# Northwest General Aviation

# Airfield Pavement

# Performance Equations

by
Stephen L. Alm



A report submitted in partial fulfillment
of the requirement for the degree of

Master of Science in Engineering

University of Washington
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# 1.0 Introduction

## 1.1 Introduction

Budgets for all forms of airfield construction, including maintenance and rehabilitation, continue to dwindle. With this decrease, the importance of managing existing pavement assets becomes increasingly significant. Airport managers often tend to delay pavement maintenance and rehabilitation without analyzing, or sometimes realizing, the effects of such decisions on future maintenance and rehabilitation costs. One of the most important steps to overcoming this potential problem is the emplacement of an effective pavement management system (PMS). A pavement management system is defined as "a set of tools or methods that can assist decision-makers in finding cost effective strategies for providing, evaluating and maintaining pavements in a serviceable condition."[3] A quality pavement management system provides critical information required for airport managers to properly analyze the structures under their purview. From this analysis, the airport manager can determine maintenance and rehabilitation requirements, project priorities, and can conduct more efficient long-term planning.

## 1.2 Prediction Modeling

Regularly scheduled pavement condition inspection is probably the most important aspect for implementing a comprehensive management program. These inspections involve "dividing the pavement network into logical segments, recording descriptive segment inventory data, and collecting pavement performance information relating to these segments."[7] From the data collected during these surveys, the progressive deterioration of the pavement can be reviewed. The major benefit is the use of this data to predict future pavement performance.

There are numerous tools used to predict pavement performance. Of these tools, the most widely used are mathematical models derived using regression analysis. The purpose of this paper is to utilize regression analysis to create mathematical models that will predict pavement life for the majority of general aviation airports in the Pacific Northwest. These models will provide an additional tool which may be used by airport managers to improve their information base and enhance their decision making methods.

As mentioned briefly above, a pavement management system allows the airport manager to make informed decisions on the most cost effective method of airfield maintenance. The use of performance modeling opens numerous areas that may contribute to an effective maintenance program. These areas include, but are not limited to:

- pavement life estimates,
- relative measures of rehabilitation effectiveness,
- life-cycle costing,
- general design decisions,
- planning decisions, and
- budget programming.

With the added knowledge obtained from this data, the airport manager can more easily face the challenges of working with limited capital. Maintenance and rehabilitation timing, pavement type, repair type, and overall design will be influenced by the pavement models.

Little research has been done in the area of regression modeling when dealing with general aviation airfield pavements. The issue was not a high priority for airport managers and little data existed. Over the last decade, however, the Federal Aviation Administration (FAA) began conducting pavement surveys utilizing the Pavement Condition Index (PCI) rating system. This collection of data has allowed the initiation of a database. Over time, if faithfully maintained and updated, this database will provide a wealth of information for use in increasingly better regression modeling.

## 1.3 Past Research

Two people have made an effort to develop comprehensive regression models based upon PCI data collected from the majority of general aviation airports in the Pacific Northwest. The first of these was LT Kim Weisenberger, Civil Engineer Corps, United States Navy, who began the initial statistical evaluation in 1988 utilizing the first sets of PCI data.[10] Unfortunately, most of the runways possessed data from only one survey. This meant that the regression models developed were not highly correlated and could not benefit airport managers to a great extent. It was, however, a significant first step in the development of an extensive database of PCI data for the general aviation airports in the Pacific Northwest. It also served to provide a strong foundation for future regression modeling work as the database expanded.

The second person to conduct research in this area was LT Christopher Floro, Civil Engineer Corps, United States Navy, who did so in 1992.[4] He took the results from Weisenberger's study a step further by adding an additional set of data points to the database. The goal was to utilize the same modeling techniques as in the previous study to confirm the validity of the methodology and regression equations developed. In this study, the data was not as comprehensive as in the first study. Several of the airports included in the original study did not have second surveys completed and were therefore omitted from the computations. The results of this study closely mimicked the original. Two data points per airport still did not provide regression models with accurate pavement performance predictions. Still further data would need to be collected. Once again, though, this study continued to expand and enhance the available database. The modeling foundation and methodology were further strengthened and the gate opened for the accomplishment of additional work.

### 1.4 Purpose

As mentioned above, it is the intention of this paper to assess runway deterioration rates. Only airfields common to the previous two studies will be reviewed in an effort to maintain data integrity. Similar procedures will be followed, only the regression analysis will be more in-depth. This paper's objectives are similar to Floro's[4]:

> 1) Provide pavement performance models (equations) and corresponding graphic representations that assist airport managers with their pavement management systems,
>
> 2) Demonstrate that properly utilized PCI data can help keep pavement rehabilitation and maintenance costs to a minimum, and
>
> 3) Provide a consolidated report containing pertinent and current data for use of the FAA and airport managers.

The above objectives will be addressed in the following chapters. Chapter Two will discuss research methodology and cover PCI survey techniques. Chapter Three consists of a thorough data review, analysis of the various pavement categories, and a summation of the report data from Weisenberger and Floro. Chapter Four contains the analysis of data applicable to this paper, equation development and pavement life calculations. A report summary, including summary and recommendations is included in Chapter Five.

# 2.0 Methodology

## 2.1 Introduction

As stated in Chapter One, this report will strive to develop regression models that will accurately represent the various pavements used in general aviation airfields. These models will provide a much needed enhancement to existing pavement management systems. The numerical and graphical outputs provided by these models will significantly improve the airport manager's ability to make sound maintenance, rehabilitation, design and life cycle costing decisions.

This study will try to establish correlations between various types of pavements used in airfield construction. Only flexible pavements and their repair/rehabilitation techniques will be evaluated. These include asphalt concrete pavements, asphalt concrete overlays, bituminous surface treatments, slurry seals and chip seals. PCC pavements will not be incorporated into this study.

The two major areas under consideration in this study are pavement LIFE and PCI versus AGE determinations. Pavement LIFE will be measured from the original construction date until the first maintenance treatment. This will help give a better idea of the durability and expected life cycle of a pavement. The PCI versus AGE data will lead to the pavement performance models. These determinations will also allow for a cursory overview of the performance of surface treatments and how they impact pavement life.

## 2.2 FAA, Advisory Circular 150/5380 - 6

In December 1982, the Federal Aviation Administration established Advisory Circular (AC) 150/5380-6, *Guidelines and Procedures for Maintenance of Airport Pavements*.[2] This publication accomplished two items of importance:

1) It outlined that a pavement management system was vital to maintaining airfield pavements in a cost effective manner, and

2) It outlined detailed procedures required for performing a Pavement Condition Index survey.

It is the latter of these items that directly concerns the development of regression models for pavement performance.

## 2.3 Pavement Condition Index Overview

The Pavement Condition Index rating system was developed by the U.S. Army Corps of Engineers to assess current pavement conditions.[10] The data obtained from this rating system provides interested parties with a wealth of information vital to an effective pavement management system. Three specific objectives for the condition survey are:[2]

1) To determine present condition of the pavement in terms of apparent structural integrity and operational surface condition.

2) To provide the FAA with a common index for comparing the condition and performance of pavements at all airports and also provide a rational basis for justification of pavement rehabilitation projects.

3) To provide feedback on pavement performance for validation and improvement of current pavement design, evaluation, and maintenance procedures.

By accomplishing these objectives, the rating system establishes a strong foundation upon which a pavement management system can be built.

The Pavement Condition Index rating survey is limited in its application, but effectively covers most areas in the airfield pavement realm. Only flexible pavements (those with conventional bituminous concrete surfaces) and jointed rigid pavements (jointed non-reinforced concrete pavements with joint spacing not exceeding 25 feet) fall into the survey categories. The survey consists mainly of a visual inspection of pavement surfaces for signs of distress. This distress may be caused by numerous factors, including: surface weathering, fatigue effects, poor drainage, differential settlement, or movement in the subbase over a time period. The survey assigns an index number ranging between 0 and 100 to the pavement structure. This number provides a reasonably objective and repeatable indication of the pavement condition.

Even though the PCI survey is fairly simple to conduct, it is often very time consuming, disruptive to airport operations and may be quite expensive. Although these factors may appear detrimental, the FAA has continued conducting rating surveys. With data in hand and the proper tools (performance models) available, airport managers will be able to better evaluate the progressive deterioration of pavements and have better insight into actual pavement life expectancies.

Appendix A provides a general overview of the procedures involved in actually conducting a PCI survey. The complete procedure is taken from Appendix A of FAA Advisory Circular 150/5380-6.[2]

### 2.4 Pavement Distress Related to PCI

The heart of the PCI rating system is the identification of pavement distress and its severity. These external signs or indicators indicate the deterioration of a pavement and can be associated with the probable causes of the failures or imperfections in the pavement system. There are several causal factors that relate to specific types of pavement distress. Pavement type, be it rigid or flexible, tends to influence the type of observed distress. Although each pavement type demonstrates its own characteristics, the distress manifestations will generally fall into one of the following broad categories[2]:

a) Cracking -- In PCC pavements cracks often result from stresses caused by contraction or warping of the pavement. Poor joint design and/or construction, overloading, and loss of subgrade support may also contribute to PCC cracking. Flexible pavement cracking is caused by deflection of the surface over an unstable foundation. Shrinkage of the surface, reflection cracking, and poorly constructed lane joints may also contribute.

b) Distortion -- Distortion occurs when the pavement surface changes from its original position. Foundation settlement, expansive soils, frost susceptibility, and poor subsurface drainage systems lead to distortion in PCC pavements. In asphalt pavements, distortion is caused by swelling soils or frost action in the subgrade, foundation settlement, poor bond between the surface and the underlying layer of the pavement structure, or lack of stability in the asphalt mix.

c) Disintegration -- The breaking up of a pavement into small, loose particles is referred to as disintegration. Improper curing and finishing, unsuitable aggregates, and improper mixing of the concrete cause disintegration in PCC pavements. Insufficient surface compaction, too little asphalt in the mix, or overheating of the mix will lead to disintegration of flexible pavements.

d) Skid Resistance -- The ability of a pavement to provide good friction characteristics under all weather conditions is a function of the pavement's surface texture or the build-up of contaminants. Polished aggregates and surface contaminants are the primary reasons for poor friction performance in PCC pavements. Too much asphalt, whether in the mix or from the prime coat, poor aggregate subject to wear, and the build-up of contaminants are the factors decreasing skid resistance in flexible pavements.

During the course of a rating survey, each feature of the pavement system is reviewed for signs of any of the aforementioned distress traits. Based upon the severity of the distress, each sample of the feature is assigned a "deduct value." These "deduct values" are totaled, adjusted, and subtracted from 100 to obtain the recorded PCI value.

## 2.5 Regression Analysis

There has been much mention of regression analysis to this point. What exactly is it though? When a relationship needs to be established between two or more variables, regression is the statistical tool that is used. In other words, regression analysis is used to generate an equation that will predict one variable from one or more other variables.[8] There are normally two variable types, dependent and independent. The variable being predicted (commonly "y") is referred to as the dependent variable while the variable used to predict (commonly "x") is the independent variable. This relationship between variables is rarely perfect. Therefore, an equation that minimizes the differences between the regression curve and the actual data is desirable. Usually a "least squares fit" method is utilized to provide the "best fit." Due to this variation, there are several parameters used to judge how well an equation "fits" the actual data. These parameters are[6]:

a) Coefficient of determination ($R^2$) -- This value explains how much of the total variation in the data is explained by the regression equation.

b) Root mean square error (RMSE) -- This is the standard deviation of the distribution of the predicted value "y" value for a specific value of "x".

c) Number of data points (N) -- Under most circumstances, the more data points used in developing the equation, the better the equation will be.

d) Hypothesis tests on regression constants (generally based on the t-statistic).

There are several different levels of regression modeling. The simplest of these is linear regression, with one independent variable. A simple linear model is very limited in its application however, so other forms will also be used in an effort to discover the most accurate model possible. These other methods include a power fit, exponential fit, WSDOT power fit, and logarithmic fit. Chapter Four will discuss the various equations in more detail and provide equation formats.

### 2.6 Modeling

There are four basic criteria that are important when developing reliable pavement models. The following are the specific criteria[1]:

a) an adequate database built from in-service pavements,

b) the inclusion of all variables that significantly affect pavement performance,

c) an adequate functional form of the model, and

d) a model that meets the proper statistical criteria for precision and accuracy (error of prediction, coefficient of determination ($R^2$), etc.)

The goal of modeling is to replicate past performance of a particular element based on variable input data.[10] The inputs to these models can range from the simple to the highly complex. This paper deals only with the more simple inputs. The PCI values utilized take into account the pavement's overall condition. Incorporated into these values are many of the extraneous factors that ideally should be separated out. These factors include climate, construction method, materials, traffic frequency, loading, time of construction, etc. The superficial inclusion of these items into the PCI value is the best available method until it is determined that a better database be developed. Until that time, the models developed during this research study are considered the most applicable based on the constraints. All of the aforementioned modeling criteria are met with the exception of "the inclusion of all variables that significantly affect pavement performance."

## 2.7 PCI vs. AGE Curves

As stated previously, the goal of this paper is to produce performance curves that best represent the anticipated performance of a specific pavement type. For purposes of this study, pavements with similar characteristics will be grouped together for analysis. Several different curve varieties will be applied to provide equations that will produce the information needed to successfully predict pavement performance.

The best way to understand this objective is to review an example curve demonstrating pavement performance. Figure 2.1 demonstrates a typical PCI vs. AGE curve common to many pavement types.

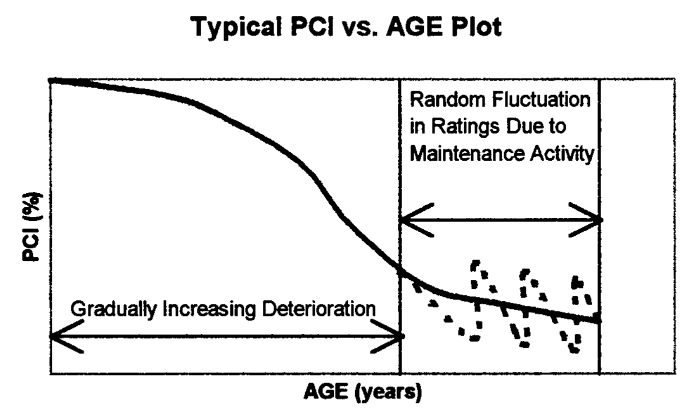


Figure 2.1 Typical PCI vs. AGE Plot[6]

From this figure, one is able to notice the gradual increase in deterioration of the pavement with age. This graph approaches an ideal representation of pavement behavior. As different regression models are used, each produces a unique curve. Figure 2.2 demonstrates some of the different curve possibilities.

Although all of the curves plotted in Figure 2.2 are variations on the Power Fit, they nonetheless serve to demonstrate how different equations will generate different curves. One can see that the PCI rating of the pavement decreases with age in each case, but the rate of decrease is dramatically altered depending upon the curve applied. Chapter Four will contain several plots using a variety of regression forms in an effort to find the best data fit.

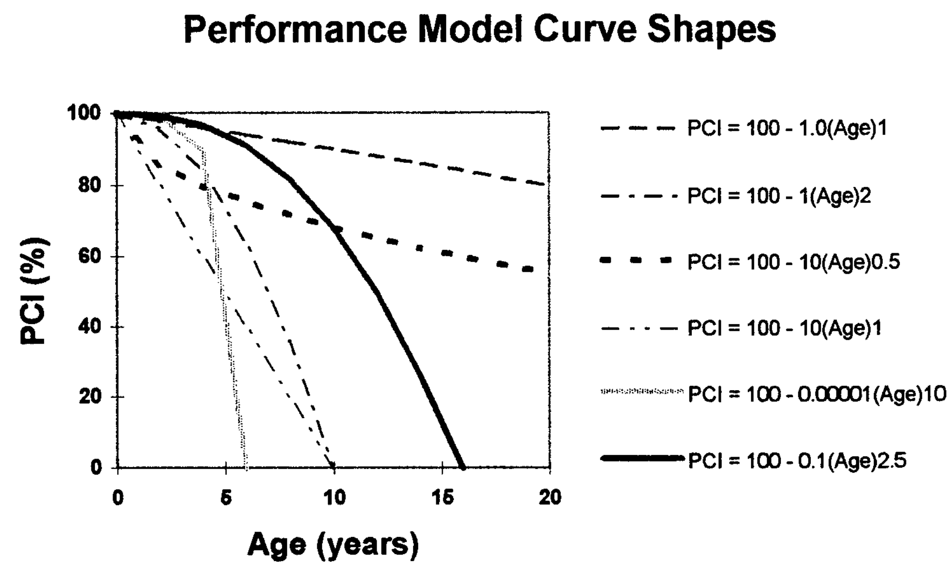


Figure 2.2 Performance Model Curve Shapes[6]

This paper's second objective is to examine the correlation between pavement structure and its estimated life. The LIFE of a pavement is defined as the length of time between original pavement construction and its first corrective or maintenance application. It is also the difference in time between maintenance applications. The LIFE measurements confirm the validity of the regression models by allowing comparison of the regression model results to the simple LIFE calculations.

Figure 2.3 depicts a typical straight line performance plot of a pavement with a constant asphalt thickness and varying base thickness. The plot demonstrates the effect of an increased base thickness on pavement life. This model could be used in several ways, but mainly it graphically illustrates various pavement life cycles. This information could be used to help determine the most cost effective solution.

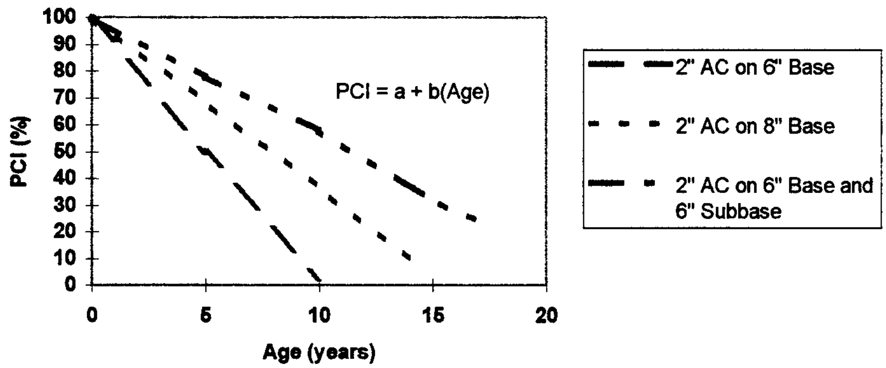


Figure 2.3 Example of PCI vs. AGE for flexible pavement with constant AC and vary base composition.[10]

### 2.8 The Pavement Condition Index Rating Scale

Figure 2.4 is a pictorial representation of the breakdown of the PCI rating scale. The left side depicts a numerical value achieved from the survey results. The right side of the diagram depicts a corresponding verbal rating.

The diagram indicates that pavement failure occurs when the PCI rating reaches 10%. The pavement is considered very poor between 10% and 25%. It is recommended, however, that pavements be rehabilitated or replaced when the PCI value reaches 55%.

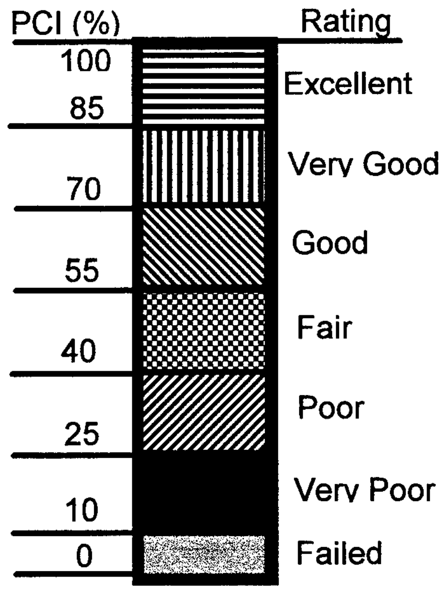


Figure 2.4 Airport Pavement Condition Index (PCI)
Rating Scale

It is important to point out the relationship between pavement condition index and pavement condition rating (PCR). PCR is typically used in highway performance rating. The Washington State Department of Transportation (WSDOT) replaced it in 1992 with the pavement structural condition, but PCR remains a valuable measurement of overall pavement condition.[6] The PCR system is similar to the PCI system. The outcome of a PCR survey is a numerical percentage. This percent does not correlate with the PCI percentages. The important point of note is that a pavement is considered at the end of its service life with a PCR value of 40. This value closely relates to the PCI value of 55%.

# 3.0 Data Review and Analysis

## 3.1 Introduction

The completion of this paper required a large amount of varied data. This chapter will discuss the source of this data, how it was categorized and why these categories were chosen. A review of Weisenberger's[10] 1988 results, Floro's[4] 1992 results, and current Federal Aviation Administration data is included for comparison purposes and as an outline of the process followed. Several tables listing the category of each airport are included in this chapter. They serve to illustrate the breakdown of the numerous runways incorporated into this study.

## 3.2 Data Source

A significant amount of data had to be reviewed and analyzed during the course of this study. Pavement Condition Index surveys from the majority of general aviation airports in Washington, Oregon and Idaho were reviewed for a variety of data inputs. Unfortunately, there has been a steady decline in the amount of data actually usable for the continuation of this modeling exercise. Table 3.1 demonstrates the decline of usable data from Weisenberger's[10] 1988 study to this 1996 study.

Table 3.1 Decline of data evaluated between studies

| *Study Year* | *Airports Evaluated* | *Runways Evaluated* |
|---|---|---|
| 1988 | 142 | 240 |
| 1992 | 120 | 202 |
| 1996 | 101 | 146 |

Although PCI surveys are conducted on all features (taxiways, aprons, runways, etc.) of an airport, only runways were considered for the purposes of this study. Runways tend to be the controlling pavement at any airfield. The higher speeds of operation, increased loading use, and higher stresses encountered tend to deteriorate runways faster than any other pavement feature.

The majority of data gathered for this study came from PCI surveys conducted over the last decade on general aviation runways in the Pacific Northwest. Appendixes B, C, and D contain actual Pavement Condition Index rating surveys from Washington, Oregon, and Idaho respectively. These surveys demonstrate the methodology used in each state and how that procedure varies. Idaho is the most unique in that it used the *MICROPAVER* computerized pavement management system in its last series of surveys. This system presents PCI data in a much different manner than the manual survey write-ups utilized by Washington and Oregon. Nonetheless, each survey contains a wide variety of pertinent information to include:

- **a)** original construction date
- **b)** maintenance history
- **c)** airport layout
- **d)** sample locations and areas
- **e)** types of pavement distress
- **f)** maintenance recommendations
- **g)** climate data
- **h)** trend conditions
- **i)** feature summaries

Much of the information obtained from these surveys was hard to interpolate. Many of the runways were constructed as far back as 1942, with little or no information contained in the maintenance history until the 1960's at the earliest. Even after pavement histories were being maintained, much of the included information was very sketchy. The terminology used is inconsistent, large gaps appear to exist in timing, and PCI results given do not correspond with normal pavement behavior. These factors were all taken into account when establishing the data categories.

As previously mentioned, PCI ratings are dependent upon various types of distress observed within the pavement structure being surveyed. Ideally, a modeling algorithm will attempt to correlate the PCI rating values to each type of distress found in the pavement. The significant data constraints in this project did not allow this technique to be feasible. Therefore, the PCI values used in this report deal only with the overall pavement rating.

The PCI rating survey, though useful, is by no means a definitive method of measuring pavement condition. A PCI survey is conducted manually by a pavement engineer. Each surveyor is trained by the same FAA office in an effort to ensure consistency and repeatability. The survey, however, still can be very subjective. For this reason, some of the PCI data points do not seem to follow normal pavement behavior. In fact, in a few surveys, the PCI rating increased over a three to four year time span even though no maintenance was documented on the pavement. This could be due to poor maintenance record keeping, but is most likely due to surveyor inconsistencies. All data collected is submitted to the FAA for review and approval. All data reviewed in this study have been blessed as acceptable by the FAA. With these factors taken into account, the data were accepted at face value and utilized as found. Runways that had data points increasing or contained unknowns were omitted from inclusion in the data base.

### 3.3 Review of 1988 and 1992 Data

Weisenberger[10] conducted the initial study developing regression models in 1988. His results were taken a step further by Floro[4] in 1992. There are numerous similarities in the difficulties encountered during the course of this study. Pavement histories are sketchy, data is inconsistent, and terminology is varied. Several assumptions were made in an effort to lend credibility to the data base.

To try and make comparison between these three studies easier, the pavements have been categorized in a similar manner. Unfortunately, the number of data points usable in the study has continually declined. The first study utilized one data point from each runway. PCI surveys were only available from 1986 and all runways involved had at least one survey done. The second study focused on utilizing two data points from each runway. Several of the airports did not have second surveys completed and several of the surveys were discounted due to inconsistent data results. Therefore, there were fewer runways available for the analysis. This paper's original focus was to examine runways with three data points. Once again, far fewer runways were available. In fact, the reduction appeared to possibly hinder further study. Taking this into consideration, it was determined that runways with two and three data points could be combined for purposes of the regression analysis. This would increase the available data as several of the airports discounted from the second study had since had new surveys completed, thereby adding a wider array of data.

The major difference in data categorization between the first two studies was in the area of BST pavements and surface maintenance applications. There were not enough data points to warrant a breakdown between single, double, and triple bituminous surface treatments and only slurry seal maintenance techniques were reviewed. In this study, categorization is identical to the second survey with all BST pavements combined. However, two forms of maintenance techniques were reviewed; slurry seals and chip seals.

Both of the previous studies generated regression equations using selected data from the PCI surveys available. The performance models developed were limited in their application due to the limited number of data points available, but provided a good approximation of pavement and maintenance treatment behavior. The models developed in both studies were not intended to be used as strict guidelines in assessing an individual pavement, but as a tool in evaluating various alternatives. A complete comparison will be conducted in Chapter Four.

### 3.4 Data Interpretation for 1996 Study

As occurred in the previous studies, some elementary assumptions were made at the outset of this study. A PCI rating value of 100% was assumed to occur at AGE zero. AGE was established as zero either at new construction or when a maintenance treatment other than a fog seal or crack seal was introduced. This assumption is fairly plausible, but may not be consistently valid. If the construction technique was improper or subpar materials were used, the pavement may not originally have possessed a perfect PCI value. Even with these factors taken into account, the basic assumption is fairly credible.

Another assumption was that pavements received a surface treatment when the PCI value approached 55%. This assumption was based upon the FAA recommendation that pavements receive some sort of rehabilitation when the PCI rating approaches "Satisfactory." Once again, this assumption may not be true at all times, but it serves to establish a solid baseline upon which to base pavement life. For the purposes of this study, pavement LIFE is defined as the time between construction or surface application and the subsequent maintenance or rehabilitation procedure.

