	Cracked at
			MR	E	E	k	Bottom-up					Top-down				slabs	specified
mo	yr	Month	psi	Mpsi	ksi	psi/in	Single	Tandem	Tridem	Quad	Total	S WB	M WB	L WB	Total	cracked	reliability
1	0.08	October	705	4.5	31.9	208	0	0	0	0	0.0001	0	0	0	0	**0**	6
2	0.17	November	724	4.62	33.4	208	0	0	0	0	0.0001	0	0	0	0.0001	**0**	6
3	0.25	December	736	4.69	197.2	229	0	0	0	0	0.0001	0	0	0	0.0001	**0**	6
4	0.33	January	744	4.75	830.3	320	0	0	0	0	0.0001	0	0	0	0.0001	**0**	6
5	0.42	February	750	4.78	739.3	378	0	0	0	0	0.0001	0	0	0	0.0001	**0**	6
6	0.5	March	755	4.82	312.6	336	0	0	0	0	0.0001	0	0	0	0.0001	**0**	6
7	0.58	April	759	4.84	21.2	186	0.0002	0.0002	0	0	0.0004	0	0	0	0.0001	**0**	6
8	0.67	May	762	4.87	24.9	192	0.0003	0.0004	0	0	0.0007	0	0.0001	0	0.0001	**0**	6
9	0.75	June	766	4.89	28.6	198	0.0003	0.0004	0	0	0.0008	0	0.0001	0	0.0001	**0**	6
10	0.83	July	768	4.9	31.3	204	0.0004	0.0005	0.0001	0	0.0009	0	0.0001	0	0.0002	**0**	6
11	0.92	August	771	4.92	32	207	0.0005	0.0005	0.0001	0	0.0011	0.0001	0.0001	0	0.0002	**0**	6
12	1	September	773	4.93	31.8	208	0.0005	0.0006	0.0001	0	0.0011	0.0001	0.0001	0	0.0002	**0**	6
13	1.08	October	775	4.94	31.9	208	0.0005	0.0006	0.0001	0	0.0011	0.0002	0.0006	0.0002	0.001	**0**	6
14	1.17	November	776	4.95	33.4	208	0.0005	0.0006	0.0001	0	0.0011	0.0003	0.0006	0.0002	0.0011	**0**	6
15	1.25	December	778	4.96	197.2	229	0.0005	0.0006	0.0001	0	0.0012	0.0003	0.0008	0.0003	0.0013	**0**	6
16	1.33	January	779	4.97	830.3	320	0.0005	0.0006	0.0001	0	0.0012	0.0004	0.0008	0.0003	0.0015	**0**	6
17	1.42	February	780	4.98	739.3	378	0.0005	0.0006	0.0001	0	0.0012	0.0004	0.0009	0.0003	0.0016	**0**	6
18	1.5	March	782	4.99	312.6	336	0.0006	0.0006	0.0001	0	0.0013	0.0005	0.001	0.0003	0.0018	**0**	6
19	1.58	April	783	5	21.2	186	0.0007	0.0008	0.0001	0	0.0016	0.0006	0.0012	0.0004	0.0022	**0**	6
20	1.67	May	784	5.01	24.9	192	0.0008	0.001	0.0001	0	0.0019	0.0008	0.0017	0.0006	0.0031	**0**	6
21	1.75	June	786	5.01	28.6	198	0.0009	0.001	0.0001	0	0.002	0.001	0.0023	0.0008	0.0041	**0**	6
22	1.83	July	787	5.02	31.3	204	0.0009	0.0011	0.0001	0	0.0021	0.0014	0.003	0.001	0.0054	**0**	6
23	1.92	August	788	5.03	32	207	0.001	0.0012	0.0001	0	0.0023	0.0016	0.0035	0.0012	0.0063	**0**	6
24	2	September	790	5.04	31.8	208	0.001	0.0012	0.0001	0	0.0024	0.0019	0.0042	0.0015	0.0076	**0**	6
25	2.08	October	791	5.05	31.9	208	0.001	0.0012	0.0001	0	0.0024	0.002	0.0046	0.0016	0.0082	**0**	6
26	2.17	November	792	5.05	33.4	208	0.001	0.0012	0.0001	0	0.0024	0.0021	0.0046	0.0016	0.0083	**0**	6
27	2.25	December	792	5.06	197.2	229	0.001	0.0012	0.0001	0	0.0024	0.0021	0.0047	0.0016	0.0085	**0**	6
28	2.33	January	793	5.06	830.3	320	0.001	0.0012	0.0001	0	0.0024	0.0022	0.0048	0.0017	0.0086	**0**	6
29	2.42	February	794	5.07	739.3	378	0.001	0.0013	0.0001	0	0.0024	0.0022	0.0048	0.0017	0.0087	**0**	6
30	2.5	March	795	5.07	312.6	336	0.0011	0.0013	0.0001	0	0.0025	0.0022	0.0049	0.0017	0.0089	**0**	6
31	2.58	April	795	5.08	21.2	186	0.0012	0.0015	0.0002	0	0.0028	0.0023	0.0051	0.0018	0.0092	**0**	6
32	2.67	May	796	5.08	24.9	192	0.0013	0.0016	0.0002	0	0.003	0.0025	0.0055	0.0019	0.0099	**0**	6
33	2.75	June	797	5.09	28.6	198	0.0013	0.0016	0.0002	0	0.0032	0.0027	0.0061	0.0021	0.0108	**0.1**	6.1