One can see how the assumption of rehabilitation at a PCI of 55% applies to LIFE determinations by reviewing the following example reviewing Condon State Airport. Originally constructed in 1966 with a one inch blade mix asphalt top course, the pavement surface lasted until a seal coat was applied in 1975 (9 year LIFE). This surface lasted until the runways were reconstructed in 1986 with five inches of concrete (11 year LIFE). A PCI survey in 1987 gave the pavement a 94% rating and a survey in 1991 gave the pavement a 78% rating. Table 3.2

summarizes some of the conclusions that can be drawn from this information and demonstrates the technique that will be applied for LIFE calculations. PCI loss per year was determined using the repair at PCI equal to 55% assumption. In other words, if the repair occurred at 55%, then 45% had been utilized in the LIFE of the pavement. This 45% was divided by the life of the pavement:

$$PCI\ Loss\ per\ Year\ \#1\ =\ \frac{45\%}{9\ years}\ =\ 5\%\ Loss\ per\ year$$

For the present pavement, the PCI loss per year was determined by dividing the decrease in PCI by the age of the pavement:

$$PCI\ Loss\ per\ Year\ \#1\ =\ \frac{6\%}{1\ year}\ =\ 6\%\ Loss\ per\ year$$

Table 3.2 LIFE and AGE calculation example

| *Pavement Type* | *LIFE* | *Age @ PCI #1* | *Age @ PCI #2* | *PCI Loss per Year #1* | *PCI Loss per Year #2* |
|---|---|---|---|---|---|
| 1-inch Blade Mix | 9 | n/a | n/a | 5% | n/a |
| Seal Coat | 11 | n/a | n/a | 4.1% | n/a |
| PCC | n/a | 1 | 5 | 6% | 4.4% |

Table 3.2 also serves to demonstrate how pavement deterioration rates will vary not only between pavement type, but also as a pavement ages. These rates, as mentioned previously, could be due to numerous factors.

### 3.5 Pavement Comparisons

As mentioned briefly above, this study originally was going to review pavements possessing three sets of PCI ratings. Due to the limited number of usable data points available however, airfields containing two sets of PCI ratings were also included. The individual points from these surveys would be grouped into categories of common pavement characteristics. Within each of these categories, an attempt would be made to develop an appropriate regression model.

These plans were problematic in execution though. As in the previous studies, the data had to be filtered and many of the points ruled out. Several pavements had surveys that reflected an increase in the PCI rating, with no maintenance recorded. This may have happened between the first and second survey or the second and third survey. Regardless, these points were omitted from the study. Numerous airfields received a surface treatment between surveys. As already mentioned, the application of a surface treatment serves to reset the time clock and PCI scale. These runways were therefore omitted from the study as well. The final data sets excused were those where the PCI value remained the same between surveys. Once again, this may have occurred between the first and second or second and third surveys.

### 3.6 Data Review

Five different pavement categories were used in the analysis of the PCI data. Each of these categories was determined based upon similar pavement characteristics. In other words, pavement structures that could be expected to exhibit similar behaviors were grouped into distinct categories. These categories are asphalt concrete pavement, asphalt concrete overlays, bituminous surface treatments, surface maintenance techniques (slurry seals and chip seals), and portland cement concrete. Portland cement concrete pavements were not reviewed due to their limited number of data points and widely varied deterioration rates. Flexible pavements were broken into four further categories.

The following tables list the data categories and the PCI information within each category. Within each table, AGE refers to the time separation between the

PCI survey and the preceding surface treatment, whether new construction or maintenance treatment. LIFE numbers refer to the pavement's life span between surface treatments. Only airports that contain at least two valid data points are included in the tables. A summary of all airport data is included in Appendix E.

### 3.6.1 Asphalt Concrete Pavements

When the term flexible pavement is utilized, one is usually referring to a pavement constructed using bituminous (or asphalt) materials in the surface (or wearing) course. These pavements may consist of bituminous surface treatments or asphalt concrete (AC) surfaces. They are called flexible due to the pavement's ability to bend or deflect under traffic loading. Generally, flexible pavements are composed of several layers of materials that can accommodate this flexing.[11] Most AC pavement designs incorporate a wearing course of asphalt concrete, a base course of high quality aggregate, and possibly a subbase course of a lower quality aggregate. The base and subbase courses may be composed of a variety of aggregate types; crushed or uncrushed, treated or untreated, or any combination thereof. For the purposes of this study, only the asphalt concrete pavements fall into this category. Bituminous surface treatments are analyzed in another category.

Within the asphalt concrete pavement category, four subdivisions have been created for this study. These categories facilitate grouping the pavements into areas with similar performance characteristics.

1) 2 - 3 inches AC on 6 - 8 inches of base -- This category contains pavements that possess a wearing course between two and three inches and a granular base thickness less than eight inches. The base thickness could be a combination of base and subbase material, as long as it was less than eight inches in depth. Table 3.3 contains a listing of the airport runways that fall into this category.

2) 2 - 3 inches AC on 8+ inches of base -- This category contains pavements that possess a wearing course between two and three inches and a granular base thickness greater than eight inches. The base thickness could be a combination of base and subbase material, as long as it totaled more than eight inches in depth. Table 3.4 contains a listing of the airport runways that fall into this category.

3) Greater than 3 inches AC on any base -- This category contains all pavements with a wearing course greater than three inches on any depth of granular base. It was determined that a pavement surface of at least three inches will limit the impact of base and subbase thickness on performance. Contrary to the previous two studies, no airports meeting the aforementioned criteria fell into this category. No further review was conducted.

4) World War Two pavement -- A large number of the airports surveyed were constructed during World War Two (between 1942 and 1945). Although a large amount of data is available on these airfields, most of it only covers the last two decades. There is an extensive gap in pavement history. The data suggest that many of these runways went over thirty-five years with no maintenance of any type. This appears to be an impossibility due to the fairly high PCI values recorded during the first surveys. In fact, several of the PCI surveys comment on the fact that "it is very apparent from looking at the existing pavement condition that some sort of surface treatment had been applied, however, there are no records within the files to confirm it."[10] Due to this aberration in the data, pavements with a baseline date between 1942 and 1945 are being addressed as an individual group. This will prevent the other pavement categories from being biased. Table 3.5 contains a listing of the airport runways that fall into this category.

## Table 3.3 2-3 inches of Asphalt on Less than 8 inches of Base

| Airport Name | R/W ID | State | PCI #1 | Age #1 | PCI #2 | Age #2 | PCI #3 | Age #3 |
|---|---|---|---|---|---|---|---|---|
| Elma Municipal Airport | R1 | WA | 88 | 12 | 83 | 15 | n/a | n/a |
| Evergreen Field, Vancouver | R1 | WA | 55 | 20 | 51 | 24 | n/a | n/a |
| Evergreen Field, Vancouver | R2 | WA | 86 | 16 | 77 | 20 | n/a | n/a |
| Lake Chelan Airport | R1 | WA | 93 | 2 | 90 | 7 | n/a | n/a |
| Moses Lake Municipal Airport | R2 | WA | 29 | 14 | 18 | 18 | n/a | n/a |
| Port of Ilwaco Airport | R1 | WA | 71 | 15 | 49 | 18 | 36 | 21 |
| Bend Municipal Airport | R2 | OR | 89 | 2 | 79 | 5 | n/a | n/a |
| Brookings State Airport | R1 | OR | 90 | 18 | 88 | 21 | n/a | n/a |
| Gold Beach Municipal Airport | R1 | OR | 90 | 22 | 88 | 25 | n/a | n/a |
| Pacific City/State Airport | R1 | OR | 79 | 37 | 75 | 41 | n/a | n/a |
| Prineville Airport | R1 | OR | 87 | 7 | 83 | 10 | n/a | n/a |
| Prineville Airport | R2 | OR | 86 | 7 | 85 | 10 | n/a | n/a |
| Seaside State Airport | R1 | OR | 88 | 23 | 83 | 27 | n/a | n/a |
| Bear Lake County Airport | R2 | ID | 96 | 2 | 57 | 9 | n/a | n/a |

## Table 3.4 2-3 inches of Asphalt on More than 8 inches of Base

| Airport Name | R/W ID | State | PCI #1 | Age #1 | PCI #2 | Age #2 | PCI #3 | Age #3 |
|---|---|---|---|---|---|---|---|---|
| Auburn Municipal Airport | R1 | WA | 81 | 19 | 84 | 23 | n/a | n/a |
| Auburn Municipal Airport | R2 | WA | 90 | 4 | 87 | 8 | n/a | n/a |
| Harvey Field (Snohomish) | R1 | WA | 64 | 16 | 64 | 16 | n/a | n/a |
| Pierce County (Puyallup) | R1 | WA | n/a | n/a | 98 | 1 | 91 | 4 |
| Port of Willipa Harbor Airport | R2 | WA | 68 | 15 | 59 | 18 | 46 | 21 |
| Baker Municipal Airport | R4 | OR | 88 | 3 | 82 | 6 | n/a | n/a |
| Bend Municipal Airport | R1 | OR | 80 | 9 | 79 | 12 | n/a | n/a |
| Hood River Airport | R1 | OR | 96 | 1 | 92 | 5 | n/a | n/a |
| Hood River Airport | R2 | OR | 95 | 1 | 90 | 5 | n/a | n/a |
| John Day State Airport | R3 | OR | 93 | 4 | 92 | 7 | n/a | n/a |
| La Grande Municipal Airport | R3 | OR | 88 | 2 | 78 | 5 | n/a | n/a |
| McDermitt State Airport | R1 | OR | 96 | 1 | 76 | 4 | n/a | n/a |
| Ontario Municipal Airport | R1 | OR | 84 | 9 | 70 | 12 | n/a | n/a |

## Table 3.5 Airports constructed during World War II

| Airport Name | R/W ID | State | Baseline Year | PCI #1 | Age #1 | PCI #2 | Age #2 | PCI #3 | Age #3 |
|---|---|---|---|---|---|---|---|---|---|
| Bowers Field, Ellensburg | R3 | WA | 1942 | 57 | 44 | 64 | 47 | 53 | 51 |
| Bowers Field, Ellensburg | R4 | WA | 1942 | 54 | 44 | 52 | 47 | 49 | 51 |
| Bremerton National | R3 | WA | 1942 | 86 | 45 | 80 | 49 | n/a | n/a |
| Bremerton National | R5 | WA | 1942 | 82 | 45 | 80 | 49 | n/a | n/a |
| Deer Park Airport | R3 | WA | 1943 | 47 | 43 | 39 | 46 | n/a | n/a |
| Kennewick-Vista Field | R2 | WA | 1942 | 68 | 45 | 63 | 50 | n/a | n/a |
| Olympia Airport | R1 | WA | 1942 | 55 | 46 | 45 | 49 | n/a | n/a |
| Winlock (Toledo) Airport | R1 | WA | 1943 | 49 | 43 | 42 | 46 | 36 | 49 |
| Baker Municipal Airport | R3 | OR | 1942 | 69 | 44 | 66 | 47 | n/a | n/a |
| Bear Lake County Airport | R1 | ID | 1942 | 27 | 44 | 2 | 51 | n/a | n/a |

### 3.6.2 AC Overlays

An asphalt concrete overlay is one of the primary means of rehabilitating a pavement.[4] It serves to provide added structural integrity, improved surface characteristics and enhanced overall safety. There are several forms of overlays ranging from Portland Cement Concrete over concrete to asphalt concrete over PCC to asphalt over asphalt.[5] An asphalt concrete overlay can vary in thickness from less than an inch to several inches. The most common depth observed in this data review was a two inch overlay. This category deals solely with asphalt concrete (or flexible) overlays. Base type was not considered when categorizing these pavements. All overlays were grouped into this category regardless of thickness or base composition. Table 3.6 contains a listing of the airport runways that fall into this category.

### 3.6.3 Bituminous Surface Treatments

As mentioned previously, bituminous surface treatments fall into the flexible pavement category. They are inherently different from asphalt concrete pavements however, and have been separated out for purposes of this study.

A BST pavement basically provides a weatherproof wearing course, but adds very little structural capability to the pavement. BST's are most often used in areas with limited traffic. Normally less than one inch in thickness, they are often applied on top of a well compacted aggregate base. They may also be utilized as a maintenance application, applied over an existing asphalt or BST pavement. The separation between maintenance application and new construction led to problems in Weisenberger's study due to the terminology used in the rating surveys. For purposes of this study, pavements that had a "chip seal" applied or a "BST" applied as a maintenance treatment were evaluated separately from new construction BST's.

Within the new construction realm, there are several different categories of BST application; single, double, or triple bituminous layer treatment (BST, DBST, or TBST respectively). These categories refer not to the number of consecutive layers, but rather to layers containing gradually increasing aggregate size. In other words, a TBST contains three layers of treatment with each successive layer containing a larger aggregate size. Within this study, all BST pavements were regarded together, regardless of the number of layers. Table 3.7 contains a listing of the airport runways that fall into this category.

Table 3.6 Runways with Overlays

| Airport Name | R/W ID | State | Overlay Depth | PCI #1 | Age #1 | PCI #2 | Age #2 | PCI #3 | Age #3 |
|---|---|---|---|---|---|---|---|---|---|
| Bremerton National | R1 | WA | 3 | 86 | 13 | 86 | 17 | n/a | n/a |
| Bremerton National | R2 | WA | 5 | 83 | 13 | 75 | 17 | n/a | n/a |
| Bremerton National | R4 | WA | 2 | 88 | 13 | 83 | 17 | n/a | n/a |
| Connell City Airport | R1 | WA | 2 | 69 | 8 | 79 | 12 | n/a | n/a |
| Crest Airport, Kent | R1 | WA | 2 | 97 | 1 | 90 | 5 | n/a | n/a |
| Moses Lake Municipal Airport | R1 | WA | 2 | 89 | 3 | 81 | 7 | n/a | n/a |
| Oak Harbor Air Park | R1 | WA | 2 | 73 | 17 | 68 | 21 | n/a | n/a |
| Ocean Shores Airport | R1 | WA | 1 | n/a | n/a | 95 | 2 | 93 | 5 |
| Olympia Airport | R3 | WA | 3 | 86 | 8 | 84 | 11 | n/a | n/a |
| Omak Airport | R1 | WA | 2.5 | 68 | 12 | 65 | 15 | 61 | 18 |
| Packwood Airport | R1 | WA | 2 | 94 | 3 | 90 | 6 | n/a | n/a |
| Richland Airport | R1 | WA | 2 | 86 | 8 | 81 | 13 | n/a | n/a |
| Richland Airport | R2 | WA | 2 | 94 | 8 | 82 | 13 | n/a | n/a |
| Wilbur Airport | R1 | WA | 2 | 92 | 1 | 83 | 4 | 75 | 8 |
| Ashland Municipal Airport | R1 | OR | 2 | 91 | 1 | 89 | 5 | n/a | n/a |
| Aurora State Airport | R1 | OR | 2 | 85 | 8 | 81 | 11 | n/a | n/a |
| Illinois Valley Airport | R1 | OR | 2 | 87 | 10 | 83 | 14 | n/a | n/a |
| La Grande Municipal Airport | R2 | OR | 4 | 72 | 12 | 68 | 15 | n/a | n/a |
| Lake County Airport | R1 | OR | 1.75 | 71 | 12 | 68 | 16 | n/a | n/a |
| Pinehurst State Airport | R1 | OR | 1 | 83 | 2 | 76 | 6 | n/a | n/a |
| Port of Astoria Airport | R1 | OR | 0.75 | 87 | 7 | 79 | 11 | n/a | n/a |
| Port of Astoria Airport | R1A | OR | 0.75 | 77 | 7 | 68 | 11 | n/a | n/a |
| Sunriver Airport | R1 | OR | 2 | 92 | 1 | 79 | 4 | n/a | n/a |
| Tillamook Airport | R1 | OR | 1.5 | 92 | 4 | 89 | 8 | n/a | n/a |
| Kellogg (Shoshone Co.) Airport | R1 | ID | 1 | 94 | 6 | 62 | 15 | n/a | n/a |
| Kellogg (Shoshone Co.) Airport | R2 | ID | 1 | 94 | 6 | 60 | 15 | n/a | n/a |
| Kellogg (Shoshone Co.) Airport | R4 | ID | 3 | 96 | 6 | 82 | 15 | n/a | n/a |
| Kellogg (Shoshone Co.) Airport | R5 | ID | 3 | 93 | 6 | 80 | 15 | n/a | n/a |

Table 3.7 Runways Constructed with BST

| Airport Name | R/W ID | State | Structure | PCI #1 | Age #1 | PCI #2 | Age #2 | PCI #3 | Age #3 |
|---|---|---|---|---|---|---|---|---|---|
| Colville Municipal Airport | R1 | WA | TBST | 62 | 2 | 52 | 6 | n/a | n/a |
| Concrete Municipal Airport | R1 | WA | DBST | 61 | 12 | 34 | 15 | 24 | 18 |
| Ione Municipal Airport | R1 | WA | TBST | 76 | 13 | 76 | 16 | 70 | 19 |
| Odessa Municipal | R1 | WA | DBST | 79 | 2 | 46 | 6 | n/a | n/a |
| Odessa Municipal | R2 | WA | TBST | 58 | 2 | 50 | 6 | n/a | n/a |
| Sequim Valley Airport | R1 | WA | DBST | 52 | 3 | 42 | 6 | n/a | n/a |
| Storm Field (Morton) | R1 | WA | TBST | 73 | 1 | 68 | 4 | n/a | n/a |
| Woodland State Airport | R1 | WA | TBST | 91 | 3 | 88 | 7 | n/a | n/a |
| Christmas Valley Airport | R1 | OR | BST | 90 | 2 | 86 | 6 | n/a | n/a |
| NewHalam Bay State Airport | R1 | OR | TBST | 80 | 8 | 77 | 12 | n/a | n/a |
| Prineville Airport | R3 | OR | BST | 39 | 7 | 31 | 10 | n/a | n/a |

### 3.6.4 Surface Maintenance Applications and Techniques

The area of surface maintenance applications appears to have the widest variation in treatment when comparing the previous studies. Weisenberger[10] separated maintenance treatments into three categories for review. Floro[4] reviewed only slurry seals as it was the only maintenance procedure with two or more data points. This study will review slurry seals and chip seals.

As with BST's, surface maintenance techniques serve to provide a weatherproof wearing course rather than a structural component. Surface maintenance techniques come in a wide variety of methods with an equal variation in costs. The simplest method is crack sealing, in which an asphalt emulsion is placed over pavement cracks in an effort to prevent further damage from occurring. Crack sealing is typically applied to only those portions of the pavement that require it. Therefore, it has little impact on the results of a PCI rating survey. The next method involves the application of an asphalt emulsion onto the pavement surface. Commonly called a fog seal or emulsion application, they do little to affect the pavement's structure and therefore have a limited effect on PCI ratings. The next maintenance method is referred to as a slurry, or sand, seal. This technique uses a well-graded fine aggregate (or sand), mineral filler, emulsified asphalt, and water which is squeegeed onto the pavement's surface. Slurry seals were a very popular maintenance method as viewed in the survey data. The final maintenance method is the chip seal, seal coat, or BST. These applications are all similar in nature and differ only in their application timing. All involve an asphalt application which is followed by an aggregate cover. As previously mentioned, new construction BST's were disassociated from maintenance BST's and evaluated separately.

Both slurry seals and chip seals were utilized to a significant extent on many of the pavements analyzed. Each of these maintenance methods served to "reset" the PCI clock to 100% and the AGE clock to zero. Table 3.8 contains the slurry sealed pavements and Table 3.9 the chip sealed pavements.

Since neither of these techniques provide any structural support to the pavement, the underlying structure most reflects the possible performance of the maintenance application. However, all slurry seals and all chip seals were reviewed as groups. A separate listing of complete pavement type is found in Appendix E.

Table 3.8 Slurry sealed pavements

| Airport Name | R/W ID | State | PCI #1 | Age #1 | PCI #2 | Age #2 | PCI #3 | Age #3 |
|---|---|---|---|---|---|---|---|---|
| Bowers Field, Ellensburg | R1 | WA | n/a | n/a | 64 | 2 | 62 | 6 |
| Ephrata Municipal Airport | R1A | WA | 60 | 17 | 55 | 21 | n/a | n/a |
| Ephrata Municipal Airport | R2 | WA | 53 | 17 | 43 | 21 | n/a | n/a |
| Lind Airport | R1 | WA | 51 | 5 | 51 | 9 | n/a | n/a |
| Pru Field (Ritzville) | R1 | WA | 83 | 2 | 77 | 6 | n/a | n/a |
| Quincy Municipal Airport | R1 | WA | 72 | 7 | 70 | 11 | n/a | n/a |
| Rosalia Municipal Airport | R1 | WA | 68 | 2 | 49 | 6 | n/a | n/a |
| Sand Canyon (Cehwelah) Airport | R1 | WA | 88 | 1 | 70 | 4 | 62 | 8 |
| Sanderson Field (Shelton) | R1 | WA | 77 | 9 | 72 | 12 | n/a | n/a |
| Waterville Airport | R1 | WA | 65 | 1 | 57 | 5 | n/a | n/a |
| Whitman County Memorial Airport (Colfax) | R1 | WA | 57 | 5 | 40 | 8 | 29 | 12 |
| Willard-Tekoa Field | R1 | WA | n/a | n/a | 90 | 2 | 85 | 6 |
| Roseburg Municipal Airport | R1 | OR | 77 | 1 | 57 | 5 | n/a | n/a |
| Scappoose Industrial Airport | R1 | OR | 65 | 1 | 64 | 5 | n/a | n/a |
| Kellogg (Shoshone Co.) Airport | R3 | ID | 40 | 3 | 22 | 12 | n/a | n/a |
| Nampa Municipal Airport | R1 | ID | 91 | 1 | 48 | 9 | n/a | n/a |
| Orofino Municipal Airport | R1 | ID | 81 | 6 | 59 | 15 | n/a | n/a |
| Priest River Municipal Airport | R1 | ID | 86 | 6 | 27 | 15 | n/a | n/a |

Table 3.9 Chip sealed pavements

| Airport Name | R/W ID | State | PCI #1 | Age #1 | PCI #2 | Age #2 | PCI #3 | Age #3 |
|---|---|---|---|---|---|---|---|---|
| Kennewick-Vista Field | R1 | WA | 69 | 11 | 66 | 16 | n/a | n/a |
| Mansfield Airport | R1 | WA | 35 | 5 | 27 | 10 | n/a | n/a |
| Sekiu Airport | R1 | WA | 68 | 1 | 61 | 5 | n/a | n/a |
| Sekiu Airport | R2 | WA | 88 | 1 | 85 | 5 | n/a | n/a |
| Sunnyside Airport | R1 | WA | 85 | 2 | 80 | 7 | n/a | n/a |
| Bandon State Airport | R1 | OR | 72 | 14 | 57 | 17 | n/a | n/a |
| Burns Municipal Airport | R2 | OR | 49 | 8 | 39 | 11 | n/a | n/a |
| Craigmont Municipal Airport | R1 | ID | 57 | 11 | 56 | 20 | n/a | n/a |

### 3.7 Portland Cement Concrete

As already mentioned, Portland Cement Concrete pavements will not be evaluated during the course of this study due to the lack of applicable data involved. This is contrary to the previous two studies, but applicable due to the lack of data integrity.

### 3.8 Pavement Life Data

Pavement LIFE was an important aspect evaluated during the course of this study. Unlike the PCI versus AGE comparisons, the categories for evaluating LIFE were slightly different with nine different categories being evaluated. These categories were identical to those used in the Floro[4] study in an effort to allow comparisons to be made. The following tables list the categories and the airports within each category. Included in each table is the original construction date, type of repair, date of repair, and life span of either the original pavement or repair type, depending upon the category.

Once again, the time frames of original construction and maintenance application were reviewed. As in the PCI versus AGE categorization, all airports constructed during the World War Two (1942 - 1945) time frame were separated out from those constructed after. This lessens the possibility of utilizing runway data that may not include a number of early repairs. Table 3.10 contains pavements constructed during World War Two that have less than three inches of asphalt. Table 3.11 contains pavements constructed during World War Two that have three or more inches of asphalt.

Table 3.10 WWII Pavements, Less than 3 inches Asphalt

| Airport Name | State | Original Type | Original Construction | Repair | Date Repair | Life |
|---|---|---|---|---|---|---|
| Bowerman Field, Hoquiam | WA | Asphalt | 1943 | Overlay | 1990 | 47 |
| Bremerton National | WA | Asphalt | 1942 | Overlay | 1974 | 32 |
| Ephrata Municipal Airport | WA | Asphalt | 1943 | Slurry seal | 1970 | 27 |
| Kennewick-Vista Field | WA | Asphalt | 1942 | Chip seal | 1976 | 34 |
| Olympia Airport | WA | Asphalt | 1942 | Overlay | 1980 | 38 |
| Richland Airport | WA | Asphalt | 1943 | Overlay | 1979 | 36 |
| Richland Airport | WA | Asphalt | 1943 | Overlay | 1979 | 36 |
| Sanderson Field (Shelton) | WA | Asphalt | 1942 | Slurry seal | 1979 | 37 |
| William R. Fairchild Int'l Airport | WA | Asphalt | 1942 | Overlay/slurry seal | 1979 | 37 |
| William R. Fairchild Int'l Airport | WA | Asphalt | 1942 | Overlay/slurry seal | 1979 | 37 |
| William R. Fairchild Int'l Airport | WA | Asphalt | 1942 | Overlay/slurry seal | 1978 | 36 |
| Baker Municipal Airport | OR | Asphalt | 1942 | Seal coat | 1963 | 21 |
| Baker Municipal Airport | OR | Asphalt | 1942 | Seal coat | 1963 | 21 |
| Boardman Airport | OR | Asphalt | 1943 | Overlay | 1980 | 37 |
| Burns Municipal Airport | OR | Asphalt | 1942 | Reconstructed | 1987 | 45 |
| Burns Municipal Airport | OR | Asphalt | 1942 | Chip seal | 1978 | 36 |
| Corvallis Municipal Airport | OR | Asphalt | 1942 | Overlay | 1984 | 42 |
| La Grande Municipal Airport | OR | Asphalt | 1942 | Overlay | 1974 | 32 |
| Lake County Airport | OR | Asphalt | 1943 | Overlay | 1985 | 42 |
| Madras City/County Airport | OR | Asphalt | 1943 | Overlay | 1977 | 34 |
| McMinnville Municipal Airport | OR | Asphalt | 1943 | Slurry seal | 1980 | 37 |
| North Bend Municipal Airport | OR | Asphalt | 1943 | Overlay | 1977 | 34 |
| North Bend Municipal Airport | OR | Asphalt | 1943 | Overlay | 1977 | 34 |
| Pendleton Municipal Airport | OR | Asphalt | 1942 | Overlay | 1974 | 32 |
| Pendleton Municipal Airport | OR | Asphalt | 1942 | Overlay | 1978 | 36 |
| Pendleton Municipal Airport | OR | Asphalt | 1942 | Overlay | 1978 | 36 |
| Pendleton Municipal Airport | OR | Asphalt | 1942 | Overlay | 1978 | 36 |
| Pendleton Municipal Airport | OR | Asphalt | 1942 | Chip seal | n/a | n/a |
| Port of Astoria Airport | OR | Asphalt | 1944 | Overlay | 1980 | 36 |
| Scappoose Industrial Airport | OR | Asphalt | 1943 | Slurry seal | 1986 | 43 |
| Newport Municipal Airport | OR | Asphalt | 1944 | Overlay | 1984 | 40 |
| Newport Municipal Airport | OR | Asphalt | 1944 | Slurry seal | 1984 | 40 |
| The Dalles Municipal Airport | OR | Asphalt | 1943 | Slurry seal | 1965 | 22 |
| Tillamook Airport | OR | Asphalt | 1943 | Overlay | 1983 | 40 |
| Tillamook Airport | OR | Asphalt | 1943 | Chip seal | 1983 | 40 |

Table 3.11 WWII Pavements, 3 inches or More Asphalt

| Airport Name | State | Original Type | Original Construction | Repair | Date Repair | Life |
|---|---|---|---|---|---|---|
| Arlington Municipal Airport | WA | Asphalt | 1942 | Overlay | 1976 | 34 |
| Bremerton National | WA | Asphalt | 1942 | Overlay | 1974 | 32 |
| Bremerton National | WA | Asphalt | 1942 | Overlay | 1974 | 32 |
| Ephrata Municipal Airport | WA | Asphalt | 1943 | Slurry seal | 1970 | 27 |
| Omak Airport | WA | Asphalt | 1943 | Overlay | 1974 | 31 |
| North Bend Municipal Airport | OR | Asphalt | 1943 | Overlay | 1977 | 34 |
| North Bend Municipal Airport | OR | Asphalt | 1943 | Chip seal | 1952 | 9 |
| Pendleton Municipal Airport | OR | Asphalt | 1942 | Overlay | 1974 | 32 |

All pavements constructed after World War Two have been grouped into similar categories to the World War Two pavements. Table 3.12 contains airports with less than three inches of asphalt and Table 3.13 contains airports with three inches of asphalt or more.

Table 3.12 Post WWII, Less than 3 inches Asphalt

| Airport Name | State | Original Type | Original Construction | Repair | Date Repair | Life |
|---|---|---|---|---|---|---|
| Blaine Municipal Airport | WA | Asphalt | 1972 | Overlay | 1992 | 20 |
| Harvey Field (Snohomish) | WA | Asphalt | 1970 | Seal coat | 1982 | 12 |
| Pangborn Field (Wenatchee) | WA | Asphalt | 1947 | Chip seal | 1974 | 27 |
| Pearson Airpark (Vancouver) | WA | Asphalt | 1966 | Chip seal | 1975 | 9 |
| Pearson Airpark (Vancouver) | WA | Asphalt | 1966 | Chip seal | 1975 | 9 |
| Pierce County (Puyallup) | WA | Asphalt | 1958 | Reconstructed | 1988 | 30 |
| Prosser Airport | WA | Asphalt | 1977 | Reconstructed | 1977 | 0 |
| Pullman-Moscow Regional Airport | WA | Asphalt | 1948 | Overlay | 1972 | 24 |
| Sekiu Airport | WA | Asphalt | 1972 | Chip seal | 1987 | 15 |
| Sekiu Airport | WA | Asphalt | 1979 | Chip seal | 1987 | 8 |
| Willard-Tekoa Field | WA | Asphalt | 1975 | Slurry seal | 1987 | 12 |
| Godendale Airport | WA | Asphalt | 1984 | Slurry seal | 1992 | 8 |
| Oroville Airport | WA | Asphalt | 1986 | Chip seal | 1992 | 6 |
| Albany Municipal Airport | OR | Asphalt | 1959 | Overlay | 1986 | 27 |
| Baker Municipal Airport | OR | Asphalt | 1983 | Reconstructed | 1983 | 0 |
| Bandon State Airport | OR | Asphalt | 1966 | Chip seal | 1972 | 6 |
| Chiloquin State Airport | OR | Asphalt | 1961 | Seal coat | 1968 | 7 |
| Florence Municipal Airport | OR | Asphalt | 1968 | Reconstructed | 1985 | 17 |
| Hermiston Municipal Airport | OR | Asphalt | 1959 | Overlay | 1977 | 18 |
| Ontario Municipal Airport | OR | Asphalt | 1977 | Reconstructed | 1977 | 0 |
| Roseburg Municipal Airport | OR | Asphalt | 1951 | Slurry seal | 1986 | 35 |
| Tri-city State Airport | OR | Asphalt | 1970 | Chip seal | n/a | n/a |
| Arco (Butte County) Airport | ID | Asphalt | 1979 | Reconstructed | 1990 | 11 |
| Bear Lake County Airport | ID | Asphalt | 1984 | Fog seal | n/a | n/a |
| Buhl Municipal Airport | ID | Asphalt | 1983 | Slurry seal | 1992 | 9 |
| Caldwell Airport | ID | Asphalt | 1975 | Slurry seal | 1986 | 11 |
| Caldwell Airport | ID | Asphalt | 1975 | Slurry seal | 1986 | 11 |
| Craigmont Municipal Airport | ID | Asphalt | 1975 | Fog seal | 1987 | 12 |
| Driggs Municipal Airport | ID | Asphalt | 1975 | Overlay | 1991 | 16 |

Table 3.12 (con't)

| Airport Name | State | Original Type | Original Construction | Repair | Date Repair | Life |
|---|---|---|---|---|---|---|
| Gooding Municipal Airport | ID | Asphalt | 1978 | Slurry seal | 1985 | 7 |
| Jerome County Airport | ID | Asphalt | 1981 | Slurry seal | 1987 | 6 |
| Mountain Home Municipal Airport | ID | Asphalt | 1973 | Overlay | 1993 | 20 |
| Nampa Municipal Airport | ID | Asphalt | 1976 | Fog seal | 1982 | 6 |
| Orofino Municipal Airport | ID | Asphalt | 1969 | Slurry seal | 1980 | 11 |
| Priest River Municipal Airport | ID | Asphalt | 1975 | Slurry seal | 1980 | 5 |
| Rexburg (Madison County) Airport | ID | Asphalt | 1972 | Reconstructed | 1991 | 19 |
| Rexburg (Madison County) Airport | ID | Asphalt | 1977 | Reconstructed | 1991 | 14 |
| Rexburg (Madison County) Airport | ID | Asphalt | 1977 | Slurry seal | n/a | n/a |
| St. Maries Municipal Airport | ID | Asphalt | 1978 | Overlaid | 1987 | 9 |
| Soda Springs Airport | ID | Asphalt | 1969 | Slurry seal | 1983 | 14 |

Table 3.13 Post WWII, 3 inches or More Asphalt

| Airport Name | State | Original Type | Original Construction | Repair | Date Repair | Life |
|---|---|---|---|---|---|---|
| Bowers Field, Ellensburg | WA | Asphalt | 1976 | Slurry seal | 1987 | 11 |
| Pangborn Field (Wenatchee) | WA | Asphalt | 1947 | Chip seal | 1974 | 27 |
| Pullman-Moscow Regional Airport | WA | Asphalt | 1968 | Reconstructed | 1993 | 25 |
| Pullman-Moscow Regional Airport | WA | Asphalt | 1968 | Reconstructed | 1993 | 25 |
| Sunnyside Airport | WA | Asphalt | 1975 | Chip seal | 1985 | 10 |
| Aurora State Airport | OR | Asphalt | 1975 | Overlay | 1978 | 3 |
| Roberts Field/Redmond Airport | OR | Asphalt | 1975 | PFC | 1981 | 6 |
| Grangeville (Idaho Co.) Airport | ID | Asphalt | 1965 | Overlay | 1983 | 18 |
| Grangeville (Idaho Co.) Airport | ID | Asphalt | 1983 | Slurry seal | 1988 | 5 |
| Grangeville (Idaho Co.) Airport | ID | Asphalt | 1983 | Slurry seal | 1988 | 5 |
| McCall Municipal Airport | ID | Asphalt | 1974 | Slurry seal | 1985 | 11 |

All pavement overlays were grouped into the same category, regardless of thickness or type of subpavement. A lack of sufficient data prevented further breakdown. Table 3.14 contains a listing of pavements within the overlay category.

Table 3.14 Overlay Pavements

| Airport Name | State | Original Type | Original Construction | Repair | Date Repair | Follow-on Repair | Life |
|---|---|---|---|---|---|---|---|
| Anacortes Airport | WA | DBST | 1968 | Overlay | 1973 | 1991 | 18 |
| Anacortes Airport | WA | DBST | 1968 | Overlay | 1973 | 1991 | 18 |
| Anacortes Airport | WA | DBST | 1968 | Overlay | 1973 | 1991 | 18 |
| Arlington Municipal Airport | WA | Asphalt | 1942 | Overlay | 1976 | 1991 | 15 |
| Pullman-Moscow Regional Airport | WA | Asphalt | 1948 | Overlay | 1972 | 1993 | 21 |
| Sand Canyon (Cehwelah) Airport | WA | Slurry Seal | 1974 | Overlay | 1979 | 1985 | 6 |
| Burley Municipal Airport | ID | Asphalt | n/a | Overlay | 1980 | 1992 | 12 |
| Challis Airport | ID | BST | 1973 | Overlay | 1986 | 1991 | 5 |
| Grangeville (Idaho Co.) Airport | ID | Asphalt | 1965 | Overlay | 1983 | 1988 | 5 |

As in the previous studies, all bituminous surface treatments were grouped together for evaluation. Table 3.15 contains a listing of the pavements that were evaluated in this category.

Table 3.15 Bituminous Surface Treatment Pavements

| Airport Name | State | Original Type | Original Construction | Repair | Date Repair | Life |
|---|---|---|---|---|---|---|
| Anacortes Airport | WA | DBST | 1968 | Overlay | 1973 | 5 |
| Anacortes Airport | WA | DBST | 1968 | Overlay | 1973 | 5 |
| Anacortes Airport | WA | DBST | 1968 | Overlay | 1973 | 5 |
| Cashmere-Dryden Airport | WA | TBST | 1951 | Seal coat | 1976 | 25 |
| Colville Municipal Airport | WA | DBST | 1949 | Seal coat | 1958 | 9 |
| Connell City Airport | WA | BST | 1970 | Overlay | 1979 | 9 |
| Crest Airport, Kent | WA | BST | 1967 | Overlay | 1986 | 19 |
| Davenport Airport | WA | BST | 1973 | BST | 1977 | 4 |
| Ferry County (Republic) Airport | WA | BST | 1974 | Chip seal | 1978 | 4 |
| Grand Couly Dam Airport | WA | BST | 1972 | Overlay | 1980 | 8 |
| Ione Municipal Airport | WA | BST | 1973 | UNK | n/a | n/a |
| Lind Airport | WA | DBST | 1971 | Slurry seal | 1982 | 11 |
| Mansfield Airport | WA | BST | 1973 | Chip seal | 1979 | 6 |
| Moses Lake Municipal Airport | WA | DBST | 1961 | Slurry seal | n/a | n/a |
| Ocean Shores Airport | WA | DBST | 1985 | Overlay | 1987 | 2 |
| Odessa Municipal | WA | DBST | 1970 | Reconstructed | 1985 | 15 |
| Odessa Municipal | WA | DBST | 1970 | Reconstructed | 1985 | 15 |
| Okanagan Legion Airport | WA | BST | 1955 | DBST | 1987 | 32 |
| Packwood Airport | WA | BST | 1975 | Overlay | 1985 | 10 |
| Port of Willipa Harbor Airport | WA | BST | 1948 | Reconstructed | 1971 | 23 |
| Port of Willipa Harbor Airport | WA | BST | 1948 | Reconstructed | 1971 | 23 |
| Pru Field (Ritzville) | WA | TBST | 1978 | Slurry seal | 1985 | 7 |
| Quincy Municipal Airport | WA | BST | 1977 | Slurry seal | 1980 | 3 |
| Storm Field (Morton) | WA | BST | 1970 | TBST | 1987 | 17 |
| Waterville Airport | WA | BST | 1976 | Slurry seal | 1988 | 12 |
| Whitman County Memorial Airport (Colfax) | WA | BST | 1970 | Slurry seal | 1981 | 11 |
| Wilbur Airport | WA | BST | 1971 | Seal coat | 1983 | 12 |
| Ashland Municipal Airport | OR | BST | 1965 | Overlay | 1986 | 21 |
| Illinois Valley Airport | OR | BST | 1953 | Overlay | 1977 | 24 |
| NewHalam Bay State Airport | OR | BST | 1965 | TBST | 1979 | 14 |
| Pinehurst State Airport | OR | BST | 1956 | Overlay | 1985 | 29 |
| Prospect State Airport | OR | BST | 1962 | DBST | 1986 | 24 |
| Sunriver Airport | OR | DBST | 1970 | Seal coat | 1973 | 3 |
| Challis Airport | ID | BST | 1973 | Overlay | 1986 | 13 |
| Sandpoint Airport | ID | BST | 1952 | Reconstructed | 1988 | 36 |

Table 3.16 contains slurry sealed pavements that have undergone further maintenance applications. Although a large number of slurry sealed airports were evaluated in the PCI versus AGE portion, very few had any further maintenance

done. Only those pavements that had been further repaired were included in the study.

Table 3.16 Slurry Sealed Pavements

| Airport Name | State | Original Type | Original Construction | Repair | Date Repair | Follow-on Repair | Life |
|---|---|---|---|---|---|---|---|
| Caldwell Airport | ID | Asphalt | 1975 | Slurry seal | 1986 | 1987 | 1 |
| Caldwell Airport | ID | Asphalt | 1975 | Slurry seal | 1986 | 1987 | 1 |
| Gooding Municipal Airport | ID | Asphalt | 1978 | Slurry seal | 1985 | 1989 | 4 |
| Jerome County Airport | ID | Asphalt | 1981 | Slurry seal | 1987 | 1991 | 4 |
| McCall Municipal Airport | ID | Asphalt | 1974 | Slurry seal | 1985 | 1990 | 5 |
| Soda Springs Airport | ID | Asphalt | 1969 | Slurry seal | 1983 | 1992 | 9 |

Pavements that had chip seals or were seal coated were also reviewed, but too few data points existed for a statistically deterministic evaluation to be properly accomplished.

# 4.0 Analysis and Results

## 4.1 Analysis Introduction

The performance equations contained in this chapter are the essence of this study. They were calculated using the *SPSS* statistical software package. The primary reference item in the development of these regression equations was *Statistical Methods for WSDOT Pavement and Material Applications*.[8] It provided the framework and guidelines required for pavement modeling. Also providing extensive help was *Development and Implementation of Washington State's Pavement Management System*.[9] This report outlined the WSDOT pavement management system and provided a thorough overview of the regression specifics required.

It is important to stress that the models contained in this report should serve to provide only a guideline for predicting pavement performance. These models are additional tools that give the airport manager or planner more information on the options available within the budgetary constraints that are most likely applicable. The limitations on the data utilized in this study restrict the use of these models in any other manner.

## 4.2 Regression Analysis Expanded

Chapter Two provided a brief introduction to the topic of regression analysis and its utilization in this study. Two regression models were applied to the data in this study, simple linear and simple non-linear. The term "simple" is used to reflect that only one independent variable exists within the equations. The two variables being examined within this study are AGE and PCI. PCI is the dependent variable and AGE is the independent variable.

To differentiate between linear and non-linear equations, the equations must be examined. A linear equation utilizes no power functions. In other words, both the parameters ($b_o$ and $b_1$) and the independent variable (AGE) are not power functions. A non-linear, or curvilinear equation is one in which the parameters appear as exponents or are multiplied or divided by other parameters. In some non-linear models, the independent variable(s) are second order powers (or higher).[8]

The simplest form of regression model is a linear equation. The basic regression model for a linear analysis is:

$$y_i = b_0 + b_1 x_i$$

where: $y_i$ = predicted value of "y" at the $i^{th}$ data point,
$x_i$ = independent variable at the $i^{th}$ data point, and
$b_0$, $b_1$ = regression constant ($b_0$ = intercept and $b_1$ = slope).

In this equation 'y' represents PCI and 'x' represents AGE. This equation plots as a straight line when graphically displayed.

There are three forms of curvilinear regression models that will be utilized in this study. The first of these is the power fit. This equation takes the following form:

$$PCI = b_0\,(AGE)^{b_1}$$

A log transformation is required to obtain the regression constants. Upon transformation the equation is represented as:

$$\log PCI = \log b_0 + b_1 \log (AGE)$$

Another form of the power model is utilized by the WSDOT pavement management system. This formula 'fixes' the power. Different numbers, usually between 1.0 and 3.0 varied by 0.25, are inserted into the power cell until the best fit is obtained. This equation takes on the following form:

$$PCI = b_0 - b_1(AGE)^{Power}$$

The next regression model utilized is the exponential fit. This equation takes the following form:

$$PCI = b_0 e^{b_1(AGE)}$$

As in the Weisenberger[10] study, a logarithmic model was also examined during the course of this research. The logarithmic model used for analysis takes the following form:

$$PCI = b_0 + b_1 ln(AGE)$$

For this study, no modeling was done using polynomial models. This is contrary to Floro's[4] study, which utilized them extensively. The addition of more than one independent variable degrades the statistical integrity of the outcome.

Chapter Two hinted at some of the factors that indicate the reliability or confidence associated with an equation formed from regression analysis. The following list will expand on the main factors and list several new ones.

a) Coefficient of Determination ($R^2$) -- Explains how much of the total variation in the data is explained by the regression equation. Expressed as a percent, this value indicates the relation of the data points to the equation line. If all data points fall directly on the line, the $R^2$ value is 100%. If the points have little relation to the line, the $R^2$

value is much lower. Therefore, the higher this value, the better approximation the line is to the data points.[8]

b) T-Ratio -- This value is the result of a hypothesis test. It determines how well the independent variable predicts the dependent variable. Normally, the T-Ratio should be greater than 2.0 for each independent variable to be a relatively strong predictor of the dependent variable.[4]

c) Standard Error of the Estimate (SEE) -- Utilized to estimate the standard deviation of the dependent variable about the regression line, the SEE value is in units of the dependent variable. The smaller the SEE value, the better reliability of the equation.[4]

### 4.3 Regression Assumptions

As mentioned in Chapter Three, one of the main assumptions in this paper was that at new construction or after the application of a surface treatment, the PCI/AGE clock 'reset' to a PCI value of 100% and a pavement AGE of zero. This assumption was applied to each set of data points and utilized in both group and individual pavement models. This assumption was applied to new construction, AC overlays, chip seals, slurry seals, and reconstruction.

### 4.4 Regression Equation Development

The assumption of a PCI value equal to 100% is fairly plausible, but may not be agreeable to all parties. It is reasonable to assume, however, that an airport manager would not accept a pavement containing obvious defects. There would be little control over concealed defects, which might impact the pavement's long term performance. Therefore, the equations developed took this fact into account. Where determined applicable, these initial points were not included and are so reflected in the equation tables.

During the initial study by Weisenberger[10], certain models had the PCI equal to 100% and AGE equal zero values removed. The equations developed were essentially the same, containing slight differences in the $R^2$, T-ratio, and PCI 'y' intercept. Floro[4] noted similar results, especially when reviewing surface maintenance techniques. The range of materials used and the impact of underlying pavement condition prevent the 'resetting' of the PCI/AGE clock from being an accurate assumption. For purposes of this study, however, all pavements were reviewed utilizing only the initial PCI equal to 100%. With little difference in the equations developed in the previous studies, no effort was made to duplicate the results.

The goal of this paper is to provide the best possible model that will provide an accurate prediction of pavement performance. The state of Washington has found the WSDOT power model to be the most reliable indicator of future pavement performance.[9] It was suspected that this model would provide the 'best fit' for airport pavements as well. This paper utilized all models mentioned in Section 4.2 in an effort to find the model best representing the data.

The *SPSS* program utilized for the statistical analysis provided all values based upon the data contained in Chapter Three. Linear, exponential, logarithmic, and straight power regression models were determined utilizing the curve estimation portion of the program. The WSDOT power models utilized the non-linear regression portion of the program. The curve estimation portion of *SPSS* provided the equation parameters, T-ratio, SEE values, and $R^2$ values. The non-linear component of SPSS provided the equation parameters, $R^2$ values, and the Root Mean Square Error(RMSE) values. Appendix F contains a summary table of the results from each modeling run.

In previous studies, two regression models were developed for each set of data. One model was developed utilizing all available data. A second model was developed with certain data points, that appeared to schew the model, omitted. For purposes of this study, regression modeling was done using only full data sets. No firm criteria could be developed for the legitimate removal of certain data points and therefore, a second data run was not justified. This assumption may be faulty in that certain data points would be allowed to alter the data, but given the limitations on the data possessed, no other option was warranted.

**4.5 Regression Analysis and Results**

Following are the results obtained from the regression analysis performed on the various data categories. Two, and possibly three, regression equations will be given for each category reviewed. A linear model and the 'best fit' WSDOT power model are shown for each analysis. A logarithmic or exponential model may be shown if it provided the best overall $R^2$ valued. The linear model was chosen due to its simplicity and the ease of making predictions based solely upon slope. The WSDOT model is shown due to the proposed correlation between airport and highway pavements.

The data obtained in this study was divided into categories as specified in Chapter Three. A brief restatement here will serve to provide a quick reference. A statistical analysis was conducted on runways by individual state and by combined data from each state. If data were insufficient for a valid analysis, no results were obtained.

Only flexible pavements were reviewed for this study. These were categorized based upon pavement construction date, pavement type, and pavement depth. Slurry seals and chip seals were the only maintenance techniques reviewed. The following is the category arrangement for the pavement sections:

- Flexible Pavements 4.5.1
- Asphalt Overlays 4.5.2
- Bituminous Surface Treatments 4.5.3
- Slurry Seal Maintenance 4.5.4
- Chip Seal Maintenance 4.5.5

### 4.5.1 Asphalt Concrete Surfaced Pavement Results

The asphalt concrete pavements were broken into four categories for analysis. One category was solely for pavements constructed during World War Two with no documented maintenance. The other three categories were based upon pavement thickness. No data was available for the pavement category of asphalt pavements with more than three inches of material. The equations obtained do not appear statistically significant although most demonstrate higher $R^2$ values than in the previous two studies, significantly higher than Floro's[4] study and varied with Weisenberger's[10] study.

For pavements with less than three inches of asphalt and less than eight inches of base, the logarithmic model presents the highest $R^2$ value. When graphically viewed, the logarithmic model does not represent typical pavement performance. Therefore, even though it possesses the highest statistical values, it should not be utilized in PCI prediction. This is true in all of the categories where the logarithmic model had the highest values.

The linear model proved the 'best fit' for pavements with less than three inches of asphalt and more than eight inches of base in all cases. In the World War Two pavement category, the linear and WSDOT power models produced nearly identical $R^2$ values.

#### 4.5.1.1 Regression Models Obtained

Tables 4.1a through 4.3b contain the results of the regression analysis performed on the flexible pavement data. The 'a' tables list a comparison of linear equations from all three studies. The 'b' tables list a comparison of WSDOT power models where available and a third 'best fit' equation where applicable. Figures 4.1 through 4.3 contain graphical plots of the combined data analysis. Plots for individual states, when available, can be found in Appendix G.