34	2.83	July	798	5.09	31.3	204	0.0014	0.0017	0.0002	0	0.0033	0.003	0.0067	0.0023	0.012	**0.1**	6.1
35	2.92	August	798	5.09	32	207	0.0015	0.0018	0.0002	0	0.0034	0.0032	0.0071	0.0025	0.0128	**0.1**	6.1
36	3	September	799	5.1	31.8	208	0.0015	0.0018	0.0002	0	0.0035	0.0035	0.0078	0.0027	0.0139	**0.1**	6.1
37	3.08	October	800	5.1	31.9	208	0.0015	0.0018	0.0002	0	0.0035	0.0036	0.0081	0.0028	0.0144	**0.1**	6.1
38	3.17	November	800	5.11	33.4	208	0.0015	0.0018	0.0002	0	0.0035	0.0036	0.0081	0.0028	0.0145	**0.1**	6.1
39	3.25	December	801	5.11	197.2	229	0.0015	0.0018	0.0002	0	0.0035	0.0037	0.0082	0.0028	0.0147	**0.1**	6.1
40	3.33	January	801	5.12	830.3	320	0.0015	0.0018	0.0002	0	0.0035	0.0037	0.0083	0.0029	0.0148	**0.1**	6.1
41	3.42	February	802	5.12	739.3	378	0.0015	0.0018	0.0002	0	0.0036	0.0037	0.0083	0.0029	0.0149	**0.1**	6.1
42	3.5	March	802	5.12	312.6	336	0.0015	0.0019	0.0002	0	0.0036	0.0037	0.0084	0.0029	0.0151	**0.1**	6.1
43	3.58	April	803	5.12	21.2	186	0.0017	0.002	0.0002	0	0.0039	0.0038	0.0086	0.003	0.0154	**0.1**	6.1
44	3.67	May	803	5.13	24.9	192	0.0018	0.0021	0.0002	0	0.0041	0.004	0.009	0.0031	0.016	**0.1**	6.1
45	3.75	June	804	5.13	28.6	198	0.0018	0.0022	0.0002	0	0.0043	0.0042	0.0095	0.0033	0.0169	**0.1**	6.1
46	3.83	July	804	5.13	31.3	204	0.0019	0.0023	0.0003	0	0.0044	0.0045	0.0101	0.0035	0.018	**0.1**	6.1
47	3.92	August	804	5.13	32	207	0.0019	0.0023	0.0003	0	0.0045	0.0047	0.0105	0.0036	0.0188	**0.1**	6.1
48	4	September	805	5.14	31.8	208	0.0019	0.0024	0.0003	0	0.0046	0.0049	0.0111	0.0038	0.0199	**0.2**	6.3
49	4.08	October	805	5.14	31.9	208	0.002	0.0024	0.0003	0	0.0046	0.0051	0.0114	0.0039	0.0204	**0.2**	6.3
50	4.17	November	805	5.14	33.4	208	0.002	0.0024	0.0003	0	0.0046	0.0051	0.0115	0.0039	0.0205	**0.2**	6.3
51	4.25	December	806	5.14	197.2	229	0.002	0.0024	0.0003	0	0.0046	0.0051	0.0116	0.004	0.0206	**0.2**	6.3
52	4.33	January	806	5.14	830.3	320	0.002	0.0024	0.0003	0	0.0046	0.0051	0.0116	0.004	0.0208	**0.2**	6.3
53	4.42	February	806	5.15	739.3	378	0.002	0.0024	0.0003	0	0.0046	0.0052	0.0117	0.004	0.0208	**0.2**	6.3
54	4.5	March	807	5.15	312.6	336	0.002	0.0024	0.0003	0	0.0047	0.0052	0.0118	0.004	0.021	**0.2**	6.3
55	4.58	April	807	5.15	21.2	186	0.0021	0.0026	0.0003	0	0.005	0.0053	0.0119	0.0041	0.0213	**0.2**	6.3
56	4.67	May	807	5.15	24.9	192	0.0022	0.0027	0.0003	0	0.0052	0.0054	0.0123	0.0042	0.022	**0.2**	6.3
57	4.75	June	808	5.15	28.6	198	0.0023	0.0028	0.0003	0	0.0053	0.0056	0.0128	0.0044	0.0228	**0.2**	6.3
58	4.83	July	808	5.16	31.3	204	0.0023	0.0028	0.0003	0	0.0054	0.0059	0.0134	0.0046	0.0239	**0.2**	6.3
59	4.92	August	808	5.16	32	207	0.0024	0.0029	0.0003	0	0.0056	0.0061	0.0138	0.0047	0.0246	**0.2**	6.3
60	5	September	809	5.16	31.8	208	0.0024	0.0029	0.0003	0	0.0056	0.0064	0.0144	0.0049	0.0257	**0.2**	6.3
61	5.08	October	809	5.16	31.9	208	0.0024	0.0029	0.0003	0	0.0057	0.0065	0.0147	0.005	0.0262	**0.2**	6.3
62	5.17	November	809	5.16	33.4	208	0.0024	0.0029	0.0003	0	0.0057	0.0065	0.0147	0.0051	0.0263	**0.2**	6.3
63	5.25	December	809	5.17	197.2	229	0.0024	0.0029	0.0003	0	0.0057	0.0065	0.0148	0.0051	0.0264	**0.2**	6.3