Table 4.1a Linear regression equations for flexible pavement containing 2 - 3 inches of Asphalt Concrete on less than 8 inches of base material

| Pavement Type | Location Category | | 1996 Linear Equations | 1992 Linear Equations | 1988 Linear Equations |
|---|---|---|---|---|---|
| Asphalt, 2 - 3 inches Less than 8 inches of base | All | Equation | PCI = 94.0 - 0.995(AGE) | PCI = 82.0- 0.486(AGE) | PCI = 98.8 - 1.12(AGE) |
| | | $R^2$ | 28.2 | 5.3 | 68.8 |
| | | T-Ratio | 4.06 | 1.13 | 12.18 |
| | | SEE | 17.63 | 20.01 | 6.3 |
| | | # Airports | 14 | n/a | n/a |
| | | N | 29 | 25 | 68 |
| | WA | Equation | PCI = 100.4 - 2.38(AGE) | PCI =99.1 - 2.14(AGE) | PCI = 99.1 - 1.59(AGE) |
| | | $R^2$ | 60.7 | 34 | 83.9 |
| | | T-Ratio | 5.13 | 2.78 | 11.46 |
| | | SEE | 17.47 | 19.2 | 5.61 |
| | | # Airports | 6 | n/a | n/a |
| | | N | 13 | 17 | 23 |
| | OR | Equation | PCI = 95.6 - 0.461(AGE) | PCI = 91.5 - 0.361(AGE) | PCI = 98.8 - 0.848(AGE) |
| | | $R^2$ | 54.7 | 51.6 | 65.9 |
| | | T-Ratio | 4.79 | 2.73 | 7.81 |
| | | SEE | 5.62 | 5.89 | 5.58 |
| | | # Airports | 7 | n/a | n/a |
| | | N | 14 | 9 | 32 |

Table 4.1b Alternate regression equations for flexible pavement containing 2 - 3 inches of Asphalt Concrete on less than 8 inches of base material

| Pavement Type | Location Category | | 1996 WSDOT Power Equations | 1992 WSDOT Power Equations | 1996 Best Fit/Alternate Equations |
|---|---|---|---|---|---|
| Asphalt, 2 - 3 inches Less than 8 inches of base | All | Equation | $PCI = 92.0 - 0.384(AGE)^{1.25}$ | n/a | $PCI = 78.1 - 1.39\ln(AGE)$ |
| | | $R^2$ | 23.1 | n/a | 36.6 |
| | | T-Ratio | n/a | n/a | 4.93 |
| | | RMSE | 18.25 | n/a | 16.57 |
| | | # Airports | 14 | n/a | 14 |
| | | N | 29 | n/a | 29 |
| | WA | Equation | $PCI = 99.2 - 1.12(AGE)^{1.25}$ | n/a | n/a |
| | | $R^2$ | 60.5 | n/a | n/a |
| | | T-Ratio | n/a | n/a | n/a |
| | | RMSE | 17.52 | n/a | n/a |
| | | # Airports | 6 | n/a | 6 |
| | | N | 13 | n/a | n/a |
| | OR | Equation | $PCI = 94.9 - 0.182(AGE)^{1.25}$ | n/a | $PCI = 87.1 - .803\ln(AGE)$ |
| | | $R^2$ | 50.3 | n/a | 80.2 |
| | | T-Ratio | n/a | n/a | 8.76 |
| | | RMSE | 5.9 | n/a | 3.72 |
| | | # Airports | 7 | n/a | 7 |
| | | N | 14 | n/a | 14 |

Table 4.2a Linear regression equations for flexible pavement containing 2 - 3 inches of Asphalt Concrete on more than 8 inches of base material

| Pavement Type | Location Category | | 1996 Linear Equations | 1992 Linear Equations | 1988 Linear Equations |
|---|---|---|---|---|---|
| Asphalt, 2-3 inches More than 8 inches of base | All | Equation | PCI = 97.6 - 1.70(AGE) | PCI = 96.1 - 0.838(AGE) | PCI = 98.0 - 1.48(AGE) |
| | | $R^2$ | 73 | 26.1 | 54.1 |
| | | T-Ratio | 10.13 | 2.45 | 8.11 |
| | | SEE | 7.16 | 10.39 | 8.37 |
| | | # Airports | 13 | n/a | n/a |
| | | N | 27 | 19 | 54 |
| | WA | Equation | PCI = 98.6 - 1.69(AGE) | PCI = 96.4 - 0.853(AGE) | PCI = 100.0 - 1.08(AGE) |
| | | $R^2$ | 71.5 | 20.3 | 51.9 |
| | | T-Ratio | 5.93 | 1.82 | 3.59 |
| | | SEE | 9.77 | 11.87 | 7.68 |
| | | # Airports | 5 | n/a | n/a |
| | | N | 11 | 15 | 12 |
| | OR | Equation | PCI = 98.0 - 2.02(AGE) | PCI = 98.1 - 1.47(AGE) | PCI = 99.1 - 1.37(AGE) |
| | | $R^2$ | 72.2 | 85.2 | 76.9 |
| | | T-Ratio | 7.56 | 4.15 | 9.17 |
| | | SEE | 4.99 | 1.71 | 4.6 |
| | | # Airports | 8 | n/a | n/a |
| | | N | 16 | 5 | 23 |

Table 4.2b Alternate regression equations for flexible pavement containing 2 - 3 inches of Asphalt Concrete on more than 8 inches of base material

| Pavement Type | Location Category | | 1996 WSDOT Power Equations | 1992 WSDOT Power Equations | 1996 Best Fit/Alternate Equations |
|---|---|---|---|---|---|
| Asphalt, 2-3 inches | All | Equation | $PCI = 96.3 - 0.788(AGE)^{1.25}$ | n/a | $PCI = 98.1e^{-0.022(AGE)}$ |
| More than 8 inches | | $R^2$ | 68.8 | n/a | 69.9 |
| of base | | T-Ratio | n/a | n/a | 9.39 |
| | | RMSE | 7.69 | n/a | 0.098 |
| | | # Airports | 13 | n/a | 13 |
| | | N | 27 | n/a | 27 |
| | WA | Equation | $PCI = 97.4 - 0.775(AGE)^{1.25}$ | n/a | n/a |
| | | $R^2$ | 68.7 | n/a | n/a |
| | | T-Ratio | n/a | n/a | n/a |
| | | RMSE | 10.25 | n/a | n/a |
| | | # Airports | 5 | n/a | n/a |
| | | N | 11 | n/a | n/a |
| | OR | Equation | $PCI = 97.1 - 1.08(AGE)^{1.25}$ | n/a | n/a |
| | | $R^2$ | 68 | n/a | n/a |
| | | T-Ratio | n/a | n/a | n/a |
| | | RMSE | 5.35 | n/a | n/a |
| | | # Airports | 8 | n/a | n/a |
| | | N | 16 | n/a | n/a |

Table 4.3a Linear regression equations for flexible pavement containing 2 - 3 inches of Asphalt Concrete on less than 8 inches of base material constructed during World War Two

| Pavement Type | Location Category | | 1996 Linear Equations | 1992 Linear Equations | 1988 Linear Equations |
|---|---|---|---|---|---|
| World War II | All | Equation | PCI = 100.1 - 0.966(AGE) | n/a | n/a |
| Less than 3 inches | | $R^2$ | 64.3 | n/a | n/a |
| Asphalt. Less than | | T-Ratio | 7.47 | n/a | n/a |
| 8 inches base. | | SEE | 16.03 | n/a | n/a |
| | | # Airports | 10 | n/a | n/a |
| | | N | 23 | n/a | n/a |
| | WA | Equation | PCI = 99.7 - 0.891(AGE) | PCI = 100.8 - 1.08(AGE) | n/a |
| | | $R^2$ | 70.2 | 70.9 | n/a |
| | | T-Ratio | 7.67 | n/a | n/a |
| | | SEE | 12.96 | n/a | n/a |
| | | # Airports | 8 | n/a | n/a |
| | | N | 19 | 11 | n/a |

Table 4.3b Alternate regression equations for flexible pavement containing 2 - 3 inches of Asphalt Concrete on less than 8 inches of base material constructed during World War Two

| Pavement Type | Location Category | | 1996 WSDOT Power Equations | 1992 WSDOT Power Equations | 1996 Best Fit/Alternate Equations |
|---|---|---|---|---|---|
| World War II Less than 3 inches Asphalt. Less than 8 inches base. | All | Equation | $PCI = 100.0 - 0.368(AGE)^{1.25}$ | $PCI = 100.0 - 0.0234(AGE)^2$ | n/a |
| | | $R^2$ | 64.4 | 72.1 | n/a |
| | | T-Ratio | n/a | 4.82 | n/a |
| | | RMSE | 16.01 | 9.88 | n/a |
| | | # Airports | 10 | n/a | n/a |
| | | N | 23 | 11 | n/a |
| | WA | Equation | $PCI = 99.6 - 0.339(AGE)^{1.25}$ | n/a | $66.0 - 2.11\ln(AGE)$ |
| | | $R^2$ | 69.9 | n/a | 70.7 |
| | | T-Ratio | n/a | n/a | 7.77 |
| | | RMSE | 13.03 | n/a | 12.85 |
| | | # Airports | 8 | n/a | 8 |
| | | N | 19 | n/a | 19 |

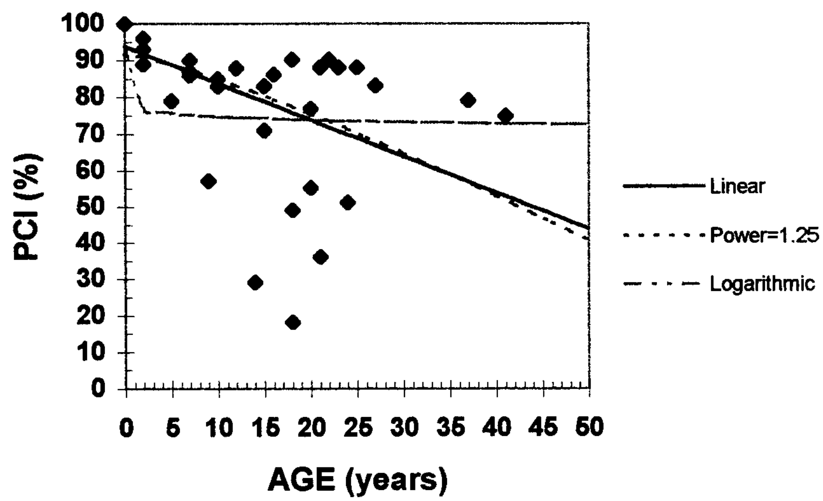


Figure 4.1 PCI vs AGE plot for flexible pavements of 2-3 inches AC on less than 8 inches base.

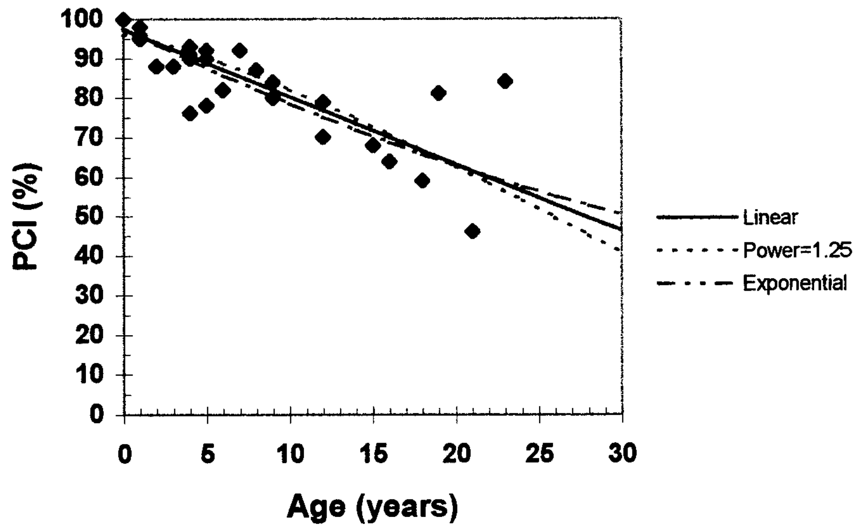


Figure 4.2 PCI vs AGE plot for flexible pavements of 2-3 inches AC on more than 8 inches base.

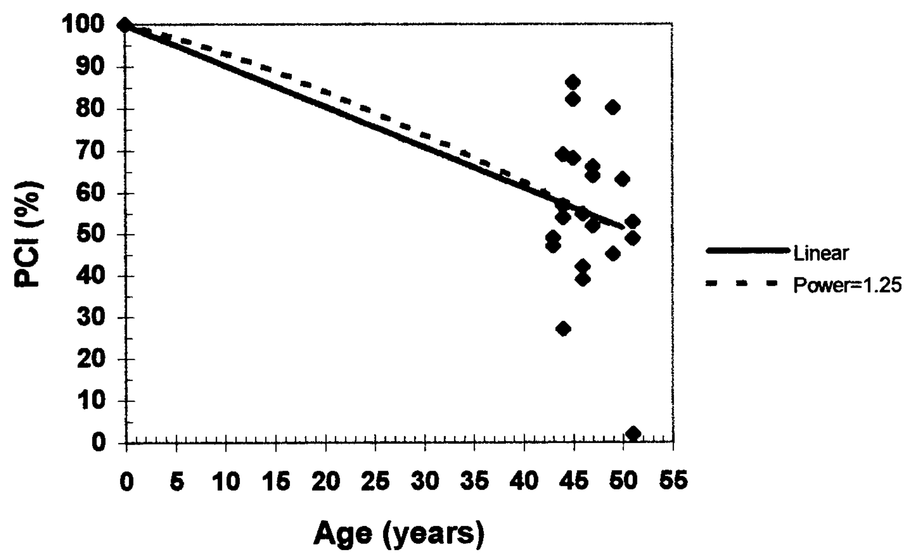


Figure 4.3 PCI vs. AGE plot for flexible pavements of 2-3 inches AC on less than 8 inches base constructed during World War Two.

#### 4.5.1.2 Pavement Life Statistics

The difference in time between original construction and the first maintenance or repair technique or between repair techniques is referred to as pavement LIFE. For purposes of this study, it was assumed that repair or maintenance techniques were performed due to necessity, not extraneous non-structural requirements. As explained in Chapter Three, the estimated PCI percent loss per year was based upon these repairs being performed at the recommended time of a PCI at approximately 55%. Using this fact, the loss per year is simply the remaining 45% value divided by the average LIFE of the pavement section. These calculations also assume that the repair elevated the pavement PCI value to 100%, as already discussed. For example assume that a pavement demonstrated a LIFE of five years. The PCI loss per year would be calculated as follows:

$$PCI\ Loss\ per\ Year = \frac{45\%}{5\ years} = 9\ \%\ Loss\ per\ year$$

When conducting the flexible pavement LIFE analysis, two categories were used; runways constructed during World War Two and runways constructed after World War Two. These categories were further broken down based upon pavement thickness. Tables 4.4a through 4.4d list the results of the LIFE analysis from this study. LIFE analysis data from the previous studies is also presented for easy comparison.

The results obtained from this study are in very close approximation to those obtained by Floro[4]. The largest exception is seen in Table 4.4d, where the average pavement life has increased by approximately three years with a 0.5 drop in PCI loss per year.

Table 4.4a Pavement LIFE characteristics for pavements constructed during World War Two with less than 3 inches of asphalt.

| Pavement Category | Study Identification | Average Life | Shortest Life | Longest Life | Average PCI Loss | Standard Deviation | Number Of Points |
|---|---|---|---|---|---|---|---|
| Less than 3 inches | 1988 | 37.4 | 9 | 43 | 1.6 | 11.2 | 42 |
| Asphalt, WWII | 1992 | 35 | 21 | 43 | 1.3 | 5.5 | 33 |
| | 1996 | 35.7 | 21 | 47 | 1.3 | 6 | 34 |

Table 4.4b Pavement LIFE characteristics for pavements constructed during World War Two with 3 inches or more of asphalt.

| Pavement Category | Study Identification | Average Life | Shortest Life | Longest Life | Average PCI Loss | Standard Deviation | Number Of Points |
|---|---|---|---|---|---|---|---|
| 3 inches or greater | 1988 | n/a | n/a | n/a | n/a | n/a | n/a |
| Asphalt, WWII | 1992 | 30.2 | 9 | 41 | 1.5 | 8.7 | 9 |
| | 1996 | 28.9 | 9 | 34 | 1.6 | 8.3 | 8 |

Table 4.4c Pavement LIFE characteristics for pavements constructed after World War Two with less than 3 inches of asphalt.

| Pavement Category | Study Identification | Average Life | Shortest Life | Longest Life | Average PCI Loss | Standard Deviation | Number Of Points |
|---|---|---|---|---|---|---|---|
| Less than 3 inches | 1988 | 12.4 | 3 | 35 | 3.7 | 7.6 | 20 |
| Asphalt, Post WWII | 1992 | 14.3 | 4 | 37 | 3 | 9.5 | 23 |
| | 1996 | 13.9 | 5 | 35 | 3.2 | 7.6 | 34 |

Table 4.4d Pavement LIFE characteristics for pavements constructed after World War Two with 3 inches or more of asphalt.

| Pavement Category | Study Identification | Average Life | Shortest Life | Longest Life | Average PCI Loss | Standard Deviation | Number Of Points |
|---|---|---|---|---|---|---|---|
| 3 inches or greater | 1988 | 14 | 10 | 18 | 3.2 | 3.8 | 5 |
| Asphalt, Post WWII | 1992 | 14.9 | 3 | 37 | 3 | 10.5 | 8 |
| | 1996 | 18.1 | 10 | 27 | 2.5 | 7.5 | 7 |

### 4.5.2 Asphalt Concrete Overlays

Asphalt overlays were evaluated as a single group rather than being broken into thickness categories as done in the previous section. The vast majority of overlays reviewed consisted of two inch surface courses. Of the runways included in this study, the thickest overlay evaluated was five inches. FAA Advisory Circular 150/5380-6[2] indicates that within this range, the thickness of the overlay plays little role on PCI rating. Although underlying pavement may play a role in overlay durability, this was not taken into consideration due to the lack of sufficient data.

A review of the results suggests that the linear model is the best overall representation of asphalt overlays. The WSDOT power model is a very close second. Results from this study provided values higher than in the previous studies almost across the board. Only linear models were examined in the previous studies, so no comparison can be made with the curvilinear equations.

#### 4.5.2.1 Regression Models Obtained

The following tables contain the results of the regression analysis conducted on overlay pavements. Table 4.5a contains the linear models from all three studies. Table 4.5b contains the WSDOT power model and 'best fit' alternative where applicable.

Table 4.5a Linear regression equations for Asphalt Concrete overlays on any base/subbase.

| Pavement Type | Location Category | | 1996 Linear Equations | 1992 Linear Equations | 1988 Linear Equations |
|---|---|---|---|---|---|
| Asphalt Overlays | All | Equation | PCI = 98.1 - 1.62(AGE) | PCI = 90.8 - 1.03(AGE) | PCI = 98.7 - 1.54(AGE) |
| | | $R^2$ | 71.9 | 23.3 | 58.5 |
| | | T-Ratio | 16.68 | 3.17 | 11.11 |
| | | SEE | 6.23 | 9.32 | 6.4 |
| | | # Airports | 28 | n/a | n/a |
| | | N | 58 | 37 | 88 |
| | WA | Equation | PCI = 97.7 - 1.25(AGE) | PCI = 93.2 - 1.23(AGE) | PCI = 98.9- 1.43(AGE) |
| | | $R^2$ | 48.3 | 29.5 | 66 |
| | | T-Ratio | 6.26 | 3.1 | 8.31 |
| | | SEE | 8.83 | 10.01 | 5.78 |
| | | # Airports | 14 | n/a | n/a |
| | | N | 30 | 25 | 36 |
| | OR | Equation | PCI = 97.2 - 1.68(AGE) | PCI = 92.4 - 1.17(AGE) | PCI = 98.1 - 1.76(AGE) |
| | | $R^2$ | 77 | 35.1 | 58.9 |
| | | T-Ratio | 9.67 | 2.44 | 7.55 |
| | | SEE | 5.28 | 6.99 | 6.6 |
| | | # Airports | 10 | n/a | n/a |
| | | N | 20 | 13 | 40 |
| | ID | Equation | PCI = 101.7 - 2.35(AGE) | n/a | PCI = 98.3 - 1.30(AGE) |
| | | $R^2$ | 73.8 | n/a | 25 |
| | | T-Ratio | 5.31 | n/a | 2.16 |
| | | SEE | 6.99 | n/a | 8.15 |
| | | # Airports | 4 | n/a | n/a |
| | | N | 8 | n/a | 12 |

Table 4.5b Alternate regression equations for Asphalt Concrete overlays on any base/subbase.

| Pavement Type | Location Category | | 1996 WSDOT Power Equations | 1992 WSDOT Power Equations | 1996 Best Fit/Alternate Equations |
|---|---|---|---|---|---|
| Asphalt Overlays | All | Equation | $PCI = 97.1 - 0.793(AGE)^{1.25}$ | n/a | n/a |
| | | $R^2$ | 69.1 | n/a | n/a |
| | | T-Ratio | n/a | n/a | n/a |
| | | RMSE | 6.54 | n/a | n/a |
| | | # Airports | 28 | n/a | n/a |
| | | N | 58 | n/a | n/a |
| | WA | Equation | $PCI = 96.8 - 0.597(AGE)^{1.25}$ | n/a | n/a |
| | | $R^2$ | 46.2 | n/a | n/a |
| | | T-Ratio | n/a | n/a | n/a |
| | | RMSE | 9.01 | n/a | n/a |
| | | # Airports | 14 | n/a | n/a |
| | | N | 30 | n/a | n/a |
| | OR | Equation | $PCI = 96.3 - 0.851(AGE)^{1.25}$ | n/a | n/a |
| | | $R^2$ | 73.4 | n/a | n/a |
| | | T-Ratio | n/a | n/a | n/a |
| | | RMSE | 5.67 | n/a | n/a |
| | | # Airports | 10 | n/a | n/a |
| | | N | 20 | n/a | n/a |
| | ID | Equation | $PCI = 98.8 - 0.343(AGE)^{1.75}$ | n/a | n/a |
| | | $R^2$ | 79.1 | n/a | n/a |
| | | T-Ratio | n/a | n/a | n/a |
| | | RMSE | 6.24 | n/a | n/a |
| | | # Airports | 4 | n/a | n/a |
| | | N | 8 | n/a | n/a |

Figure 4.4 graphically illustrates the regression equations obtained for the combined category. Plots of each individual state can be found in Appendix G.

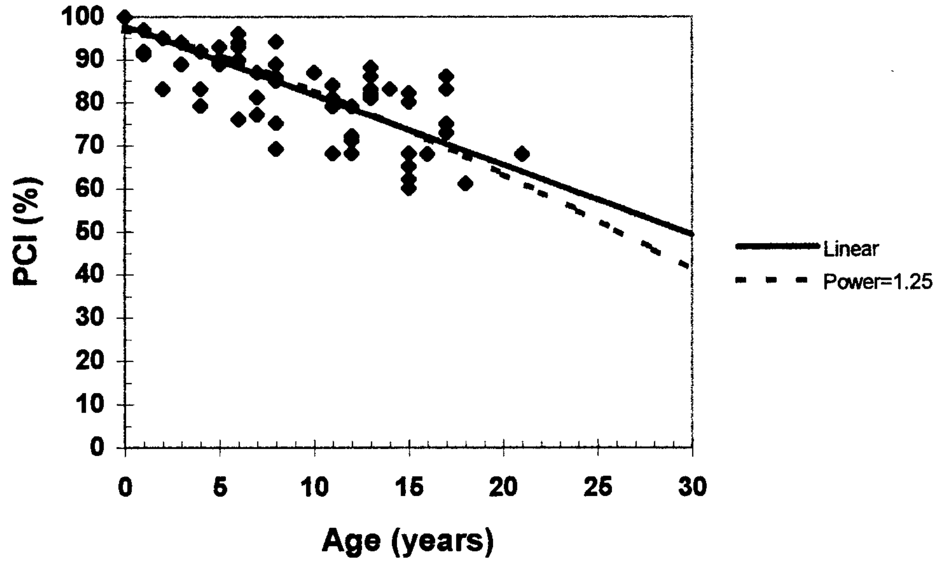


Figure 4.4 PCI vs AGE plot for asphalt overlays of any thickness on any base/subbase.

#### 4.5.2.2 Pavement LIFE Statistics

As in the previous section, pavement LIFE was determined by subtracting the overlay repair date from the subsequent repair date. Table 4.6 lists the comparison LIFE statistics from the three studies. The 1992 results mimic the 1988 results as no pavement maintenance was recorded within that time frame. A review of the LIFE statistics indicates an increase in the average pavement life in conjunction with a dramatic jump in the standard deviation.

Table 4.6 Pavement LIFE characteristics for AC overlays of any thickness on any base/subbase.

| Pavement Category | Study Identification | Average Life | Shortest Life | Longest Life | Average PCI Loss | Standard Deviation | Number Of Points |
|---|---|---|---|---|---|---|---|
| Asphalt Overlay | 1988 | 11.6 | 8 | 16 | 3.9 | 2.6 | 7 |
| | 1992 | 11.6 | 8 | 16 | 3.9 | 2.6 | 7 |
| | 1996 | 13.1 | 5 | 21 | 3.4 | 6.3 | 9 |

### 4.5.3 Bituminous Surface Treatments

As stated in Chapter Three, all new construction BST pavements, whether single, double, or triple surface treatments, were evaluated as a single category. The results obtained from this survey did not easily compare with either of the previous surveys. Weisenberger's[10] study evaluated each BST treatment separately with only a combined summary comparable. Floro's[4] study examined two separate trends using only the WSDOT power model. An analysis of the combined data was not accomplished and therefore not comparable. This study looked at only the combined data equations.

A review of the results shows a significant rise in the $R^2$ values from the 1988 study. It appears that the logarithmic model provides the 'best fit', but it should be discounted as it does not follow typical pavement performance trends.

#### 4.5.3.1 Regression Models Obtained

Tables 4.7a and 4.7b contain the regression equations developed and the corresponding equations from previous studies where available. Table 4.7a contains the linear models and Table 4.7b the WSDOT power and 'best fit' models.

Figure 4.5 is the graphical representation of the regression equations developed from the bituminous surface treatment analysis. Only the combined plot is shown. Plots for individual states can be found in Appendix G. Note that there appears to be two separate trends in the data plot. An analysis of the data failed to indicate any cause for this disparity. An examination was conducted on whether the pavement composition contributed to the trend. Of the pavements analyzed, six where TBST's, three were DBST's, and two were BST's. The data, therefore, failed to indicate that this played any role in the resulting outcome.

Table 4.7a Linear regression equations for all levels of bituminous surface treatments; new construction only.

| Pavement Type | Location Category | | 1996 Linear Equations | 1992 Linear Equations | 1988 Linear Equations |
|---|---|---|---|---|---|
| Bituminous Surface Treatments | All | Equation | PCI = 87.9 - 2.54(AGE) | n/a | PCI = 77.1 - 1.54(AGE) |
| | | $R^2$ | 37.2 | n/a | 7.8 |
| | | T-Ratio | 4.43 | n/a | 1.51 |
| | | SEE | 19.28 | n/a | 15.71 |
| | | # Airports | 11 | n/a | n/a |
| | | N | 24 | n/a | 16 |
| | WA | Equation | PCI = 85.5 - 2.28(AGE) | n/a | n/a |
| | | $R^2$ | 35.6 | n/a | n/a |
| | | T-Ratio | 3.64 | n/a | n/a |
| | | SEE | 19.37 | n/a | n/a |
| | | # Airports | 8 | n/a | n/a |
| | | N | 18 | n/a | n/a |
| | OR | Equation | PCI = 97.6 - 3.91(AGE) | n/a | n/a |
| | | $R^2$ | 48.7 | n/a | n/a |
| | | T-Ratio | 2.58 | n/a | n/a |
| | | SEE | 19.89 | n/a | n/a |
| | | # Airports | 3 | n/a | n/a |
| | | N | 6 | n/a | n/a |

Table 4.7b Alternate regression equations for all levels of bituminous surface treatments; new construction only.

| Pavement Type | Location Category | | 1996 WSDOT Power Equations | 1992 WSDOT Power Equations | 1996 Best Fit/Alternate Equations |
|---|---|---|---|---|---|
| Bituminous Surface Treatments | All | Equation | $PCI = 85.5 - 1.16(AGE)^{1.25}$ | n/a | PCI = 66.3 - 2.12ln(AGE) |
| | | $R^2$ | 31.7 | n/a | 55.8 |
| | | T-Ratio | n/a | n/a | 6.45 |
| | | RMSE | 20.11 | n/a | 16.18 |
| | | # Airports | 11 | n/a | 11 |
| | | N | 24 | n/a | 24 |
| | WA | Equation | $PCI = 83.3 - 1.03(AGE)^{1.25}$ | n/a | PCI = 64.9 - 2.20ln(AGE) |
| | | $R^2$ | 30.1 | n/a | 61.6 |
| | | T-Ratio | n/a | n/a | 6.21 |
| | | RMSE | 20.18 | n/a | 14.95 |
| | | # Airports | 8 | n/a | 8 |
| | | N | 18 | n/a | 18 |
| | OR | Equation | $PCI = 95.9 - 2.09(AGE)^{1.25}$ | n/a | n/a |
| | | $R^2$ | 45.7 | n/a | n/a |
| | | T-Ratio | n/a | n/a | n/a |
| | | RMSE | 20.47 | n/a | n/a |
| | | # Airports | 3 | n/a | n/a |
| | | N | 6 | n/a | n/a |

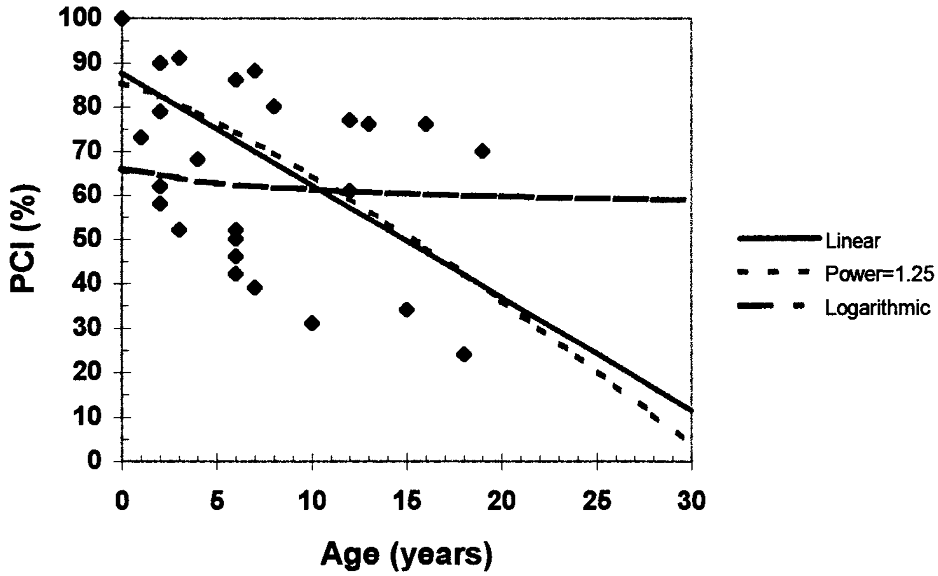


Figure 4.5 PCI vs AGE plot for bituminous surface treatments, all categories; new construction only.

#### 4.5.3.2 Pavement LIFE Statistics

Pavement LIFE for bituminous surface treatments was obtained identically to asphalt pavement LIFE. Several additional pavements were reviewable in this study compared to the previous studies. While life did not change dramatically from the 1992 study, the standard deviation increased significantly. This increase is most likely due to the large increase in the number of data points analyzed. Table 4.8 lists the LIFE statistics for the bituminous surface treatments reviewed.

Table 4.8 Pavement LIFE statistics for Bituminous Surface Treatments

| Pavement Category | Study Identification | Average Life | Shortest Life | Longest Life | Average PCI Loss | Standard Deviation | Number Of Points |
|---|---|---|---|---|---|---|---|
| Bituminous Surface | 1988 | 9.2 | 1 | 29 | 4.9 | 6.4 | 22 |
| Treatment | 1992 | 14.4 | 11 | 17 | 3.1 | 2.2 | 5 |
| | 1996 | 13.6 | 2 | 36 | 3.3 | 9.1 | 34 |

### 4.5.4 Slurry Sealed Pavements

Two surface maintenance techniques were reviewed in the course of this study. The first of these is the slurry seal. This is a very common repair method for runways, providing a large number of data points. As with bituminous surface treatments, data comparison was difficult to accomplish due to the variations in data treatment between surveys. Floro[4] once again analyzed two separate trends, using only WSDOT power models. This time the combined data was reviewed however, and is included in Table 4.9b for comparison. Weisenberger[10] reviewed slurry seals, but only as a group. Individual state statistics are not available for comparison.

The statistical results from this study are considerably better than in previous studies, but are in no way statistically significant. In large part, this is due the wide variation in material types and application procedures. The assumption of an initial PCI of 100% at AGE zero may not be valid either. This is noted with pavements that possess lower PCI values at young ages.

#### 4.5.4.1 Regression Models Obtained

Tables 4.9a and 4.9b contain the regression equations developed from analysis of the slurry sealed pavements. Table 4.9a contains the linear equations developed and Table 4.9b the WSDOT power models and 'best fit' equations where applicable. Note that the highest $R^2$ value was provided by a logarithmic model.

Table 4.9a Linear regression equations for slurry sealed pavements

| Pavement Type | Location Category | | 1996 Linear Equations | 1992 Linear Equations | 1988 Linear Equations |
|---|---|---|---|---|---|
| Slurry Seals | All | Equation | PCI = 89.0 - 2.87(AGE) | n/a | PCI = 74.0 - 0.25(AGE) |
| | | $R^2$ | 52.4 | n/a | 0 |
| | | T-Ratio | 7.71 | n/a | 0.46 |
| | | SEE | 15.9 | n/a | 16.11 |
| | | # Airports | 18 | n/a | n/a |
| | | N | 38 | n/a | 24 |
| | WA | Equation | PCI = 88.7 - 2.54(AGE) | n/a | n/a |
| | | $R^2$ | 52.2 | n/a | n/a |
| | | T-Ratio | 6.27 | n/a | n/a |
| | | SEE | 14.89 | n/a | n/a |
| | | # Airports | 12 | n/a | n/a |
| | | N | 25 | n/a | n/a |
| | ID | Equation | PCI = 94.0 - 4.10(AGE) | n/a | n/a |
| | | $R^2$ | 63.9 | n/a | n/a |
| | | T-Ratio | 4.21 | n/a | n/a |
| | | SEE | 19.05 | n/a | n/a |
| | | # Airports | 4 | n/a | n/a |
| | | N | 8 | n/a | n/a |

Table 4.9b Alternate regression equations for slurry sealed pavements

| Pavement Type | Location Category | | 1996 WSDOT Power Equations | 1992 WSDOT Power Equations | 1996 Best Fit/Alternate Equations |
|---|---|---|---|---|---|
| Slurry Seals | All | Equation | $PCI = 86.3 - 1.31(AGE)^{1.25}$ | $PCI = 72.6 - 0.2(AGE)^{1.5}$ | PCI = 65.6 - 2.18ln(AGE) |
| | | $R^2$ | 45.4 | 18 | 64.6 |
| | | T-Ratio | n/a | 2.15 | 9.93 |
| | | RMSE | 17.04 | 13.11 | 13.71 |
| | | # Airports | 18 | n/a | 18 |
| | | N | 38 | 23 | 38 |
| | WA | Equation | $PCI = 86.1 - 1.13(AGE)^{1.25}$ | n/a | PCI = 66.9 - 2.09ln(AGE) |
| | | $R^2$ | 44.5 | n/a | 69.4 |
| | | T-Ratio | n/a | n/a | 9.04 |
| | | RMSE | 16.04 | n/a | 11.91 |
| | | # Airports | 12 | n/a | 12 |
| | | N | 25 | n/a | 25 |
| | ID | Equation | $PCI = 91.7 - 2.05(AGE)^{1.25}$ | n/a | n/a |
| | | $R^2$ | 60.9 | n/a | n/a |
| | | T-Ratio | n/a | n/a | n/a |
| | | RMSE | 19.84 | n/a | n/a |
| | | # Airports | 4 | n/a | 4 |
| | | N | 8 | | n/a |

Figure 4.6 graphically illustrates the regression equations developed for the combined category. Individual state plots can be found in Appendix G.

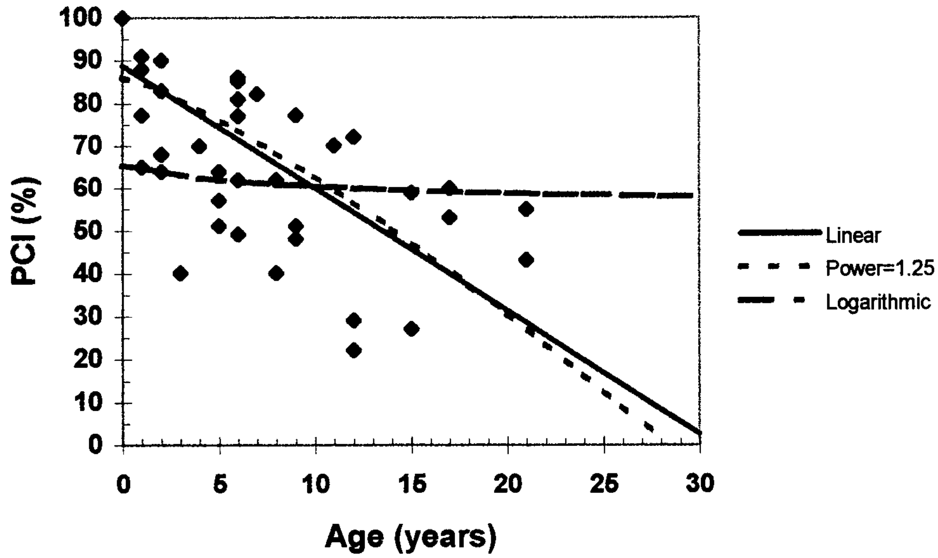


Figure 4.6 PCI vs AGE plot for slurry sealed pavements

#### 4.5.4.2 Pavement LIFE Statistics

Since slurry seal application is almost solely a maintenance technique, pavement LIFE statistics were determined by subtracting the original application date from any follow on maintenance application. Although widely used, very few slurry sealed pavements had received a repair treatment, thereby presenting very few data points. A 1992 review was not conducted on the LIFE data. When compared to the 1988 survey, the 1996 results are very similar across the board. Table 4.10 contains the LIFE statistics for slurry sealed pavements.

Table 4.10 Pavement LIFE characteristics for slurry sealed pavements.

| Pavement Category | Study Identification | Average Life | Shortest Life | Longest Life | Average PCI Loss | Standard Deviation | Number Of Points |
|---|---|---|---|---|---|---|---|
| Slurry Seal | 1988 | 5.6 | 3 | 10 | 8 | 3 | 6 |
| | 1992 | n/a | n/a | n/a | n/a | n/a | n/a |
| | 1996 | 4.1 | 1 | 9 | 11 | 2.7 | 7 |

### 4.5.5 Chip Sealed Pavements

The second maintenance technique reviewed was pavements that had been chip sealed. The chip seal category included all pavements labeled as chip seals or BSTs applied as maintenance techniques. These were not included in the new construction BST category. A comparison to the prior studies proved difficult. Floro[4] did not review chip seals as a separate category. Weisenberger[10] performed only linear regression and did not break categories down into states. Theoretically, maintenance chip seals should behave similarly to new construction BSTs due to their virtually identical construction process. A review of the regression models for both demonstrates that this is a fairly accurate assumption. The chip sealed pavements performed slightly better, most like due to the more substantial base course (existing pavement).

#### 4.5.5.1 Regression Models Obtained

Tables 4.11a and 4.11b contain the regression equations developed from analysis of the chip sealed pavements. Table 4.11a contains the linear models obtained and Table 4.11b contains the WSDOT power models and 'best fit' alternative.

Table 4.11a Linear regression equations for chip seal pavements.

| Pavement Type | Location Category | | 1996 Linear Equations | 1992 Linear Equations | 1988 Linear Equations |
|---|---|---|---|---|---|
| Chip Seals | All | Equation | PCI = 89.8 - 2.51(AGE) | n/a | PCI = 77.6 - 1.46(AGE) |
| | | $R^2$ | 46.4 | n/a | 21.4 |
| | | T-Ratio | 4.37 | n/a | 2.54 |
| | | SEE | 17.54 | n/a | 16.25 |
| | | # Airports | 8 | n/a | n/a |
| | | N | 16 | n/a | 20 |
| | WA | Equation | PCI = 90.0 - 2.96(AGE) | n/a | n/a |
| | | $R^2$ | 39 | n/a | n/a |
| | | T-Ratio | 2.88 | n/a | n/a |
| | | SEE | 18.99 | n/a | n/a |
| | | # Airports | 5 | n/a | n/a |
| | | N | 10 | n/a | n/a |

Table 4.11b Alternate regression equations for chip seal pavements.

| Pavement Type | Location Category | | 1996 WSDOT Power Equations | 1992 WSDOT Power Equations | 1996 Best Fit/Alternate Equations |
|---|---|---|---|---|---|
| Chip Seals | All | Equation | $PCI = 87.5 - 1.15(AGE)^{1.25}$ | n/a | PCI = 65.9 - 2.15ln(AGE) |
| | | $R^2$ | 39.7 | n/a | 63.8 |
| | | T-Ratio | n/a | n/a | 6.23 |
| | | RMSE | 18.61 | n/a | 14.42 |
| | | # Airports | 8 | n/a | 8 |
| | | N | 16 | n/a | 16 |
| | WA | Equation | $PCI = 87.7 - 1.41(AGE)^{1.25}$ | n/a | PCI = 69.0 - 1.96ln(AGE) |
| | | $R^2$ | 32.7 | n/a | 52.4 |
| | | T-Ratio | n/a | n/a | 3.78 |
| | | RMSE | 19.95 | n/a | 16.78 |
| | | # Airports | 5 | n/a | 5 |
| | | N | 10 | n/a | 10 |

Figure 4.7 graphically demonstrates the equations developed for chip sealed pavements. Only the combined data plot is shown. Plots for each individual state possessing data can be found in Appendix G.

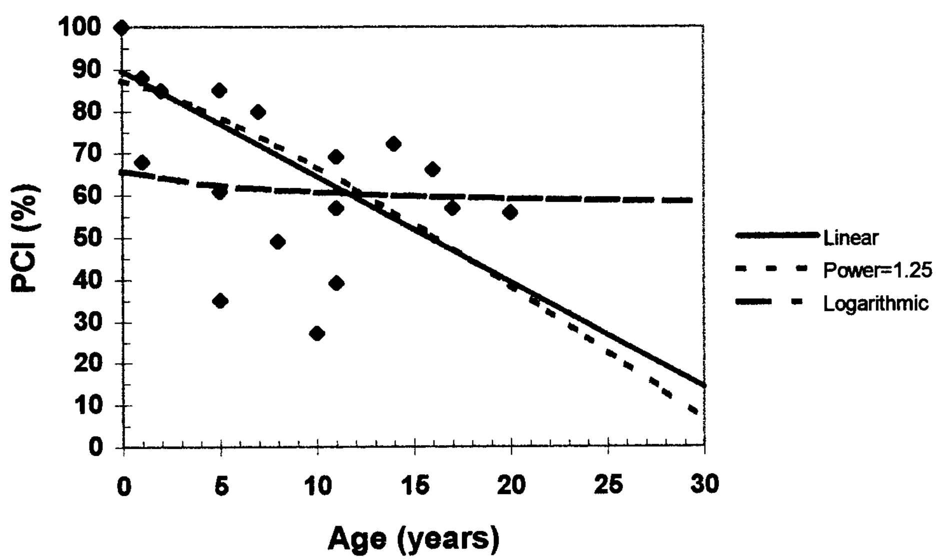


Figure 4.7 PCI vs AGE plot for chip sealed pavements.

#### 4.5.5.2 Pavement LIFE Statistics

It was not possible to calculate pavement LIFE statistics for chip sealed pavements; too few data points existed to give a valid statistical outcome. This is primarily due to the fact that this is solely a maintenance application category. Few runways possessing chip seals had been rehabilitated.

## 4.6 Discussion of Results

A large amount of information was generated and reviewed in the course of this research project. Most of the performance trends observed were already mentioned in each section. During the course of this project, however, several areas were highlighted that will be touched on in this section.

### 4.6.1 Airport Pavement Performance

A review of the data indicates airport pavements that seem to have unusually long life spans. It is typical for an asphalt concrete pavement to have a life span of about 12 to 15 years[11]. Many of the airports reviewed in this study have life spans beyond 30 years. This seems to be highly unlikely, but no data exists to suggest otherwise.

It is almost difficult to compare pavement performance between Idaho, Oregon, and Washington. Depending upon the pavement type and the regression model reviewed, each state performed better on some and worse on others. No hard results could be obtained from the data. It is interesting to note, however, that there were significantly more data points available for Washington than either Idaho or Oregon.

In highway pavements, the thickness of the asphalt concrete and base layers plays a vital role in pavement durability. In airport pavements, however, the results indicate that thickness plays little role in pavement durability. This is most likely due to the significantly lighter loads encountered on a general aviation runway than on most highway pavements.

#### 4.6.2 Surface Maintenance Techniques

The greatest difference in LIFE results came from the surface maintenance techniques reviewed. Slurry seals and chip seals deteriorated much faster than any of the new pavements. This is most likely due to the assumption of resetting the PCI/AGE clock upon maintenance application as has already been explained.

A review of the PCI/AGE surveys reveals that surface maintenance applications are most often applied as tools to extend the existing pavement life. This fact is backed by data showing little increase in the pavement PCI percentage immediately after the maintenance application. Most of these repairs do not provide long term solutions. In fact, it appears as though the underlying pavement plays a greater role in the performance of the maintenance application than any other fact. Any deficiencies in the underlying pavement usually transfer through the maintenance application. On the positive side, asphalt concrete overlays resulted in equations and LIFE determinations that demonstrate strong statistical predictablity. Chip seals and slurry seals, on the other hand, suggest the importance of knowing existing conditions before trying to predict future performance.

#### 4.6.3 Equation Models

Much has already been addressed regarding the regression equations utilized in this study. The most predominant models utilized in the regression results were the linear, WSDOT power, and logarithmic models. As previously explained the logarithmic models, although providing the highest $R^2$ values in many cases, do not conform to typical pavement performance models. In other words, they predict an almost infinite life for each pavement. Even though shown on the graphical plots where applicable, they should not be utilized for any form of pavement evaluation.

The linear and WSDOT models often provided fairly similar results. It was anticipated that the WSDOT model would consistently provide the 'best fit' as in highway pavements, but in many instances, the linear model was statistically better represented. The linear model, although very simple, actually has many strengths. In fact the very nature of its simplicity makes it easy to work with in many ways. It is plotted fairly easily, provides an easily determinable slope to predict deterioration, and requires no advanced system to compute. Ideally, however, the WSDOT power model should be more widely utilized. It provides a much more realistic model of actual pavement performance.

# 5.0 Summary and Recommendations

## 5.1 Summary

The intent of this paper was to develop regression models capable of forecasting airfield pavement performance. These models could be utilized by airport managers to more efficiently maintain their pavement management systems. The models were developed utilizing all available data from the Federal Aviation Administration for the states of Idaho, Oregon, and Washington. Given that climate plays a significant role in pavement performance, it is most likely that the equations developed in this study will not be applicable to many other areas of the country. In addition to the climate uncertainty, the equations generated by the study were not statistically strong. In other words, they did little to accurately predict future pavement performance, but rather indicated only general trends.

Regardless of the outcome, this study served to illustrate many of the pitfalls involved in establishing accurate regression models. The most important factor in developing quality regression models is good data. The data utilized in this study had many inaccuracies, generating little confidence in its validity. It served well for providing general trend models, but lacked enough depth or information to produce accurate prediction models. Inconsistent terminology, inspector subjectivity, poor maintenance records, and superficial procedures were only a few of the problems contributing to the inadequate data.

Timeliness was also a major concern. PCI surveys are usually conducted every three to four years on each airport. This survey had hoped to examine airfields containing three valid data points. Unfortunately, very few airports possessed this number of points due to the large time spread between surveys. Many airports had further maintenance accomplished within that time span. This essentially reset the PCI/AGE clock and eliminated future data points from contributing to the pavement modeling. Timing has also impacted the number of surveys completed. Washington has put a halt to conducting PCI surveys with no money budgeted for future surveys. This could effectively eliminate any future study of regional airfield pavement performance.

Many assumptions were made during the course of this study to overcome the lack of information in the data. Often these assumptions could significantly alter the resulting statistical analysis. Different assumptions were made in each of the three studies performed, prohibiting accurate comparisons from being made. Often, this was dictated as the data changed over time. It was more difficult to break the data into well defined categories with each subsequent report. This was due solely to data availability and the information contained within that data.

An example of how an assumption impacts the results is observed by examining whether the maintenance applications were required or preventive. The data did not spell out which, so the assumption was made that all new pavement applications were done because the existing surface was unstable. This assumption could significantly alter the pavement life calculations and could influence the overall pavement condition. More information needs to be obtained in this, and all areas to successfully predict pavement performance.

## 5.2 Recommendations

Several actions could be taken that would further progress the results of this study. As previously mentioned, this study dealt only with airfield runways. Other pavement features, such as taxiways and aprons, are also integral parts of an airport. A future study could examine the pavement conditions and develop regression models, adding another tool to the airport manager's pavement management system.

In any future studies, an attempt should be made to eliminate the assumptions that were utilized to complete this study. For example, a survey could be conducted after each maintenance application in order to establish baseline PCI figures. This would help eliminate the assumption of resetting the PCI/AGE clock after a maintenance application. Cost and time could be prohibitive in conducting these additional surveys, but the extra data could contribute to more statistically significant models.

The author believes that through utilization of the models developed in this study, an airport manager will be able to more accurately predict future pavement performance. This will allow for better planning and budgeting and increase the efficient use of the resources available.

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# APPENDIX A

***Summary of PCI Survey***

***Content and Procedure***

There is a considerable amount of data included in a PCI survey on any given airfield. It may come from many sources, but the majority of information is drawn from construction and maintenance records maintained by the airport and from previous pavement condition surveys. Regardless of locale, the information gathered serves to provide a solid record of the airport's history. The following items should be included in each PCI survey that is conducted:

1) Design, construction, and maintenance history -- All data from original construction of the airport pavement system to the present should be maintained. Any maintenance projects, repair projects, or physical changes to the pavement system should be readily available.

2) Traffic history -- The amount and type of traffic utilizing the airport should be recorded and kept up-to-date.

3) Climatological data -- The airport should be able to provide routine weather data for the vicinity of the airport to include annual temperature ranges and precipitation.

4) Airport layout -- Redline drawings of all major airport components should be maintained.

5) Frost action -- Frost tends to heavily impact pavement performance. Any pavement actions observed due to frost should be noted.

6) Photographs -- Regular photographs should be taken detailing general and specific airport conditions.

7) Pavement condition survey reports -- All previous PCI surveys should be available for reference in the current survey.

As already mentioned, the Pavement Condition Index rating system was developed by the U.S. Army Corps of Engineers. It is a straightforward system that can be broken into nine fairly distinct steps. The following is a brief outline of the actions required.

1) Divide the airport pavement into features and increments -- All airport pavements must be divided up based upon pavement design, construction history, and traffic area. A pavement feature will have consistent structural thickness and materials, be constructed at the same time, and be located in one airport facility, i.e., runway, taxiway,

etc. Once the airfield is segmented, an initial survey needs to be done to determine the amount and varying degrees of distress in the different pavement areas.

2) Divide each pavement feature into sample units -- Both flexible and rigid pavements have different requirements. The bottom line is a given number of slabs for PCC pavement and a set square footage for flexible pavement.

3) Inspect and record distress type, severity, and density -- Guidelines are included in AC 150/5380-6 for identifying pavement distress and severity.

4) Determine deduct values -- Each distress type, density, and severity level has an appropriate deduct value determined from published curves.

5) Find total deduct value (TDV) -- All deduct values for each distress condition observed are summed.

6) Find corrected deduct value (CDV) -- Both rigid and flexible pavements have specific procedures outlined for adjusting the TDV.

7) Determine Pavement Condition Index -- For each sample unit inspected use the following formula to determine PCI:

$$PCI = 100 - CDV$$

8) Determine PCI value for total feature -- The average of all sample unit PCI's gives the PCI value for the total feature.

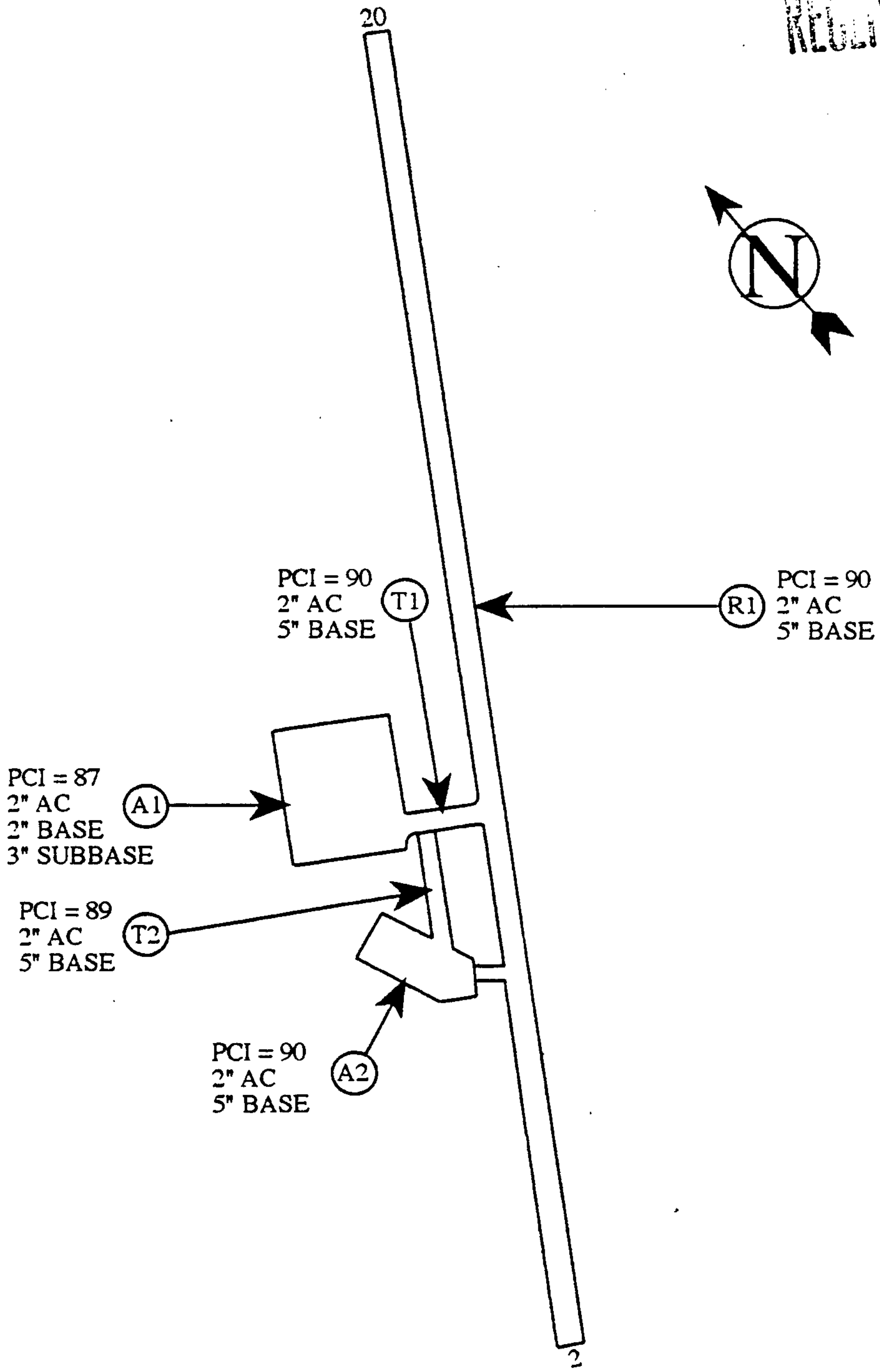
9) Cross PCI with verbal description -- Each PCI value has a corresponding verbal description.