64	5.33	January	810	5.17	830.3	320	0.0024	0.0029	0.0003	0	0.0057	0.0066	0.0149	0.0051	0.0266	**0.2**	6.3
65	5.42	February	810	5.17	739.3	378	0.0024	0.003	0.0003	0	0.0057	0.0066	0.0149	0.0051	0.0266	**0.2**	6.3
66	5.5	March	810	5.17	312.6	336	0.0024	0.003	0.0003	0	0.0058	0.0066	0.015	0.0052	0.0268	**0.2**	6.3
67	5.58	April	811	5.17	21.2	186	0.0026	0.0031	0.0004	0	0.0061	0.0067	0.0152	0.0052	0.0271	**0.3**	6.4
68	5.67	May	811	5.17	24.9	192	0.0027	0.0032	0.0004	0	0.0063	0.0068	0.0156	0.0053	0.0277	**0.3**	6.4
69	5.75	June	811	5.18	28.6	198	0.0027	0.0033	0.0004	0	0.0064	0.007	0.016	0.0055	0.0286	**0.3**	6.4
70	5.83	July	811	5.18	31.3	204	0.0028	0.0034	0.0004	0	0.0065	0.0073	0.0166	0.0057	0.0296	**0.3**	6.4
71	5.92	August	812	5.18	32	207	0.0028	0.0034	0.0004	0	0.0066	0.0075	0.017	0.0058	0.0304	**0.3**	6.4
72	6	September	812	5.18	31.8	208	0.0028	0.0035	0.0004	0	0.0067	0.0077	0.0176	0.006	0.0314	**0.3**	6.4
73	6.08	October	812	5.18	31.9	208	0.0028	0.0035	0.0004	0	0.0067	0.0078	0.0179	0.0061	0.0319	**0.3**	6.4

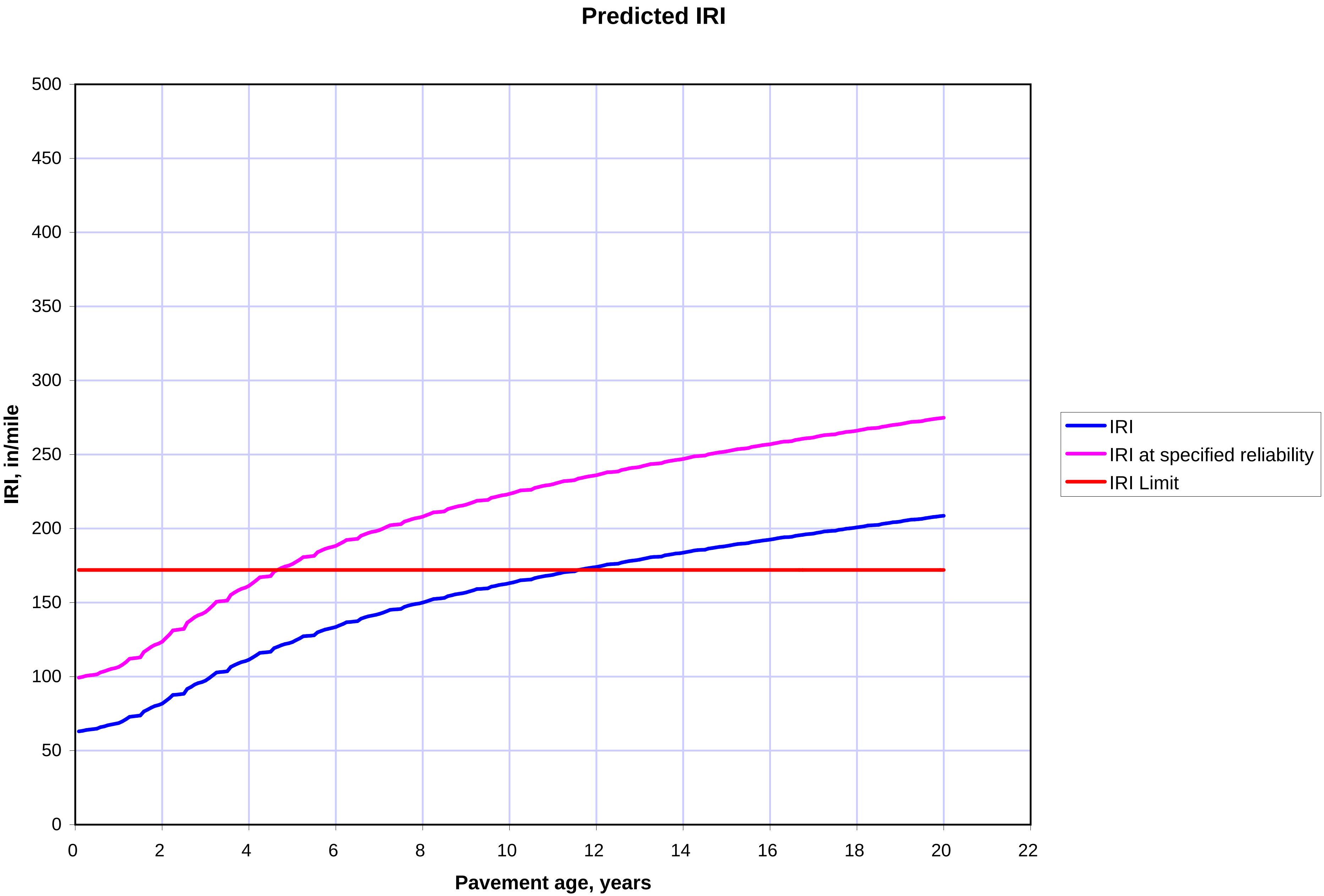
74	6.17	November	813	5.19	33.4	208	0.0028	0.0035	0.0004	0	0.0067	0.0079	0.018	0.0061	0.032	**0.3**	6.4
75	6.25	December	813	5.19	197.2	229	0.0029	0.0035	0.0004	0	0.0067	0.0079	0.018	0.0062	0.0321	**0.3**	6.4
76	6.33	January	813	5.19	830.3	320	0.0029	0.0035	0.0004	0	0.0067	0.0079	0.0181	0.0062	0.0322	**0.3**	6.4
77	6.42	February	813	5.19	739.3	378	0.0029	0.0035	0.0004	0	0.0068	0.0079	0.0181	0.0062	0.0323	**0.3**	6.4
78	6.5	March	814	5.19	312.6	336	0.0029	0.0035	0.0004	0	0.0068	0.008	0.0182	0.0062	0.0325	**0.3**	6.4
79	6.58	April	814	5.19	21.2	186	0.003	0.0037	0.0004	0	0.0071	0.0081	0.0184	0.0063	0.0327	**0.3**	6.4
80	6.67	May	814	5.19	24.9	192	0.0031	0.0038	0.0004	0	0.0073	0.0082	0.0188	0.0064	0.0334	**0.4**	6.6
81	6.75	June	814	5.2	28.6	198	0.0032	0.0039	0.0004	0	0.0074	0.0084	0.0192	0.0066	0.0342	**0.4**	6.6
82	6.83	July	815	5.2	31.3	204	0.0032	0.0039	0.0004	0	0.0076	0.0087	0.0198	0.0068	0.0353	**0.4**	6.6
83	6.92	August	815	5.2	32	207	0.0033	0.004	0.0005	0	0.0077	0.0088	0.0202	0.0069	0.036	**0.4**	6.6
84	7	September	815	5.2	31.8	208	0.0033	0.004	0.0005	0	0.0078	0.0091	0.0208	0.0071	0.037	**0.4**	6.6
85	7.08	October	815	5.2	31.9	208	0.0033	0.004	0.0005	0	0.0078	0.0092	0.0211	0.0072	0.0375	**0.4**	6.6
86	7.17	November	816	5.2	33.4	208	0.0033	0.004	0.0005	0	0.0078	0.0092	0.0211	0.0072	0.0376	**0.4**	6.6
87	7.25	December	816	5.21	197.2	229	0.0033	0.004	0.0005	0	0.0078	0.0093	0.0212	0.0072	0.0377	**0.4**	6.6
88	7.33	January	816	5.21	830.3	320	0.0033	0.004	0.0005	0	0.0078	0.0093	0.0213	0.0073	0.0378	**0.4**	6.6
89	7.42	February	816	5.21	739.3	378	0.0033	0.0041	0.0005	0	0.0078	0.0093	0.0213	0.0073	0.0379	**0.4**	6.6
90	7.5	March	816	5.21	312.6	336	0.0033	0.0041	0.0005	0	0.0079	0.0093	0.0214	0.0073	0.0381	**0.4**	6.6
91	7.58	April	817	5.21	21.2	186	0.0035	0.0042	0.0005	0	0.0082	0.0094	0.0216	0.0074	0.0383	**0.4**	6.6
92	7.67	May	817	5.21	24.9	192	0.0035	0.0043	0.0005	0	0.0084	0.0096	0.0219	0.0075	0.039	**0.5**	6.7
93	7.75	June	817	5.21	28.6	198	0.0036	0.0044	0.0005	0	0.0085	0.0098	0.0224	0.0076	0.0398	**0.5**	6.7
94	7.83	July	817	5.22	31.3	204	0.0036	0.0045	0.0005	0	0.0086	0.01	0.023	0.0078	0.0408	**0.5**	6.7
95	7.92	August	817	5.22	32	207	0.0037	0.0045	0.0005	0	0.0088	0.0102	0.0234	0.008	0.0416	**0.5**	6.7
96	8	September	818	5.22	31.8	208	0.0037	0.0046	0.0005	0	0.0088	0.0104	0.024	0.0082	0.0426	**0.5**	6.7
97	8.08	October	818	5.22	31.9	208	0.0037	0.0046	0.0005	0	0.0088	0.0105	0.0243	0.0083	0.0431	**0.5**	6.7
98	8.17	November	818	5.22	33.4	208	0.0037	0.0046	0.0005	0	0.0088	0.0106	0.0243	0.0083	0.0431	**0.5**	6.7
99	8.25	December	818	5.22	197.2	229	0.0037	0.0046	0.0005	0	0.0088	0.0106	0.0244	0.0083	0.0433	**0.5**	6.7
100	8.33	January	818	5.22	830.3	320	0.0037	0.0046	0.0005	0	0.0088	0.0106	0.0245	0.0083	0.0434	**0.5**	6.7
101	8.42	February	819	5.22	739.3	378	0.0038	0.0046	0.0005	0	0.0089	0.0106	0.0245	0.0083	0.0435	**0.5**	6.7
102	8.5	March	819	5.23	312.6	336	0.0038	0.0046	0.0005	0	0.0089	0.0107	0.0246	0.0084	0.0436	**0.6**	6.9
103	8.58	April	819	5.23	21.2	186	0.0039	0.0048	0.0005	0	0.0092	0.0107	0.0247	0.0084	0.0439	**0.6**	6.9
104	8.67	May	819	5.23	24.9	192	0.004	0.0049	0.0006	0	0.0095	0.0109	0.0251	0.0086	0.0446	**0.6**	6.9
105	8.75	June	819	5.23	28.6	198	0.004	0.005	0.0006	0	0.0096	0.0111	0.0256	0.0087	0.0454	**0.6**	6.9
106	8.83	July	820	5.23	31.3	204	0.0041	0.005	0.0006	0	0.0097	0.0113	0.0262	0.0089	0.0464	**0.6**	6.9
107	8.92	August	820	5.23	32	207	0.0042	0.0051	0.0006	0	0.0098	0.0115	0.0266	0.009	0.0471	**0.6**	6.9
108	9	September	820	5.23	31.8	208	0.0042	0.0051	0.0006	0	0.0099	0.0118	0.0272	0.0092	0.0482	**0.7**	7
109	9.08	October	820	5.23	31.9	208	0.0042	0.0051	0.0006	0	0.0099	0.0119	0.0274	0.0093	0.0486	**0.7**	7
110	9.17	November	820	5.23	33.4	208	0.0042	0.0051	0.0006	0	0.0099	0.0119	0.0275	0.0093	0.0487	**0.7**	7
111	9.25	December	820	5.24	197.2	229	0.0042	0.0051	0.0006	0	0.0099	0.0119	0.0276	0.0094	0.0489	**0.7**	7
112	9.33	January	821	5.24	830.3	320	0.0042	0.0051	0.0006	0	0.0099	0.012	0.0276	0.0094	0.049	**0.7**	7
113	9.42	February	821	5.24	739.3	378	0.0042	0.0052	0.0006	0	0.01	0.012	0.0277	0.0094	0.0491	**0.7**	7
114	9.5	March	821	5.24	312.6	336	0.0042	0.0052	0.0006	0	0.01	0.012	0.0278	0.0094	0.0492	**0.7**	7
115	9.58	April	821	5.24	21.2	186	0.0044	0.0054	0.0006	0	0.0103	0.0121	0.0279	0.0095	0.0495	**0.7**	7
116	9.67	May	821	5.24	24.9	192	0.0045	0.0055	0.0006	0	0.0105	0.0122	0.0283	0.0096	0.0501	**0.7**	7
117	9.75	June	821	5.24	28.6	198	0.0045	0.0055	0.0006	0	0.0107	0.0124	0.0288	0.0098	0.051	**0.7**	7
118	9.83	July	822	5.24	31.3	204	0.0046	0.0056	0.0006	0	0.0108	0.0127	0.0294	0.01	0.052	**0.7**	7
119	9.92	August	822	5.24	32	207	0.0046	0.0057	0.0006	0	0.0109	0.0129	0.0298	0.0101	0.0527	**0.8**	7.1
120	10	September	822	5.24	31.8	208	0.0046	0.0057	0.0006	0	0.011	0.0131	0.0304	0.0103	0.0538	**0.8**	7.1
121	10.08	October	822	5.25	31.9	208	0.0046	0.0057	0.0006	0	0.011	0.0132	0.0306	0.0104	0.0543	**0.8**	7.1
122	10.17	November	822	5.25	33.4	208	0.0046	0.0057	0.0006	0	0.011	0.0132	0.0307	0.0104	0.0544	**0.8**	7.1
123	10.25	December	822	5.25	197.2	229	0.0046	0.0057	0.0006	0	0.011	0.0133	0.0308	0.0104	0.0545	**0.8**	7.1
124	10.33	January	822	5.25	830.3	320	0.0046	0.0057	0.0006	0	0.011	0.0133	0.0308	0.0105	0.0546	**0.8**	7.1