The above steps demonstrate that the rating system is fairly straightforward. By having a standardized procedure in place, the FAA can better regulate the quality and repeatability of ongoing surveys. When these procedures are followed, the confidence level of the data ranges from 92% to 95% depending upon the size of the sample area. The lower confidence value is related to a smaller inspection area. The confidence level indicates the probability that an obtained value from the survey will fall within a percentage range of 10%(±5%) to 16%(±8%) of representing the entire pavement feature being surveyed.[4]

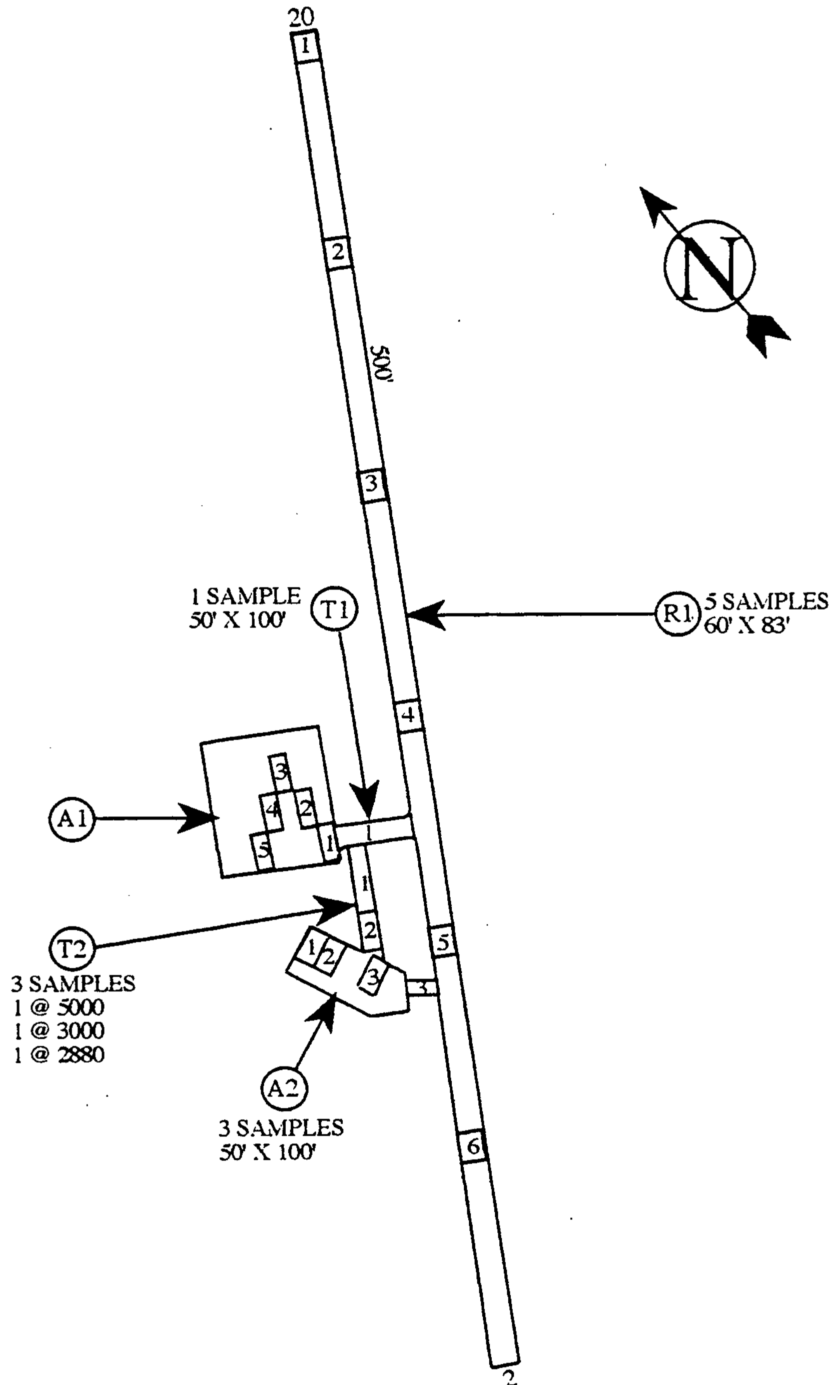
# APPENDIX B

***Example PCI Survey***

***Washington***




LAKE CHELAN MUNICIPAL AIRPORT
PAVEMENT FEATURES AND PCI NUMBERS
MARCH, 1993




LAKE CHELAN MUNICIPAL AIRPORT
LOCATION OF SAMPLE UNITS WITHIN EACH FEATURE
MARCH, 1993

Lake Chelan Municipal Airport
Pavement Maintenance and Development Report
March, 1993

The pavements at this airport were last inspected during June, 1988.

A paved runway has existed at this location for many years. A State project provided widening, seal coat and other improvements in 1976. The pavements as they exist today are a result of projects accomplished during 1986 and 1987. In 1986 the runway was widened from 45' to 60' and a new 2" AC surface applied. The large tiedown apron A1 and it's stub taxiway were also constructed in 1986. The service apron A2 and two short taxiway segments were constructed during 1987.

Currently, all of the pavements remain in excellent condition. Minor cracking has developed since the last inspection along with some raveling and weathering. A fog seal should be applied sometime in the next 2-3 years to check the raveling and the cracks should be sealed also.

PAVEMENT FEATURE SUMMARY

Airport Facility: Runway
Total Number of Sample Units: 6

| Sample Unit Number | Sample Unit Area | PCI |
|---|---|---|
| 1 | 5000 | 76 |
| 2 | 5000 | 90 |
| 3 | 5000 | 95 |
| 4 | 5000 | 85 |
| 5 | 5000 | 97 |
| 6 | 5000 | 97 |

Average PCI: 90
Condition Rating: Excellent

Airport Facility: Taxiway T1
Total Number of Sample Units: 1

| Sample Unit Number | Sample Unit Area | PCI |
|---|---|---|
| 1 | 5130 | 90 |

Average PCI: 90
Condition Rating: Excellent

Airport Facility: Taxiway T2
Total Number of Sample Units: 3

| Sample Unit Number | Sample Unit Area | PCI |
|---|---|---|
| 1 | 5000 | 91 |
| 2 | 5000 | 85 |
| 3 | 5000 | 93 |

Average PCI: 89
Condition Rating: Excellent

Airport Facility: Apron A1
Total Number of Sample Units: 5

| Sample Unit Number | Sample Unit Area | PCI |
|---|---|---|
| 1 | 5000 | 88 |
| 2 | 5000 | 89 |
| 3 | 5000 | 87 |
| 4 | 5000 | 87 |
| 5 | 5000 | 88 |

Average PCI: 87
Condition Rating: Excellent

Airport Facility: Apron A2
Total Number of Sample Units: 3

| Sample Unit Number | Sample Unit Area | PCI |
|---|---|---|
| 1 | 5000 | 89 |
| 2 | 5000 | 90 |
| 3 | 5000 | 91 |

Average PCI: 90
Condition Rating: Excellent

PRINCIPAL DISTRESSES:

Runway Minor cracking; depressions; raveling

Taxiway T1 Depressions; oil spillage; raveling

Taxiway T2 Depressions; raveling

Apron A1 Minor cracking; oil spillage; depressions; raveling

Apron A2 Same as A1

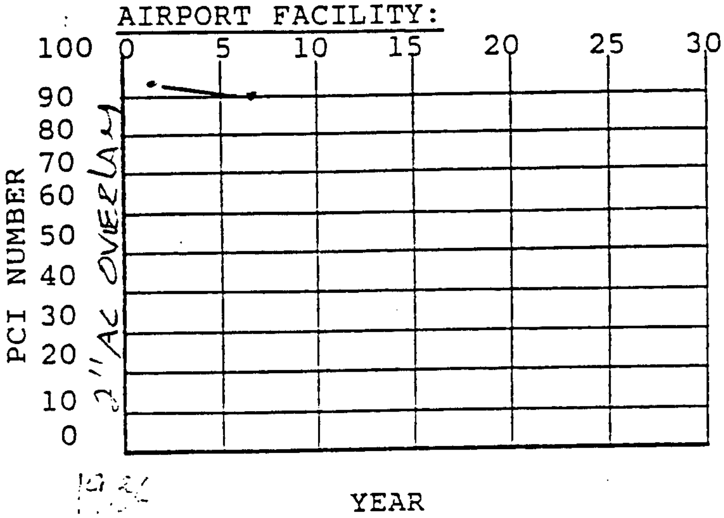
PAVEMENT CONDITION TREND

AIRPORT: LAKE CHELAN MUNICIPAL

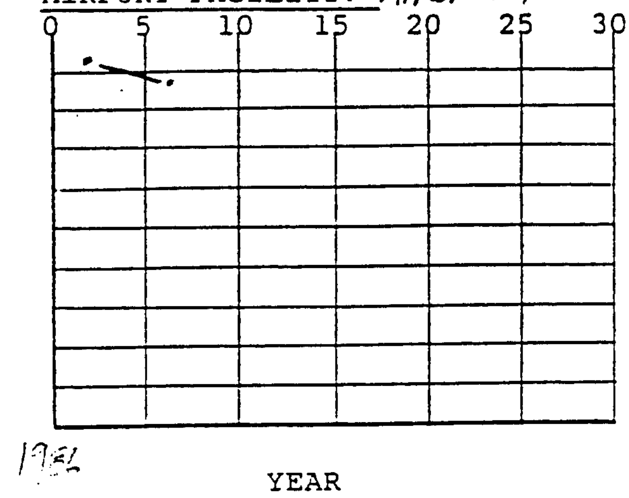
DATE OF LAST SURVEY: JUNE 1988
MARCH, 1993

NOTES: PCI NUMBER indicates PAVEMENT CONDITION INDEX
Horizontal scale covers 30 yrs.
Year 0 is year of original construction, major reconstruct. or overlay

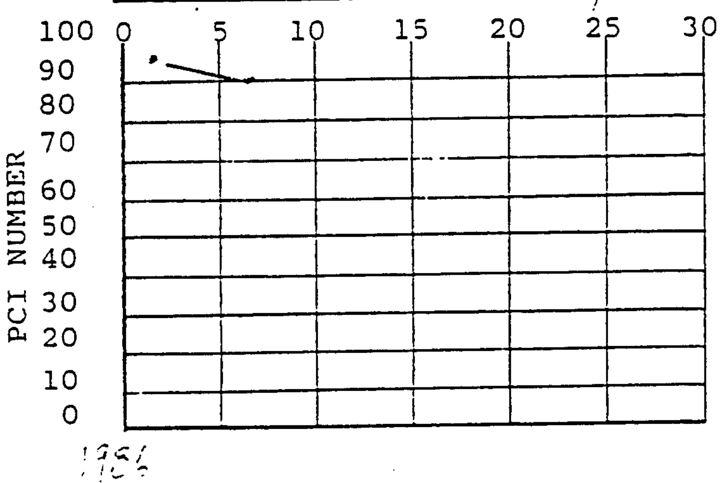
AIRPORT FACILITY:



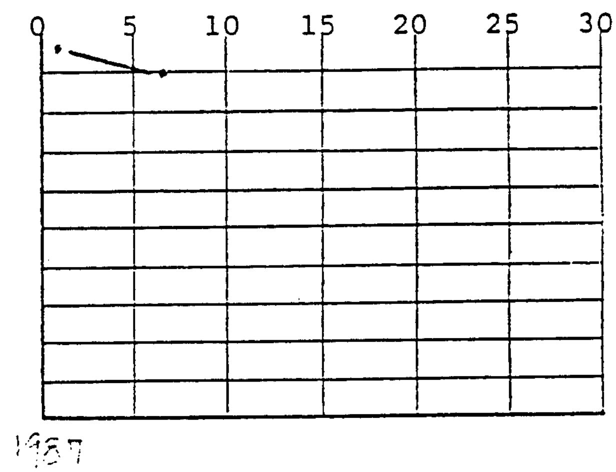

AIRPORT FACILITY: APRON A1



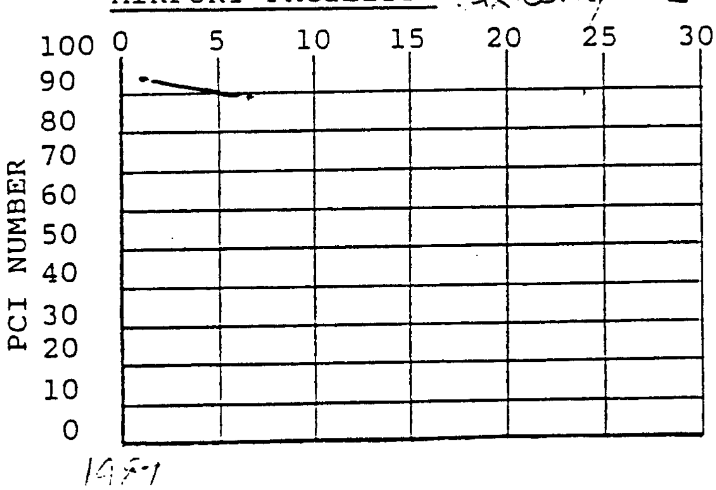

AIRPORT FACILITY: TAXIWAY T1



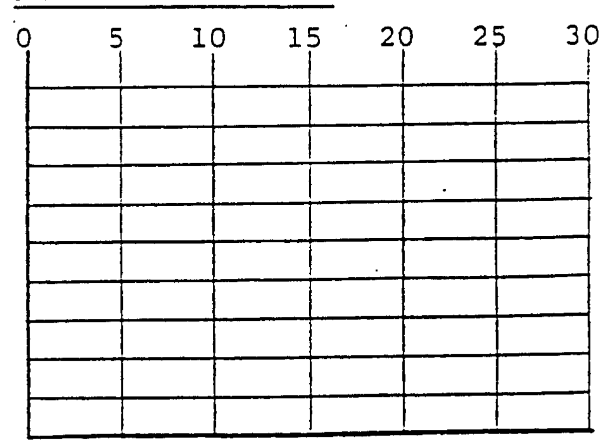

AIRPORT FACILITY: APRON A2




AIRPORT FACILITY: TAXIWAY T2



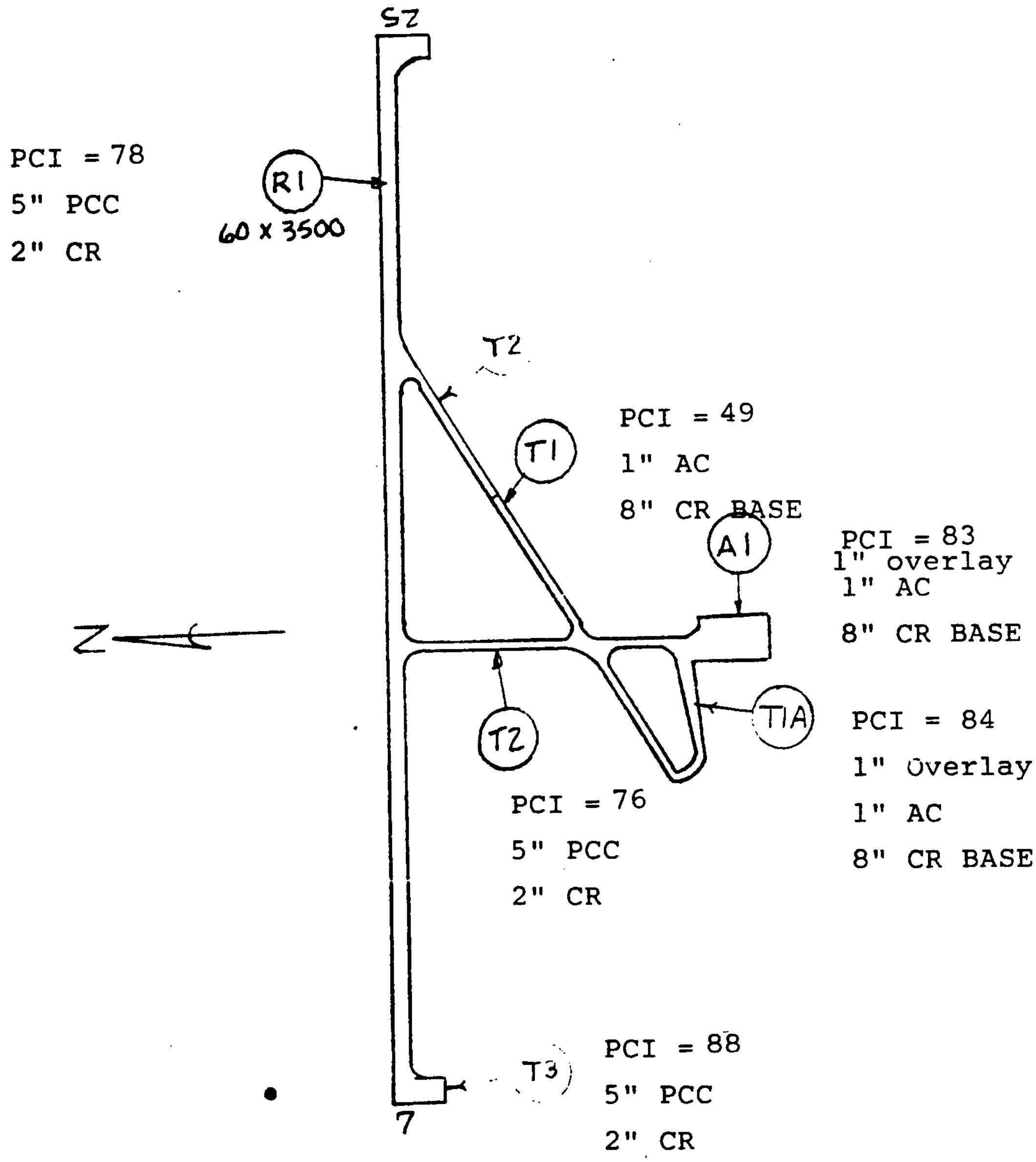

AIRPORT FACILITY:



# APPENDIX C

***Example PCI Survey***

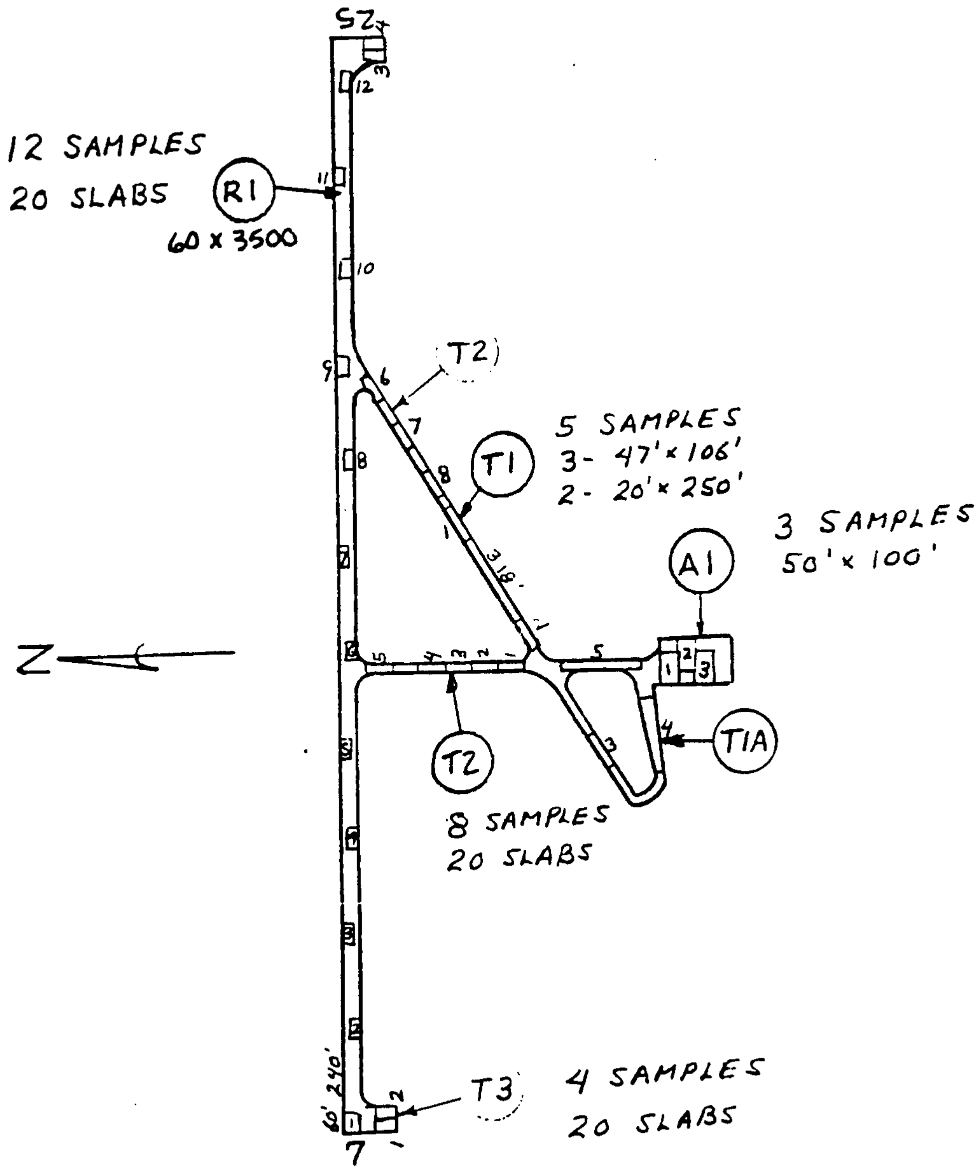
***Oregon***




CONDON STATE AIRPORT

PAVEMENT FEATURES AND PCI NUMBERS

JUNE 3, 1991




CONDON STATE AIRPORT

LOCATION OF SAMPLE AREAS WITHIN EACH FEATURE

JUNE 3, 1991

<u>FEATURE SUMMARY</u>

AIRPORT: Condon State Airport

DATE OF SURVEY: June 3, 1991

AIRPORT FACILITY: Runway 1

TOTAL NO. OF SAMPLE UNITS: 12

| SAMPLE UNIT NO. | SAMPLE UNIT AREA | PCI |
|---|---|---|
| 1 | 20 Slabs | 85 |
| 2 | " " | 88 |
| 3 | " " | 85 |
| 4 | " " | 72 |
| 5 | " " | 66 |
| 6 | " " | 92 |
| 7 | " " | 70 |
| 8 | " " | 63 |
| 9 | " " | 74 |
| 10 | " " | 72 |
| 11 | " " | 87 |
| 12 | " " | 86 |

Average PCI: 78

Condition Rating: Very Good

AIRPORT FACILITY: Taxiway 1

TOTAL NO. OF SAMPLE UNITS: 3

| SAMPLE UNIT NO. | SAMPLE UNIT AREA | PCI |
|---|---|---|
| 1 | 5000 | 47 |
| 2 | 5000 | 53 |
| 3 | 5000 | 47 |

Average PCI: 49

Condition Rating: Fair

AIRPORT FACILITY: Taxiway 1A

TOTAL NO. OF SAMPLE UNITS: 2

| SAMPLE UNIT NO. | SAMPLE UNIT AREA | PCI |
|---|---|---|
| 4 | 5000 | 84 |
| 5 | 5000 | 84 |

Average PCI: 84

Condition Rating: Very Good

AIRPORT FACILITY: Taxiway 2

TOTAL NO. OF SAMPLE UNITS: 8

| SAMPLE UNIT NO. | SAMPLE UNIT AREA | PCI |
|---|---|---|
| 1 | 20 Slabs | 94 |
| 2 | " " | 54 |
| 3 | " " | 40 |
| 4 | " " | 46 |
| 5 | " " | 96 |
| 6 | " " | 91 |
| 7 | " " | 91 |
| 8 | " " | 92 |

Average PCI: 76

Condition Rating: Very Good

AIRPORT FACILITY: Taxiway 3

TOTAL NO. OF SAMPLE UNITS: 4

| SAMPLE UNIT NO. | SAMPLE UNIT AREA | PCI |
|---|---|---|
| 1 | 20 Slabs | 96 |
| 2 | " " | 90 |
| 3 | " " | 82 |
| 4 | " " | 84 |

Average PCI: 88

Condition Rating: Excellent

AIRPORT FACILITY: Apron

TOTAL NO. OF SAMPLE UNITS: 3

| SAMPLE UNIT NO. | SAMPLE UNIT AREA | PCI |
|---|---|---|
| 1 | 5000 | 78 |
| 2 | 5000 | 89 |
| 3 | 5000 | 82 |

Average PCI: 83

Condition Rating: Very Good

PRINCIPAL DISTRESSES:

RUNWAY - Corner breaks, longitudinal/transverse/diagonal cracking and spalling joints

TAXIWAY T 1 - Block, longitudinal/transverse cracking plus ravelling

TAXIWAY T 1 A - Longitudinal and transverse cracking plus ravelling

TAXIWAY T 2 - Longitudinal/transverse cracking and spalling joints

TAXIWAY T 3 - Some cracking plus spalling joints and corners

APRON Longitudinal and transverse cracking plus some depressions and ravelling

CONDON STATE AIRPORT

PAVEMENT MAINTENANCE AND DEVELOPMENT

JUNE 3, 1991

The original pavements at Condon State Airport were constructed prior to 1966 with an 8" crushed aggregate base and 1" blade mix asphalt surface. A seal coat was applied during the summer of 1975. A new concrete runway 3500' x 60' with turnarounds and two taxiways 30' wide was constructed during 1986. The concrete is at least 5" thick and was placed on a 1" - 2" crushed rock leveling course. In 1989 the apron and a portion of the taxiway were overlaid 1"+ using a blade mix asphalt surfacing. Traffic at this airport consists mainly of single engine aircraft with ag aircraft operations being a significant portion.

Currently, the concrete pavements are in very good condition. But, they do show significant deterioration in the past 4 years. This is particularly noticeable in some of the longitudinal cracking which has progressed from low severity to medium and even high severity due to spalling with a good deal of loose or missing particles. The bituminous paved taxiway that used to be the runway is in fair condition with a lot of cracks and raveling. It could be crackfilled and slurry or chip sealed. Or, the surface could be pulverized or removed and replaced with a new 30' wide surface. The narrow taxiways now are very good as is the apron with some fine cracks and raveling the main problems.