125	10.42	February	823	5.25	739.3	378	0.0047	0.0057	0.0006	0	0.011	0.0133	0.0309	0.0105	0.0547	**0.8**	7.1
126	10.5	March	823	5.25	312.6	336	0.0047	0.0058	0.0006	0	0.0111	0.0134	0.031	0.0105	0.0548	**0.8**	7.1
127	10.58	April	823	5.25	21.2	186	0.0048	0.0059	0.0007	0	0.0114	0.0134	0.0311	0.0106	0.0551	**0.8**	7.1
128	10.67	May	823	5.25	24.9	192	0.0049	0.006	0.0007	0	0.0116	0.0136	0.0315	0.0107	0.0558	**0.8**	7.1
129	10.75	June	823	5.25	28.6	198	0.005	0.0061	0.0007	0	0.0118	0.0138	0.032	0.0109	0.0566	**0.9**	7.3
130	10.83	July	823	5.25	31.3	204	0.005	0.0062	0.0007	0	0.0119	0.014	0.0326	0.0111	0.0577	**0.9**	7.3
131	10.92	August	823	5.25	32	207	0.0051	0.0062	0.0007	0	0.012	0.0142	0.033	0.0112	0.0584	**0.9**	7.3
132	11	September	823	5.26	31.8	208	0.0051	0.0063	0.0007	0	0.0121	0.0145	0.0336	0.0114	0.0595	**0.9**	7.3
133	11.08	October	824	5.26	31.9	208	0.0051	0.0063	0.0007	0	0.0121	0.0146	0.0339	0.0115	0.06	**0.9**	7.3
134	11.17	November	824	5.26	33.4	208	0.0051	0.0063	0.0007	0	0.0121	0.0146	0.0339	0.0115	0.06	**0.9**	7.3
135	11.25	December	824	5.26	197.2	229	0.0051	0.0063	0.0007	0	0.0121	0.0146	0.034	0.0115	0.0602	**0.9**	7.3
136	11.33	January	824	5.26	830.3	320	0.0051	0.0063	0.0007	0	0.0121	0.0147	0.0341	0.0116	0.0603	**0.9**	7.3
137	11.42	February	824	5.26	739.3	378	0.0051	0.0063	0.0007	0	0.0122	0.0147	0.0341	0.0116	0.0604	**0.9**	7.3
138	11.5	March	824	5.26	312.6	336	0.0052	0.0063	0.0007	0	0.0122	0.0147	0.0342	0.0116	0.0605	**1**	7.4
139	11.58	April	824	5.26	21.2	186	0.0053	0.0065	0.0007	0	0.0125	0.0148	0.0344	0.0117	0.0608	**1**	7.4
140	11.67	May	824	5.26	24.9	192	0.0054	0.0066	0.0007	0	0.0128	0.015	0.0348	0.0118	0.0615	**1**	7.4
141	11.75	June	825	5.26	28.6	198	0.0054	0.0067	0.0008	0	0.0129	0.0152	0.0353	0.0119	0.0624	**1**	7.4
142	11.83	July	825	5.26	31.3	204	0.0055	0.0068	0.0008	0	0.013	0.0154	0.0359	0.0122	0.0634	**1**	7.4
143	11.92	August	825	5.26	32	207	0.0056	0.0068	0.0008	0	0.0132	0.0156	0.0363	0.0123	0.0642	**1.1**	7.6
144	12	September	825	5.26	31.8	208	0.0056	0.0069	0.0008	0	0.0132	0.0158	0.0369	0.0125	0.0652	**1.1**	7.6
145	12.08	October	825	5.26	31.9	208	0.0056	0.0069	0.0008	0	0.0132	0.016	0.0372	0.0126	0.0657	**1.1**	7.6
146	12.17	November	825	5.27	33.4	208	0.0056	0.0069	0.0008	0	0.0132	0.016	0.0372	0.0126	0.0658	**1.1**	7.6
147	12.25	December	825	5.27	197.2	229	0.0056	0.0069	0.0008	0	0.0132	0.016	0.0373	0.0126	0.066	**1.1**	7.6
148	12.33	January	825	5.27	830.3	320	0.0056	0.0069	0.0008	0	0.0133	0.0161	0.0374	0.0127	0.0661	**1.1**	7.6
149	12.42	February	825	5.27	739.3	378	0.0056	0.0069	0.0008	0	0.0133	0.0161	0.0374	0.0127	0.0662	**1.1**	7.6
150	12.5	March	826	5.27	312.6	336	0.0056	0.0069	0.0008	0	0.0133	0.0161	0.0375	0.0127	0.0663	**1.1**	7.6
151	12.58	April	826	5.27	21.2	186	0.0058	0.0071	0.0008	0	0.0137	0.0162	0.0377	0.0128	0.0666	**1.1**	7.6

152	12.67	May	826	5.27	24.9	192	0.0059	0.0072	0.0008	0	0.0139	0.0163	0.0381	0.0129	0.0673	**1.1**	7.6
153	12.75	June	826	5.27	28.6	198	0.0059	0.0073	0.0008	0	0.014	0.0165	0.0386	0.0131	0.0682	**1.2**	7.7
154	12.83	July	826	5.27	31.3	204	0.006	0.0074	0.0008	0	0.0142	0.0168	0.0392	0.0133	0.0693	**1.2**	7.7
155	12.92	August	826	5.27	32	207	0.006	0.0074	0.0008	0	0.0143	0.017	0.0396	0.0134	0.07	**1.2**	7.7
156	13	September	826	5.27	31.8	208	0.0061	0.0075	0.0008	0	0.0144	0.0172	0.0403	0.0136	0.0711	**1.2**	7.7
157	13.08	October	826	5.27	31.9	208	0.0061	0.0075	0.0008	0	0.0144	0.0174	0.0406	0.0137	0.0716	**1.3**	7.9
158	13.17	November	826	5.27	33.4	208	0.0061	0.0075	0.0008	0	0.0144	0.0174	0.0406	0.0137	0.0717	**1.3**	7.9
159	13.25	December	826	5.27	197.2	229	0.0061	0.0075	0.0008	0	0.0144	0.0174	0.0407	0.0138	0.0719	**1.3**	7.9
160	13.33	January	827	5.27	830.3	320	0.0061	0.0075	0.0008	0	0.0144	0.0175	0.0408	0.0138	0.072	**1.3**	7.9
161	13.42	February	827	5.28	739.3	378	0.0061	0.0075	0.0008	0	0.0145	0.0175	0.0408	0.0138	0.0721	**1.3**	7.9
162	13.5	March	827	5.28	312.6	336	0.0061	0.0075	0.0008	0	0.0145	0.0175	0.0409	0.0138	0.0723	**1.3**	7.9
163	13.58	April	827	5.28	21.2	186	0.0063	0.0077	0.0009	0	0.0148	0.0176	0.0411	0.0139	0.0726	**1.3**	7.9
164	13.67	May	827	5.28	24.9	192	0.0064	0.0078	0.0009	0	0.0151	0.0177	0.0415	0.014	0.0733	**1.3**	7.9
165	13.75	June	827	5.28	28.6	198	0.0064	0.0079	0.0009	0	0.0152	0.018	0.042	0.0142	0.0741	**1.3**	7.9
166	13.83	July	827	5.28	31.3	204	0.0065	0.008	0.0009	0	0.0153	0.0182	0.0426	0.0144	0.0753	**1.4**	8
167	13.92	August	827	5.28	32	207	0.0065	0.0081	0.0009	0	0.0155	0.0184	0.0431	0.0146	0.076	**1.4**	8
168	14	September	827	5.28	31.8	208	0.0066	0.0081	0.0009	0	0.0156	0.0187	0.0437	0.0148	0.0771	**1.4**	8
169	14.08	October	827	5.28	31.9	208	0.0066	0.0081	0.0009	0	0.0156	0.0188	0.044	0.0149	0.0777	**1.4**	8
170	14.17	November	828	5.28	33.4	208	0.0066	0.0081	0.0009	0	0.0156	0.0188	0.0441	0.0149	0.0778	**1.4**	8
171	14.25	December	828	5.28	197.2	229	0.0066	0.0081	0.0009	0	0.0156	0.0189	0.0442	0.0149	0.0779	**1.4**	8
172	14.33	January	828	5.28	830.3	320	0.0066	0.0081	0.0009	0	0.0156	0.0189	0.0442	0.0149	0.0781	**1.5**	8.2
173	14.42	February	828	5.28	739.3	378	0.0066	0.0081	0.0009	0	0.0156	0.0189	0.0443	0.015	0.0781	**1.5**	8.2
174	14.5	March	828	5.28	312.6	336	0.0066	0.0082	0.0009	0	0.0157	0.0189	0.0444	0.015	0.0783	**1.5**	8.2
175	14.58	April	828	5.28	21.2	186	0.0068	0.0083	0.0009	0	0.0161	0.019	0.0445	0.015	0.0786	**1.5**	8.2
176	14.67	May	828	5.28	24.9	192	0.0069	0.0085	0.001	0	0.0163	0.0192	0.045	0.0152	0.0793	**1.5**	8.2
177	14.75	June	828	5.28	28.6	198	0.0069	0.0085	0.001	0	0.0164	0.0194	0.0455	0.0153	0.0802	**1.5**	8.2
178	14.83	July	828	5.29	31.3	204	0.007	0.0086	0.001	0	0.0166	0.0197	0.0461	0.0156	0.0814	**1.6**	8.3
179	14.92	August	828	5.29	32	207	0.007	0.0087	0.001	0	0.0167	0.0199	0.0466	0.0157	0.0822	**1.6**	8.3
180	15	September	828	5.29	31.8	208	0.0071	0.0087	0.001	0	0.0168	0.0201	0.0472	0.0159	0.0833	**1.6**	8.3
181	15.08	October	828	5.29	31.9	208	0.0071	0.0087	0.001	0	0.0168	0.0203	0.0475	0.016	0.0838	**1.6**	8.3
182	15.17	November	829	5.29	33.4	208	0.0071	0.0087	0.001	0	0.0168	0.0203	0.0476	0.0161	0.0839	**1.6**	8.3
183	15.25	December	829	5.29	197.2	229	0.0071	0.0088	0.001	0	0.0168	0.0203	0.0477	0.0161	0.0841	**1.6**	8.3
184	15.33	January	829	5.29	830.3	320	0.0071	0.0088	0.001	0	0.0168	0.0204	0.0478	0.0161	0.0842	**1.6**	8.3
185	15.42	February	829	5.29	739.3	378	0.0071	0.0088	0.001	0	0.0169	0.0204	0.0478	0.0161	0.0843	**1.6**	8.3