Suggested minimum maintenance program is as follows:

| | | | |
|---|---|---|---|
| Taxiway T 1 | Fine chip seal for 30' width | | |
| | 4000 S.Y. @ $1.40 | = | $5600.00 |
| | Crackfilling 5000 L.F. @ $1.10 | = | $5500.00 |

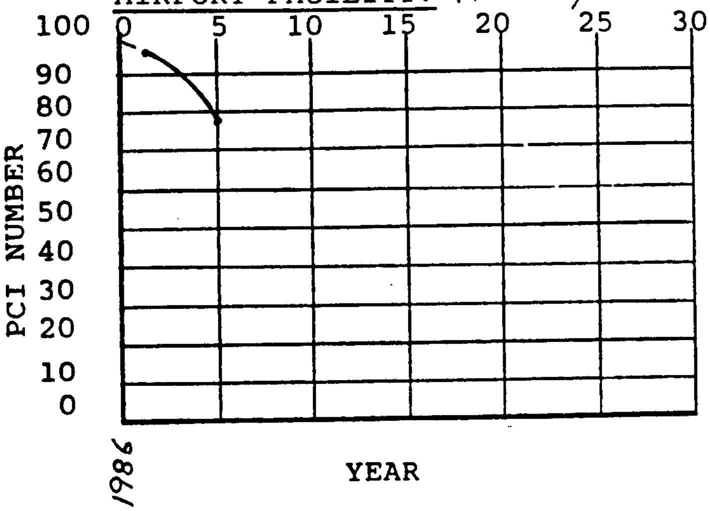
## PAVEMENT CONDITION TREND

**AIRPORT:** Condon State

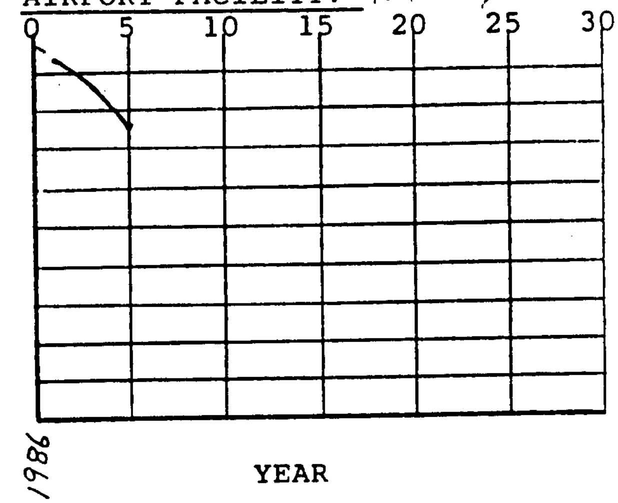
**DATE OF LAST SURVEY:** June 3, 1991

NOTES: PCI NUMBER indicates PAVEMENT CONDITION INDEX Horizontal scale covers 30 yrs. Year 0 is year of original construction, major reconstruct. or overlay

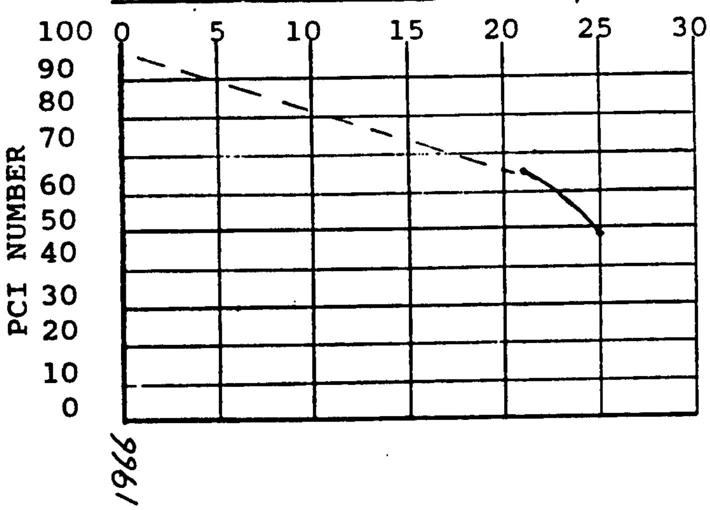
**AIRPORT FACILITY:** Runway R1



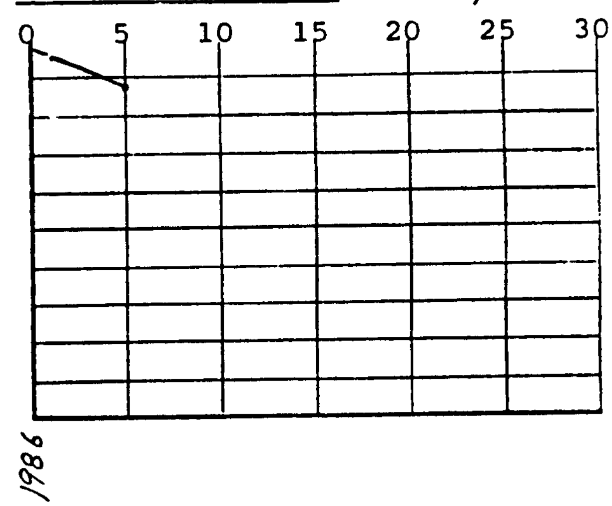

**AIRPORT FACILITY:** Taxiway T2



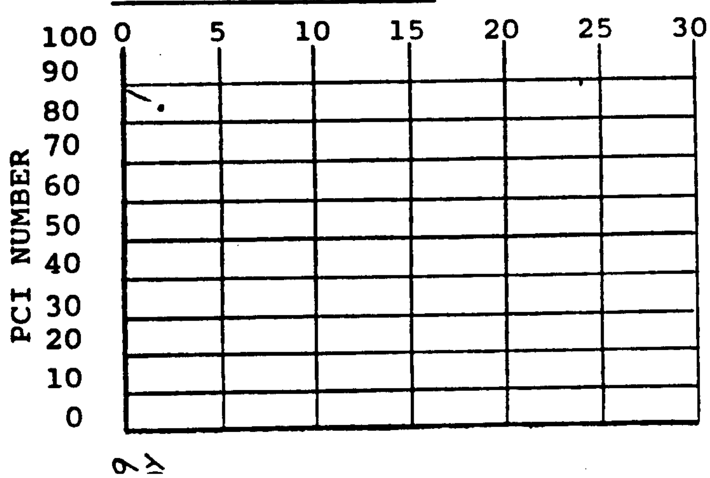

**AIRPORT FACILITY:** Taxiway T1



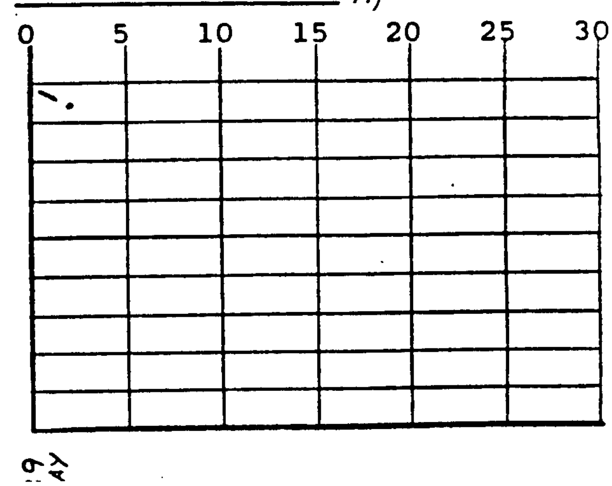

**AIRPORT FACILITY:** Taxiway T3




**AIRPORT FACILITY:** Taxiway T1A




**AIRPORT FACILITY:** Apron A1



# APPENDIX D

***Example PCI Survey***

***Idaho***

# PRIEST RIVER AIRPORT

This appendix presents the results of the pavement management system implementation for Priest River Airport, conducted as part of the Idaho Division of Aeronautics State System Plan.

## DATA COLLECTION

A records review was conducted to determine pavement structure and age. Table PR-1 contains the cross-section information for each pavement section; the information is presented graphically in Figure PR-1. Runway 01/19 is 2,970 feet long, and 50 feet wide, with an estimated last construction date of 1980. Taxiway 1 also has an estimated last construction date of 1980. Apron 1 (Sections 1, 2, and 3) has a last construction date of 1991. An Inventory Report showing all last construction dates is provided in Appendix PR-2.

The pavement was divided into branches, sections and sample units in accordance with the methodology outlined in Federal Aviation Administration Advisory Circular AC:150/5380-6, *Guidelines and Procedures for Maintenance of Airport Pavements*. The branches, sections and sample units used throughout this project are shown in Figure PR-2. A list report showing all branches and associated information is provided in Appendix PR-1.

Using the branch, section, and sample unit divisions, a visual inspection was conducted at the airport on 25 April 1995. Based on the visual inspection, a Pavement Condition Index (PCI) and Pavement Condition Rating (PCR) were assigned to each pavement section. The PCR for each pavement section is illustrated in Figure PR-3 and its distribution is shown in Figure PR-4. The section PCIs ranged from a low of 23, with a PCR of "Very Poor", to a high of 75, corresponding to a PCR of "Very Good". The average airport PCI was 48, with an associated PCR of "Fair". Summary PCI Reports are provided in Appendices PR-3 and PR-4. The PCI survey data are provided in the Inspection Report attached in Appendix PR-5. The types of distress observed in each pavement section are provided in the Inspection Report. The most common distresses observed throughout the airport were: alligator cracking, longitudinal/transverse cracking, oil spillage, depressions, and weathering/raveling, with isolated occurrences of block cracking, patching and rutting.

## RECOMMENDATIONS

A Network Maintenance report was generated using the Micro PAVER pavement maintenance management software. This report indicates, for each pavement section, the recommended localized preventative maintenance activities required to minimize the impact of the existing distresses. This report is provided in Appendix PR-6. This report identified approximately 10,400 lineal feet of cracks needing sealing, approximately 5,800 square feet of pavement requiring a localized sand slurry seal, approximately 155,400 square feet of pavement requiring a localized fog seal, and approximately 5,000 square feet of area requiring an asphalt concrete patch. These activities, if accomplished, will improve the overall pavement condition and will slow its subsequent rate of deterioration.

The Micro PAVER database was also used to develop recommendations for the timing of *global* (applied over the entire pavement section) pavement maintenance activities such as fog seals, sand slurry seals, and bituminous surface treatments, as well as the timing of major rehabilitation projects such as thin (minimum 2-inch thickness) asphalt concrete overlays. The Idaho-specific pavement deterioration curves developed during this project were used to estimate deterioration rates to trigger global maintenance and rehabilitation activities. Based on this analysis the following activities are recommended:

1. Place a thin overlay on Runway 01/19 (Sections 1 and 2) in 1996 to correct the load-related alligator cracking and rutting and to raise the projected PCIs from 34 and 26 (PCRs of "Poor" and "Poor") to 100 (a PCR of "Excellent").
2. Reconstruct Taxiway 01 in 1996 to raise the PCI from a projected 22 (a PCR of "Very Poor") to 100 (a PCR of "Excellent").
3. Place a slurry seal on Apron 1 (Sections 1, 2, and 3) in 1997 to correct environmental distresses and slow pavement deterioration. Patch localized areas of alligator cracking in the apron prior to placing the slurry seal. Monitor the apron for further deterioration.

Undertaking global maintenance on one or more pavement sections as detailed above would eliminate the need for localized fog seals or slurry seals on those sections. However, it is recommended that crack sealing and patching be done prior to global maintenance work to ensure the best possible performance from a seal coat or overlay.

Localized preventative maintenance such as crack sealing should be continued on a regular basis. Such maintenance increases pavement life, and the length of time until major repair or rehabilitation is required.

**PAVEMENT CONDITION INDEX**

IDAHO STATE AVIATION SYSTEM PLAN

PAVEMENT HISTORY REPORT

Airport Name: Priest River Airport | Page: 1 of: 1

Date Prepared: 16-Jun-95

| Feature No. | Soil Class | Subgrade Class | CBR | Subgrade Prep. | Frost Course | Subbase Course | Base Course | Surface Course | Overlay Course | Surface Treatment | Crack Seal |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Project Number | | | Date | | | | | | | |
| R01PR | Silty | Sand | | | | | 6" | 0.2' A.C. | | | |
| 1 | | Unknown | | 1975 | | | 0.75" Minus | Plant Mix | | | |
| R01PR | | | | | | | | | | P-626 | |
| 1 | | Unknown | | Unknown | | | | | | Slurry | |
| R01PR | Silty | Sand | | | | | 6" | 0.2' A.C. | | | |
| 2 | | Unknown | | 1975 | | | 0.75" Minus | Plant Mix | | | |
| R01PR | | | | | | | | | | P-626 | |
| 2 | | Unknown | | Unknown | | | | | | Slurry | |
| T01PR | Silty | Sand | | | | | 6" | 0.2' A.C. | | | |
| | | Unknown | | 1975 | | | 0.75" Minus | Plant Mix | | | |
| T01PR | | | | | | | | | | P-626 | |
| | | Unknown | | Unknown | | | | | | Slurry | |
| A01PR | Silty | Sand | | | | | 6" | 0.2' A.C. | | | |
| 1 | | Unknown | | 1975 | | | 0.75" Minus | Plant Mix | | | |
| A01PR | | | | | | | | | | P-626 | |
| 1 | | Unknown | | Unknown | | | | | | Slurry | |
| A01PR | | | | | | | | | 1.5" A.C. | | |
| 1 | | | | Nov-91 | | | | | | | |
| A01PR | Silty | Sand | | | | | 6" | 0.2' A.C. | | | |
| 2 | | Unknown | | 1975 | | | 0.75" Minus | Plant Mix | | | |
| A01PR | | | | | | | | | 1.5" A.C. | | |
| 2 | | | | Nov-91 | | | | | | | |
| A01PR | | | | | | | | A.C. | | | |
| 3 | | | | Unknown | | | | | | | |
| A01PR | | | | | | | | | 1.5" A.C. | | |
| 3 | | | | Nov-91 | | | | | | | |

Figure PR-1. Pavement Cross-Section
Priest River Airport

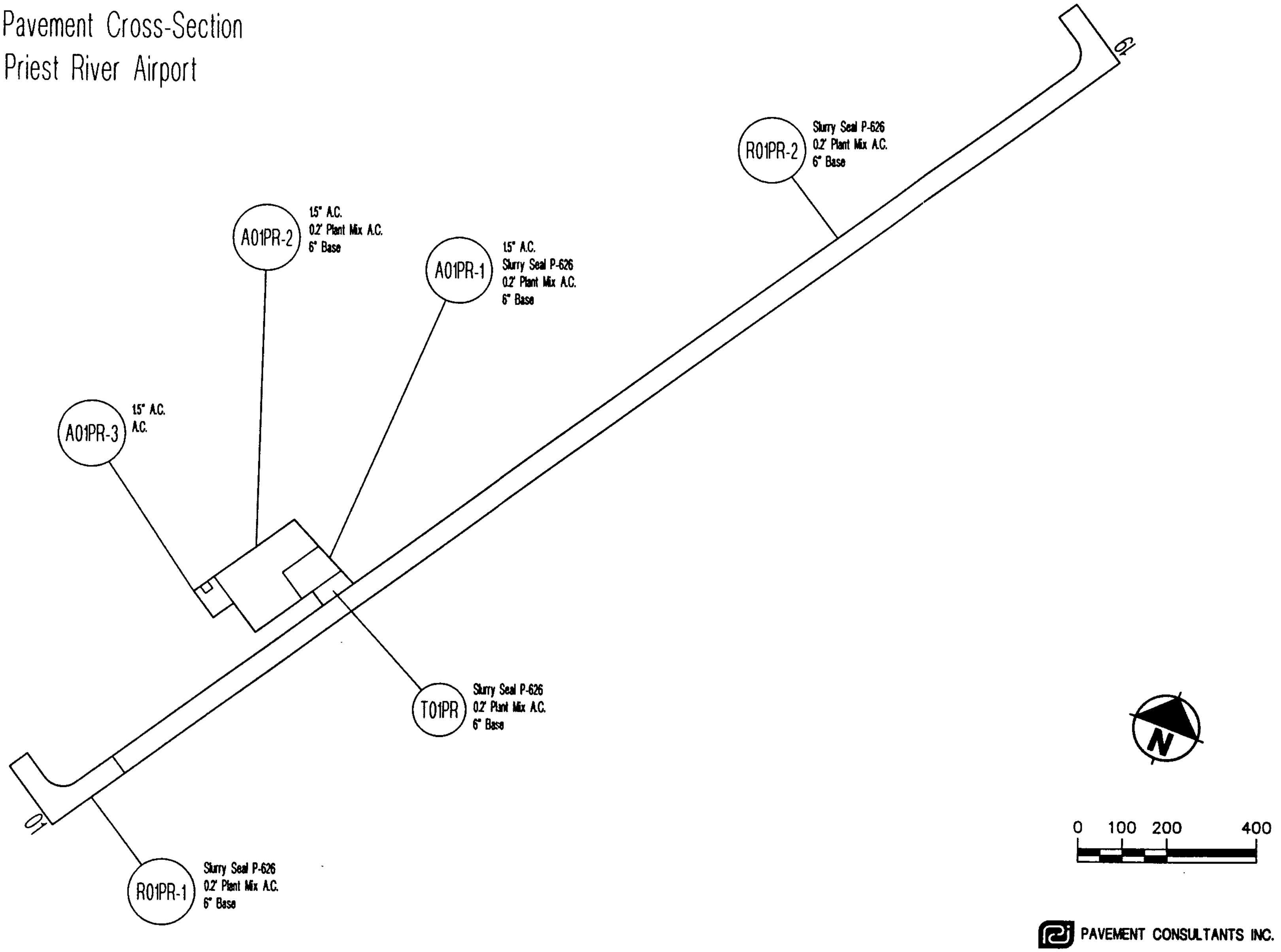


Figure PR-2. Section and Sample Unit Layout
Priest River Airport

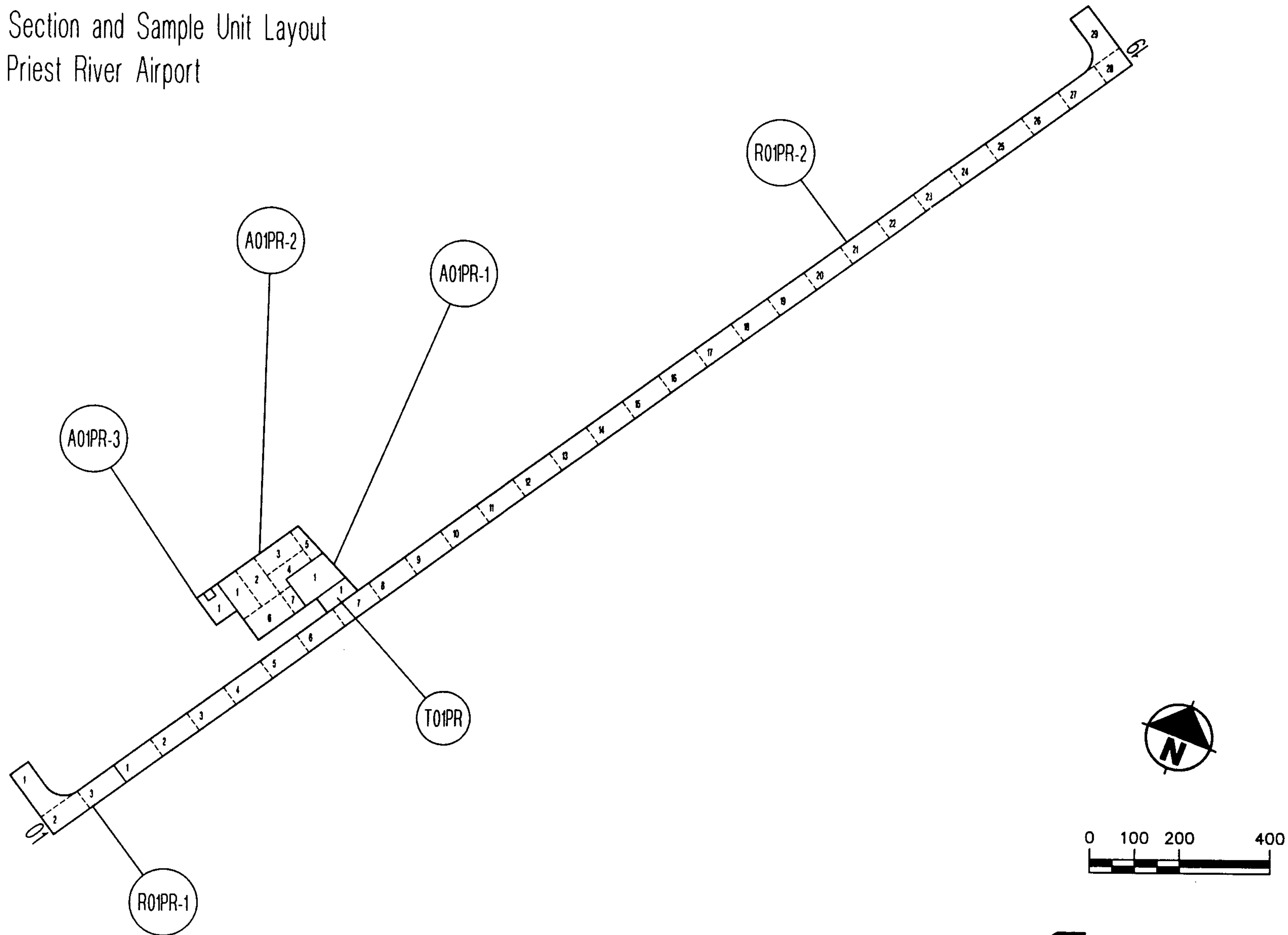


Figure PR-3. Pavement Condition Rating
Priest River Airport

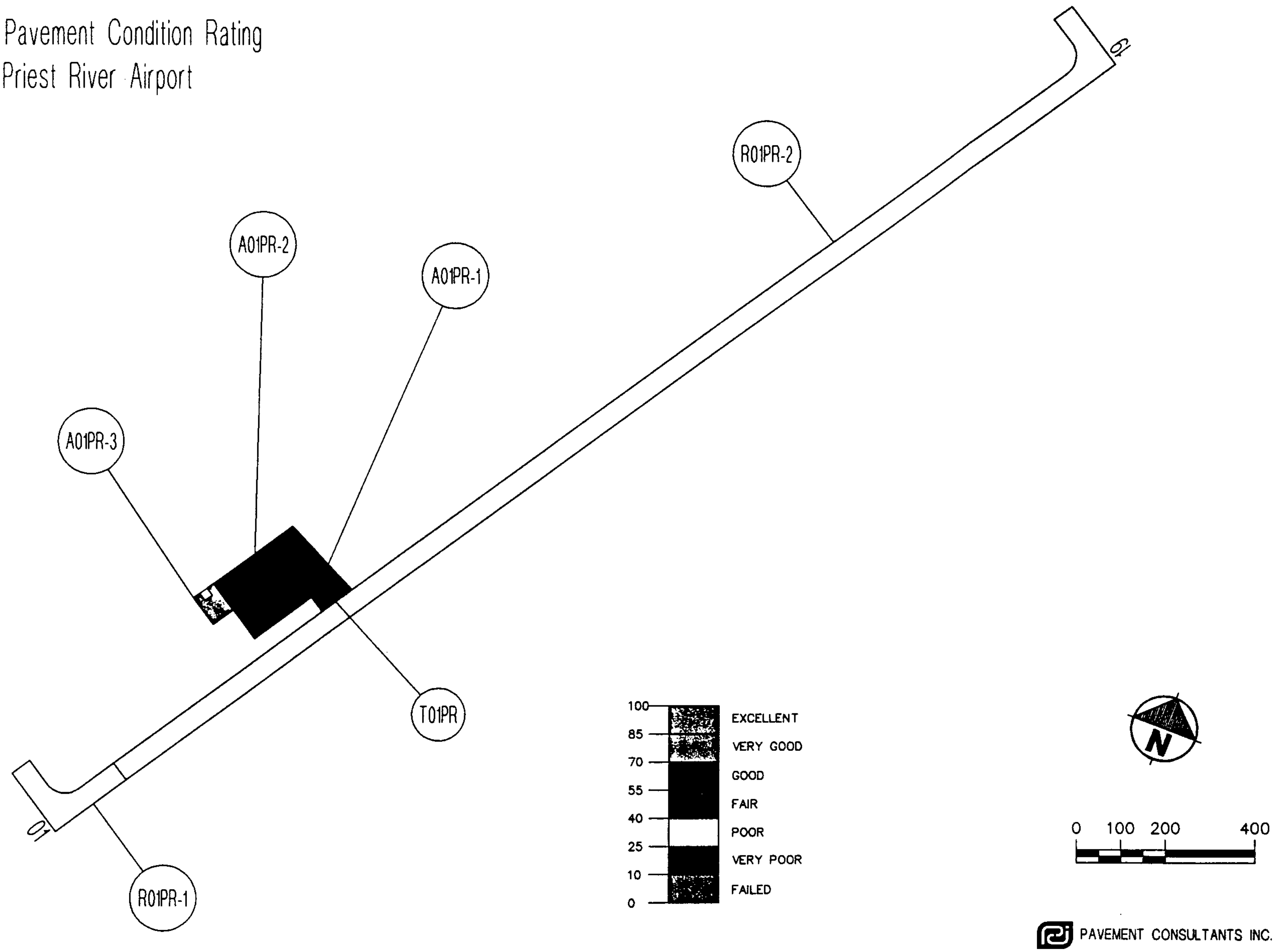
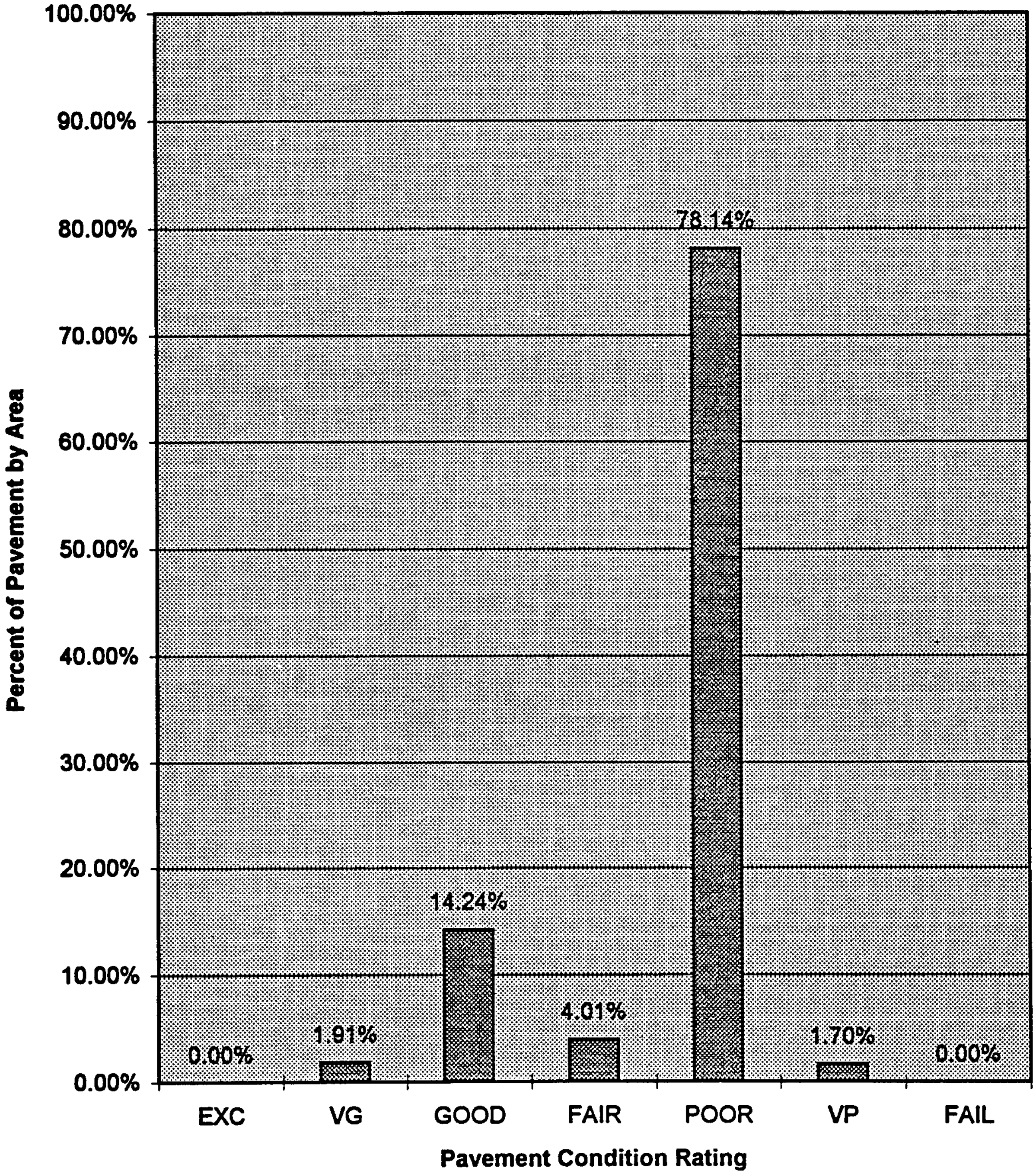