186	15.5	March	829	5.29	312.6	336	0.0071	0.0088	0.001	0	0.0169	0.0204	0.0479	0.0162	0.0845	**1.7**	8.4
187	15.58	April	829	5.29	21.2	186	0.0073	0.009	0.001	0	0.0173	0.0205	0.0481	0.0162	0.0848	**1.7**	8.4
188	15.67	May	829	5.29	24.9	192	0.0074	0.0091	0.001	0	0.0175	0.0207	0.0485	0.0164	0.0855	**1.7**	8.4
189	15.75	June	829	5.29	28.6	198	0.0074	0.0092	0.001	0	0.0177	0.0209	0.049	0.0165	0.0865	**1.7**	8.4
190	15.83	July	829	5.29	31.3	204	0.0075	0.0093	0.001	0	0.0178	0.0212	0.0497	0.0168	0.0876	**1.8**	8.6
191	15.92	August	829	5.29	32	207	0.0076	0.0094	0.001	0	0.018	0.0214	0.0502	0.0169	0.0884	**1.8**	8.6
192	16	September	829	5.29	31.8	208	0.0076	0.0094	0.0011	0	0.018	0.0216	0.0508	0.0171	0.0896	**1.8**	8.6
193	16.08	October	830	5.29	31.9	208	0.0076	0.0094	0.0011	0	0.0181	0.0218	0.0512	0.0172	0.0902	**1.8**	8.6
194	16.17	November	830	5.29	33.4	208	0.0076	0.0094	0.0011	0	0.0181	0.0218	0.0512	0.0173	0.0903	**1.8**	8.6
195	16.25	December	830	5.29	197.2	229	0.0076	0.0094	0.0011	0	0.0181	0.0218	0.0513	0.0173	0.0904	**1.8**	8.6
196	16.33	January	830	5.3	830.3	320	0.0076	0.0094	0.0011	0	0.0181	0.0219	0.0514	0.0173	0.0906	**1.9**	8.7
197	16.42	February	830	5.3	739.3	378	0.0076	0.0094	0.0011	0	0.0181	0.0219	0.0514	0.0173	0.0906	**1.9**	8.7
198	16.5	March	830	5.3	312.6	336	0.0077	0.0095	0.0011	0	0.0182	0.0219	0.0515	0.0174	0.0908	**1.9**	8.7
199	16.58	April	830	5.3	21.2	186	0.0078	0.0097	0.0011	0	0.0186	0.022	0.0517	0.0174	0.0911	**1.9**	8.7
200	16.67	May	830	5.3	24.9	192	0.0079	0.0098	0.0011	0	0.0188	0.0222	0.0522	0.0176	0.0919	**1.9**	8.7
201	16.75	June	830	5.3	28.6	198	0.008	0.0099	0.0011	0	0.019	0.0224	0.0527	0.0178	0.0928	**1.9**	8.7
202	16.83	July	830	5.3	31.3	204	0.008	0.0099	0.0011	0	0.0191	0.0227	0.0534	0.018	0.0941	**2**	8.9
203	16.92	August	830	5.3	32	207	0.0081	0.01	0.0011	0	0.0193	0.0229	0.0539	0.0181	0.0949	**2**	8.9
204	17	September	830	5.3	31.8	208	0.0081	0.0101	0.0011	0	0.0193	0.0232	0.0545	0.0184	0.0961	**2**	8.9
205	17.08	October	831	5.3	31.9	208	0.0081	0.0101	0.0011	0	0.0193	0.0233	0.0549	0.0185	0.0967	**2.1**	9
206	17.17	November	831	5.3	33.4	208	0.0081	0.0101	0.0011	0	0.0194	0.0233	0.0549	0.0185	0.0968	**2.1**	9
207	17.25	December	831	5.3	197.2	229	0.0082	0.0101	0.0011	0	0.0194	0.0234	0.055	0.0185	0.0969	**2.1**	9
208	17.33	January	831	5.3	830.3	320	0.0082	0.0101	0.0011	0	0.0194	0.0234	0.0551	0.0186	0.0971	**2.1**	9
209	17.42	February	831	5.3	739.3	378	0.0082	0.0101	0.0011	0	0.0194	0.0234	0.0552	0.0186	0.0972	**2.1**	9
210	17.5	March	831	5.3	312.6	336	0.0082	0.0101	0.0011	0	0.0195	0.0235	0.0553	0.0186	0.0973	**2.1**	9
211	17.58	April	831	5.3	21.2	186	0.0084	0.0103	0.0012	0	0.0199	0.0235	0.0555	0.0187	0.0977	**2.1**	9
212	17.67	May	831	5.3	24.9	192	0.0085	0.0105	0.0012	0	0.0201	0.0237	0.0559	0.0188	0.0984	**2.1**	9
213	17.75	June	831	5.3	28.6	198	0.0085	0.0106	0.0012	0	0.0203	0.024	0.0565	0.019	0.0994	**2.2**	9.2
214	17.83	July	831	5.3	31.3	204	0.0086	0.0106	0.0012	0	0.0204	0.0243	0.0572	0.0192	0.1007	**2.2**	9.2
215	17.92	August	831	5.31	32	207	0.0087	0.0107	0.0012	0	0.0206	0.0245	0.0577	0.0194	0.1015	**2.2**	9.2
216	18	September	831	5.31	31.8	208	0.0087	0.0108	0.0012	0	0.0207	0.0247	0.0584	0.0196	0.1027	**2.3**	9.3
217	18.08	October	832	5.31	31.9	208	0.0087	0.0108	0.0012	0	0.0207	0.0249	0.0587	0.0197	0.1033	**2.3**	9.3
218	18.17	November	832	5.31	33.4	208	0.0087	0.0108	0.0012	0	0.0207	0.0249	0.0588	0.0198	0.1035	**2.3**	9.3
219	18.25	December	832	5.31	197.2	229	0.0087	0.0108	0.0012	0	0.0207	0.025	0.0589	0.0198	0.1036	**2.3**	9.3
220	18.33	January	832	5.31	830.3	320	0.0087	0.0108	0.0012	0	0.0207	0.025	0.059	0.0198	0.1038	**2.3**	9.3
221	18.42	February	832	5.31	739.3	378	0.0087	0.0108	0.0012	0	0.0207	0.025	0.059	0.0198	0.1039	**2.3**	9.3
222	18.5	March	832	5.31	312.6	336	0.0088	0.0108	0.0012	0	0.0208	0.0251	0.0591	0.0199	0.104	**2.3**	9.3
223	18.58	April	832	5.31	21.2	186	0.0089	0.011	0.0012	0	0.0212	0.0251	0.0593	0.0199	0.1044	**2.3**	9.3
224	18.67	May	832	5.31	24.9	192	0.009	0.0112	0.0013	0	0.0215	0.0253	0.0598	0.0201	0.1052	**2.4**	9.4
225	18.75	June	832	5.31	28.6	198	0.0091	0.0113	0.0013	0	0.0216	0.0256	0.0603	0.0203	0.1062	**2.4**	9.4
226	18.83	July	832	5.31	31.3	204	0.0092	0.0113	0.0013	0	0.0218	0.0259	0.0611	0.0205	0.1075	**2.5**	9.6
227	18.92	August	832	5.31	32	207	0.0092	0.0114	0.0013	0	0.022	0.0261	0.0616	0.0207	0.1084	**2.5**	9.6
228	19	September	833	5.31	31.8	208	0.0093	0.0115	0.0013	0	0.022	0.0264	0.0623	0.0209	0.1096	**2.5**	9.6
229	19.08	October	833	5.31	31.9	208	0.0093	0.0115	0.0013	0	0.0221	0.0265	0.0627	0.0211	0.1102	**2.6**	9.7

230	19.17	November	833	5.31	33.4	208	0.0093	0.0115	0.0013	0	0.0221	0.0266	0.0627	0.0211	0.1103	**2.6**	9.7
231	19.25	December	833	5.31	197.2	229	0.0093	0.0115	0.0013	0	0.0221	0.0266	0.0628	0.0211	0.1105	**2.6**	9.7
232	19.33	January	833	5.32	830.3	320	0.0093	0.0115	0.0013	0	0.0221	0.0266	0.0629	0.0211	0.1107	**2.6**	9.7
233	19.42	February	833	5.32	739.3	378	0.0093	0.0115	0.0013	0	0.0221	0.0266	0.063	0.0212	0.1108	**2.6**	9.7
234	19.5	March	833	5.32	312.6	336	0.0093	0.0116	0.0013	0	0.0222	0.0267	0.0631	0.0212	0.111	**2.6**	9.7
235	19.58	April	833	5.32	21.2	186	0.0095	0.0118	0.0013	0	0.0226	0.0268	0.0633	0.0213	0.1113	**2.6**	9.7
236	19.67	May	833	5.32	24.9	192	0.0096	0.0119	0.0013	0	0.0229	0.027	0.0637	0.0214	0.1121	**2.6**	9.7
237	19.75	June	833	5.32	28.6	198	0.0097	0.012	0.0013	0	0.023	0.0272	0.0643	0.0216	0.1132	**2.7**	9.9
238	19.83	July	834	5.32	31.3	204	0.0098	0.0121	0.0014	0	0.0232	0.0275	0.0651	0.0219	0.1145	**2.7**	9.9
239	19.92	August	834	5.32	32	207	0.0098	0.0122	0.0014	0	0.0234	0.0278	0.0656	0.022	0.1154	**2.8**	10
240	20	September	834	5.32	31.8	208	0.0099	0.0122	0.0014	0	0.0234	0.0281	0.0664	0.0223	0.1167	**2.8**	10
											0.0234				**0.1167**		


Cumulative damage
Cumulative damage
Pavement age, years
Top-down
Bottom-up
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1.0
0
2
4
6
8
10
12
14
16
18
20
22


Predicted Cracking
Percent slabs cracked, %
100
90
80
70
60
50
40
30
20
10
0
0
2
4
6
8
10
12
14
16
18
20
22
Pavement age, years
Percent slabs cracked
Cracked at specified reliability
Limit percent slabs cracked


Predicted IRI
IRI, in/mile
500
450
400
350
300
250
200
150
100
50
0
0
2
4
6
8
10
12
14
16
18
20
22
Pavement age, years
IRI
IRI at specified reliability
IRI Limit