Figure PR-4. Distribution of Pavement Condition
Priest River Airport



# APPENDIX PR-1

# LIST REPORT

# BRANCH LISTING REPORT

Site Name : Idaho Division of Aeronautics
Database Name : C:PRIESTR

Report Date: JUN/21/1995

Network ID: All
Branch Number: All
Branch Use: All
Number of Sections: All
Branch Area: All

| Network | Branch Number | Branch Name | Branch Use | Branch Area (SF) | Number of Sections |
|---|---|---|---|---|---|
| 00031 | A01PR | Apron 01 | APRON | 40086.00 | 3 |
| 00031 | R01PR | Runway 01/19 | RUNWAY | 155434.00 | 2 |
| 00031 | T01PR | Taxiway 01 | TAXIWAY | 3387.00 | 1 |
| | | | TOTALS | 198907.00 | 6 |

# APPENDIX PR-2

# INVENTORY REPORT

INVENTORY REPORT

Site Name : Idaho Division of Aeronautics
Database Name : C:PRIESTR  Report Date: JUN/21/1995

Network ID: All
Branch Number: All
Section Number: All
Branch Use: All
Surface Type: All
Pavement Rank: All
Zone: All
Section Category: All
Section Area: All

| | [---Branch---] | | [---Section---] | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Network | Num | Use | Num | Cat | Family | Zone | Rank | Type | Length(LF) | Area(SF) |
| 00031 | A01PR | APRON | 01 | 1 | DEFAULT | 1S6 | P | AAC | 110.00 | 7971.00 |
| | | FROM: T01 | | | | TO: A01-2 | | | | |
| | | | 02 | 1 | DEFAULT | 1S6 | P | AAC | 230.00 | 28315.00 |
| | | FROM: A01-1 | | | | TO: Hangars | | | | |
| | | | 03 | 1 | DEFAULT | 1S6 | S | AAC | 75.00 | 3800.00 |
| | | FROM: | | | | TO: | | | | |
| Apron 01 | | | | | | AREA OF SELECTED SECTIONS: | | | | 40086.00 |
| 00031 | R01PR | RUNWAY | 01 | 1 | DEFAULT | 1S6 | P | AC | 200.00 | 16037.00 |
| | | FROM: R01 end | | | | TO: R01-2 | | | | |
| | | | 02 | 1 | DEFAULT | 1S6 | P | AC | 2770.00 | 139397.00 |
| | | FROM: R01-1 | | | | TO: R19 end | | | | |
| Runway 01/19 | | | | | | AREA OF SELECTED SECTIONS: | | | | 155434.00 |
| 00031 | T01PR | TAXIWAY | 01 | 1 | DEFAULT | 1S6 | P | AC | 85.00 | 3387.00 |
| | | FROM: R01 | | | | TO: A01 | | | | |
| Taxiway 01 | | | | | | AREA OF SELECTED SECTIONS: | | | | 3387.00 |

TOTAL LENGTH : 3470.00 LF  TOTAL AREA : 198907.00 SF

# APPENDIX PR-3

# PCI REPORT - SORTED BY BRANCH AND SECTION

# PCI REPORT

Site Name : Idaho Division of Aeronautics
Database Name : C:PRIESTR

Report Date: JUN/21/1995

Network ID: All
Branch Number: All
Section Number: All
Branch Use: All
Surface Type: All
Pavement Rank: All
Zone: All
Section Category: All
Section Area: All
Last Construction Date: All
Last Inspection Date: All
PCI: All

| Netwrk ID | Branch Number<br>Name<br>Use | Section<br>Num/Rank/Surf/Length(LF)/Area(SF) | Last Construct Date | Last Inspection Date | PCI |
|---|---|---|---|---|---|
| 00031 | A01PR<br>Apron 01<br>APRON | 01 / P / AAC / 110.00/ 7971.00<br>Cat:1 Zone:1S6<br>From: T01 | NOV/01/1991<br>Family:DEFAULT<br>To: A01-2 | APR/25/1995<br>Age (Yrs): 3.5 | 55 |
| 00031 | A01PR<br>Apron 01<br>APRON | 02 / P / AAC / 230.00/ 28315.00<br>Cat:1 Zone:1S6<br>From: A01-1 | NOV/01/1991<br>Family:DEFAULT<br>To: Hangars | APR/25/1995<br>Age (Yrs): 3.5 | 70 |
| 00031 | A01PR<br>Apron 01<br>APRON | 03 / S / AAC / 75.00/ 3800.00<br>Cat:1 Zone:1S6<br>From: | NOV/01/1991<br>Family:DEFAULT<br>To: | APR/25/1995<br>Age (Yrs): 3.5 | 75 |
| 00031 | R01PR<br>Runway 01/19<br>RUNWAY | 01 / P / AC / 200.00/ 16037.00<br>Cat:1 Zone:1S6<br>From: R01 end | SEP/01/1980<br>Family:DEFAULT<br>To: R01-2 | APR/25/1995<br>Age (Yrs):14.6 | 36 |
| 00031 | R01PR<br>Runway 01/19<br>RUNWAY | 02 / P / AC / 2770.00/ 139397.00<br>Cat:1 Zone:1S6<br>From: R01-1 | SEP/01/1980<br>Family:DEFAULT<br>To: R19 end | APR/25/1995<br>Age (Yrs):14.6 | 27 |
| 00031 | T01PR<br>Taxiway 01<br>TAXIWAY | 01 / P / AC / 85.00/ 3387.00<br>Cat:1 Zone:1S6<br>From: R01 | SEP/01/1980<br>Family:DEFAULT<br>To: A01 | APR/25/1995<br>Age (Yrs):14.6 | 23 |

# APPENDIX PR-4

# PCI REPORT - SORTED BY PCI

PCI REPORT

Site Name : Idaho Division of Aeronautics
Database Name : C:PRIESTR

Report Date: JUN/21/1995

Network ID: All
Branch Number: All
Section Number: All
Branch Use: All
Surface Type: All
Pavement Rank: All
Zone: All
Section Category: All
Section Area: All
Last Construction Date: All
Last Inspection Date: All
PCI: All

| Netwrk ID | Branch Number Name Use | Section Num/Rank/Surf/Length(LF)/Area(SF) | Last Construct Date | Last Inspection Date | PCI |
|---|---|---|---|---|---|
| 00031 | A01PR<br>Apron 01<br>APRON | 03 / S / AAC / 75.00/ 3800.00<br>Cat:1 Zone:1S6<br>From: To: | NOV/01/1991<br>Family:DEFAULT | APR/25/1995<br>Age (Yrs): 3.5 | 75 |
| 00031 | A01PR<br>Apron 01<br>APRON | 02 / P / AAC / 230.00/ 28315.00<br>Cat:1 Zone:1S6<br>From: A01-1 To: Hangars | NOV/01/1991<br>Family:DEFAULT | APR/25/1995<br>Age (Yrs): 3.5 | 70 |
| 00031 | A01PR<br>Apron 01<br>APRON | 01 / P / AAC / 110.00/ 7971.00<br>Cat:1 Zone:1S6<br>From: T01 To: A01-2 | NOV/01/1991<br>Family:DEFAULT | APR/25/1995<br>Age (Yrs): 3.5 | 55 |
| 00031 | R01PR<br>Runway 01/19<br>RUNWAY | 01 / P / AC / 200.00/ 16037.00<br>Cat:1 Zone:1S6<br>From: R01 end To: R01-2 | SEP/01/1980<br>Family:DEFAULT | APR/25/1995<br>Age (Yrs):14.6 | 36 |
| 00031 | R01PR<br>Runway 01/19<br>RUNWAY | 02 / P / AC / 2770.00/ 139397.00<br>Cat:1 Zone:1S6<br>From: R01-1 To: R19 end | SEP/01/1980<br>Family:DEFAULT | APR/25/1995<br>Age (Yrs):14.6 | 27 |
| 00031 | T01PR<br>Taxiway 01<br>TAXIWAY | 01 / P / AC / 85.00/ 3387.00<br>Cat:1 Zone:1S6<br>From: R01 To: A01 | SEP/01/1980<br>Family:DEFAULT | APR/25/1995<br>Age (Yrs):14.6 | 23 |

# APPENDIX PR-5

# INSPECTION REPORT

# INSPECTION REPORT

Site Name : Idaho Division of Aeronautics
Report Date: JUN/21/1995
Database Name : C:PRIESTR

Network ID : All
Branch Number : All
Section Number : All
Branch Use : All
Surface Type : All
Pavement Rank : All
Zone : All
Section Category : All
Section Area : All
Last Construction Date: All
Last Inspection Date : All

Network ID - 00031
Branch Name - Apron 01
Branch Number - A01PR
Section Number - 01
Family - DEFAULT
Section Length - 110.00 LF
Section Width - 75.00 LF
Section Area - 7971.00 SF

Inspection Date: APR/25/1995
Safety:
Drainage Cond.:
Riding Quality :
F.O.D.:
Shoulder Cond. :
Overall Cond.:

SAMPLE UNIT=1 (RANDOM) SAMPLE SIZE= 7971.00 SF

| DISTRESS-TYPE | SEVERITY | QUANTITY | DENSITY % | DEDUCT VALUE |
|---|---|---|---|---|
| 41 ALLIGATOR CR | MEDIUM | 40.00 (SF) | .50 | 22.9 |
| 45 DEPRESSION | LOW | 100.00 (SF) | 1.25 | 8.0 |
| 45 DEPRESSION | HIGH | 4.00 (SF) | .05 | 12.0 |
| 48 L & T CR | LOW | 15.00 (LF) | .19 | 3.0 |
| 48 L & T CR | MEDIUM | 134.00 (LF) | 1.68 | 14.4 |
| 49 OIL SPILLAGE | N/A | 48.00 (SF) | .60 | 3.2 |
| 52 WEATH/RAVEL | LOW | 6.00 (SF) | .08 | 1.0 |

SAMPLE PCI = 55

PCI OF SECTION = 55
RATING = FAIR

TOTAL NUMBER OF SAMPLE UNITS = 1
NUMBER OF RANDOM SAMPLE UNITS SURVEYED = 1
NUMBER OF ADDITIONAL SAMPLE UNITS SURVEYED = 0

FOR PROJECT LEVEL ANALYSIS:
RECOMMEND EVERY SAMPLE UNIT BE SURVEYED.
STANDARD DEVIATION OF PCI BETWEEN RANDOM UNITS SURVEYED = .0%

INSPECTION REPORT

Site Name : Idaho Division of Aeronautics    Report Date: JUN/21/1995
Database Name : C:PRIESTR

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*** EXTRAPOLATED DISTRESS QUANTITIES FOR SECTION ***

| DISTRESS-TYPE | SEVERITY | QUANTITY | DENSITY % | DEDUCT VALUE |
|---|---|---|---|---|
| 41 ALLIGATOR CR | MEDIUM | 40.00 (SF) | .50 | 22.9 |
| 45 DEPRESSION | LOW | 100.00 (SF) | 1.25 | 8.0 |
| 45 DEPRESSION | HIGH | 4.00 (SF) | .05 | 12.0 |
| 48 L & T CR | LOW | 15.00 (LF) | .19 | 3.0 |
| 48 L & T CR | MEDIUM | 134.00 (LF) | 1.68 | 14.4 |
| 49 OIL SPILLAGE | N/A | 48.00 (SF) | .60 | 3.2 |
| 52 WEATH/RAVEL | LOW | 6.00 (SF) | .08 | 1.0 |

*** PERCENT OF DEDUCT VALUES BASED ON DISTRESS MECHANISM ***

LOAD RELATED DISTRESSES = 35.51 PERCENT DEDUCT VALUES.
CLIMATE/DURABILITY RELATED DISTRESSES = 28.54 PERCENT DEDUCT VALUES.
OTHER RELATED DISTRESSES = 35.95 PERCENT DEDUCT VALUES.

# INSPECTION REPORT

Site Name : Idaho Division of Aeronautics
Database Name : C:PRIESTR

Report Date: JUN/21/1995

Network ID : All
Branch Number : All
Section Number : All
Branch Use : All
Surface Type : All
Pavement Rank : All
Zone : All
Section Category : All
Section Area : All
Last Construction Date: All
Last Inspection Date : All

Network ID - 00031
Branch Name - Apron 01
Branch Number - A01PR
Section Number - 02 Family - DEFAULT

Section Length - 230.00 LF
Section Width - 157.00 LF
Section Area - 28315.00 SF

Inspection Date: APR/25/1995
Riding Quality :
Shoulder Cond. :
Safety:
Overall Cond.:
Drainage Cond.:
F.O.D.:

SAMPLE UNIT=1 (RANDOM) SAMPLE SIZE= 5000.00 SF

| DISTRESS-TYPE | SEVERITY | QUANTITY | DENSITY % | DEDUCT VALUE |
|---|---|---|---|---|
| 45 DEPRESSION | MEDIUM | 100.00 (SF) | 2.00 | 21.8 |
| 45 DEPRESSION | HIGH | 6.00 (SF) | .12 | 12.8 |
| 48 L & T CR | LOW | 126.00 (LF) | 2.52 | 8.8 |
| 48 L & T CR | MEDIUM | 50.00 (LF) | 1.00 | 11.2 |
| 49 OIL SPILLAGE | N/A | 30.00 (SF) | .60 | 3.2 |

SAMPLE PCI = 60

SAMPLE UNIT=2 (RANDOM) SAMPLE SIZE= 5000.00 SF

| DISTRESS-TYPE | SEVERITY | QUANTITY | DENSITY % | DEDUCT VALUE |
|---|---|---|---|---|
| 45 DEPRESSION | MEDIUM | 30.00 (SF) | .60 | 11.8 |
| 45 DEPRESSION | HIGH | 3.00 (SF) | .06 | 12.0 |
| 48 L & T CR | LOW | 146.00 (LF) | 2.92 | 9.8 |
| 49 OIL SPILLAGE | N/A | 20.00 (SF) | .40 | 3.0 |

SAMPLE PCI = 75

SAMPLE UNIT=3 (RANDOM) SAMPLE SIZE= 5000.00 SF

| DISTRESS-TYPE | SEVERITY | QUANTITY | DENSITY % | DEDUCT VALUE |
|---|---|---|---|---|
| 48 L & T CR | LOW | 94.00 (LF) | 1.88 | 7.1 |
| 48 L & T CR | MEDIUM | 90.00 (LF) | 1.80 | 14.9 |
| 49 OIL SPILLAGE | N/A | 10.00 (SF) | .20 | 2.5 |

SAMPLE PCI = 78

INSPECTION REPORT

Site Name : Idaho Division of Aeronautics    Report Date: JUN/21/1995
Database Name : C:PRIESTR

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SAMPLE UNIT=6 (RANDOM)    SAMPLE SIZE= 5700.00 SF

| DISTRESS-TYPE | SEVERITY | QUANTITY | DENSITY % | DEDUCT VALUE |
|---|---|---|---|---|
| 48 L & T CR | LOW | 100.00 (LF) | 1.75 | 6.8 |
| 48 L & T CR | MEDIUM | 20.00 (LF) | .35 | 7.0 |
| 49 OIL SPILLAGE | N/A | 4.00 (SF) | .07 | 2.0 |
| 55 SLIPPAGE CR | N/A | 100.00 (SF) | 1.75 | 17.9 |

SAMPLE PCI = 70

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PCI OF SECTION = 70    RATING = GOOD

TOTAL NUMBER OF SAMPLE UNITS = 7
NUMBER OF RANDOM SAMPLE UNITS SURVEYED = 4
NUMBER OF ADDITIONAL SAMPLE UNITS SURVEYED = 0

FOR PROJECT LEVEL ANALYSIS:
RECOMMENDED MINIMUM OF 6 RANDOM SAMPLE UNITS TO BE SURVEYED.
STANDARD DEVIATION OF PCI BETWEEN RANDOM UNITS SURVEYED = 7.9%

*** EXTRAPOLATED DISTRESS QUANTITIES FOR SECTION ***

| DISTRESS-TYPE | SEVERITY | QUANTITY | DENSITY % | DEDUCT VALUE |
|---|---|---|---|---|
| 45 DEPRESSION | MEDIUM | 177.82 (SF) | .63 | 12.1 |
| 45 DEPRESSION | HIGH | 12.31 (SF) | .04 | 12.0 |
| 48 L & T CR | LOW | 637.43 (LF) | 2.25 | 8.1 |
| 48 L & T CR | MEDIUM | 218.86 (LF) | .77 | 10.0 |
| 49 OIL SPILLAGE | N/A | 87.54 (SF) | .31 | 2.9 |
| 55 SLIPPAGE CR | N/A | 136.79 (SF) | .48 | 7.3 |

*** PERCENT OF DEDUCT VALUES BASED ON DISTRESS MECHANISM ***

LOAD RELATED DISTRESSES = .00 PERCENT DEDUCT VALUES.
CLIMATE/DURABILITY RELATED DISTRESSES = 34.59 PERCENT DEDUCT VALUES.
OTHER RELATED DISTRESSES = 65.41 PERCENT DEDUCT VALUES.

# INSPECTION REPORT

Site Name : Idaho Division of Aeronautics
Database Name : C:PRIESTR

Report Date: JUN/21/1995

Inspection Date: AUG/20/1986
Riding Quality :
Shoulder Cond. :
Safety:
Overall Cond.:
Drainage Cond.:
F.O.D.:

SAMPLE UNIT=1 (RANDOM) SAMPLE SIZE= 5000.00 SF

| DISTRESS-TYPE | SEVERITY | QUANTITY | DENSITY % | DEDUCT VALUE |
|---|---|---|---|---|
| 41 ALLIGATOR CR | LOW | 78.00 (SF) | 1.56 | 24.7 |
| 43 BLOCK CR | LOW | 36.00 (SF) | .72 | 7.0 |
| 43 BLOCK CR | MEDIUM | 450.00 (SF) | 9.00 | 22.7 |
| 45 DEPRESSION | LOW | 589.00 (SF) | 11.78 | 28.9 |
| 48 L & T CR | LOW | 283.00 (LF) | 5.66 | 16.1 |
| 49 OIL SPILLAGE | N/A | 3.00 (SF) | .06 | 2.0 |
| 50 PATCHING | LOW | 350.00 (SF) | 7.00 | 12.0 |
| 52 WEATH/RAVEL | MEDIUM | 24.00 (SF) | .48 | 6.1 |

SAMPLE PCI = 39

SAMPLE UNIT=2 (RANDOM) SAMPLE SIZE= 5000.00 SF

| DISTRESS-TYPE | SEVERITY | QUANTITY | DENSITY % | DEDUCT VALUE |
|---|---|---|---|---|
| 41 ALLIGATOR CR | LOW | 160.00 (SF) | 3.20 | 31.7 |
| 43 BLOCK CR | LOW | 80.00 (SF) | 1.60 | 9.3 |
| 45 DEPRESSION | LOW | 171.00 (SF) | 3.42 | 15.7 |
| 48 L & T CR | LOW | 592.00 (LF) | 11.84 | 25.6 |
| 49 OIL SPILLAGE | N/A | 11.00 (SF) | .22 | 2.6 |
| 50 PATCHING | LOW | 500.00 (SF) | 10.00 | 14.6 |
| 52 WEATH/RAVEL | LOW | 940.00 (SF) | 18.80 | 13.3 |

SAMPLE PCI = 41

SAMPLE UNIT=3 (RANDOM) SAMPLE SIZE= 5000.00 SF

| DISTRESS-TYPE | SEVERITY | QUANTITY | DENSITY % | DEDUCT VALUE |
|---|---|---|---|---|
| 41 ALLIGATOR CR | LOW | 174.00 (SF) | 3.48 | 32.6 |
| 45 DEPRESSION | LOW | 227.00 (SF) | 4.54 | 18.4 |
| 48 L & T CR | LOW | 514.00 (LF) | 10.28 | 23.6 |
| 50 PATCHING | LOW | 1000.00 (SF) | 20.00 | 20.4 |
| 52 WEATH/RAVEL | LOW | 1010.00 (SF) | 20.20 | 13.8 |

SAMPLE PCI = 43

PCI OF SECTION = 41 RATING = FAIR

TOTAL NUMBER OF SAMPLE UNITS = 7
NUMBER OF RANDOM SAMPLE UNITS SURVEYED = 3
NUMBER OF ADDITIONAL SAMPLE UNITS SURVEYED = 0

FOR PROJECT LEVEL ANALYSIS:
RECOMMENDED MINIMUM OF 5 RANDOM SAMPLE UNITS TO BE SURVEYED.
STANDARD DEVIATION OF PCI BETWEEN RANDOM UNITS SURVEYED = 2.0%

INSPECTION REPORT

Site Name : Idaho Division of Aeronautics
Database Name : C:PRIESTR

Report Date: JUN/21/1995

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*** EXTRAPOLATED DISTRESS QUANTITIES FOR SECTION ***

| DISTRESS-TYPE | SEVERITY | QUANTITY | DENSITY % | DEDUCT VALUE |
|---|---|---|---|---|
| 41 ALLIGATOR CR | LOW | 777.72 (SF) | 2.75 | 30.2 |
| 43 BLOCK CR | LOW | 218.97 (SF) | .77 | 7.2 |
| 43 BLOCK CR | MEDIUM | 849.45 (SF) | 3.00 | 16.3 |
| 45 DEPRESSION | LOW | 1863.13 (SF) | 6.58 | 22.2 |
| 48 L & T CR | LOW | 2621.97 (LF) | 9.26 | 22.2 |
| 49 OIL SPILLAGE | N/A | 26.43 (SF) | .09 | 2.0 |
| 50 PATCHING | LOW | 3492.18 (SF) | 12.33 | 16.2 |
| 52 WEATH/RAVEL | LOW | 3680.95 (SF) | 13.00 | 11.2 |
| 52 WEATH/RAVEL | MEDIUM | 45.30 (SF) | .16 | 4.4 |

*** PERCENT OF DEDUCT VALUES BASED ON DISTRESS MECHANISM ***

LOAD RELATED DISTRESSES = 22.90 PERCENT DEDUCT VALUES.
CLIMATE/DURABILITY RELATED DISTRESSES = 58.77 PERCENT DEDUCT VALUES.
OTHER RELATED DISTRESSES = 18.33 PERCENT DEDUCT VALUES.

INSPECTION REPORT

Site Name : Idaho Division of Aeronautics
Database Name : C:PRIESTR

Report Date: JUN/21/1995

Network ID : All
Branch Number : All
Section Number : All
Branch Use : All
Surface Type : All
Pavement Rank : All
Zone : All
Section Category : All
Section Area : All
Last Construction Date: All
Last Inspection Date : All

Network ID - 00031
Branch Name - Apron 01
Branch Number - A01PR
Section Number - 03 Family - DEFAULT

Section Length - 75.00 LF
Section Width - 56.00 LF
Section Area - 3800.00 SF

Inspection Date: APR/25/1995
Riding Quality : Safety: Drainage Cond.:
Shoulder Cond. : Overall Cond.: F.O.D.:

SAMPLE UNIT=1 (RANDOM) SAMPLE SIZE= 3800.00 SF

| DISTRESS-TYPE | SEVERITY | QUANTITY | DENSITY % | DEDUCT VALUE |
|---|---|---|---|---|
| 48 L & T CR | LOW | 50.00 (LF) | 1.32 | 5.7 |
| 48 L & T CR | MEDIUM | 85.00 (LF) | 2.24 | 16.7 |
| 49 OIL SPILLAGE | N/A | 40.00 (SF) | 1.05 | 3.7 |

SAMPLE PCI = 75

PCI OF SECTION = 75 RATING = V. GOOD

TOTAL NUMBER OF SAMPLE UNITS = 1
NUMBER OF RANDOM SAMPLE UNITS SURVEYED = 1
NUMBER OF ADDITIONAL SAMPLE UNITS SURVEYED = 0

FOR PROJECT LEVEL ANALYSIS:
RECOMMEND EVERY SAMPLE UNIT BE SURVEYED.

STANDARD DEVIATION OF PCI BETWEEN RANDOM UNITS SURVEYED = .0%

*** EXTRAPOLATED DISTRESS QUANTITIES FOR SECTION ***

| DISTRESS-TYPE | SEVERITY | QUANTITY | DENSITY % | DEDUCT VALUE |
|---|---|---|---|---|
| 48 L & T CR | LOW | 50.00 (LF) | 1.32 | 5.7 |
| 48 L & T CR | MEDIUM | 85.00 (LF) | 2.24 | 16.7 |
| 49 OIL SPILLAGE | N/A | 40.00 (SF) | 1.05 | 3.7 |

*** PERCENT OF DEDUCT VALUES BASED ON DISTRESS MECHANISM ***

LOAD RELATED DISTRESSES = .00 PERCENT DEDUCT VALUES.
CLIMATE/DURABILITY RELATED DISTRESSES = 85.88 PERCENT DEDUCT VALUES.
OTHER RELATED DISTRESSES = 14.12 PERCENT DEDUCT VALUES.

# INSPECTION REPORT

Site Name : Idaho Division of Aeronautics
Database Name : C:PRIESTR

Report Date: JUN/21/1995

Network ID : All
Branch Number : All
Section Number : All
Branch Use : All
Surface Type : All
Pavement Rank : All
Zone : All
Section Category : All
Section Area : All
Last Construction Date: All
Last Inspection Date : All

Network ID - 00031
Branch Name - Runway 01/19
Branch Number - R01PR
Section Number - 01 Family - DEFAULT

Section Length - 200.00 LF
Section Width - 48.00 LF
Section Area - 16037.00 SF

Inspection Date: APR/25/1995
Riding Quality :
Shoulder Cond. :
Safety:
Overall Cond.:
Drainage Cond.:
F.O.D.:

SAMPLE UNIT=1 (RANDOM) SAMPLE SIZE= 6437.00 SF

| DISTRESS-TYPE | SEVERITY | QUANTITY | DENSITY % | DEDUCT VALUE |
|---|---|---|---|---|
| 41 ALLIGATOR CR | LOW | 500.00 (SF) | 7.77 | 40.6 |
| 41 ALLIGATOR CR | MEDIUM | 500.00 (SF) | 7.77 | 52.9 |
| 45 DEPRESSION | LOW | 20.00 (SF) | .31 | 1.7 |
| 48 L & T CR | LOW | 200.00 (LF) | 3.11 | 10.3 |
| 48 L & T CR | MEDIUM | 96.00 (LF) | 1.49 | 13.6 |
| 52 WEATH/RAVEL | MEDIUM | 6437.00 (SF) | 100.00 | 56.8 |

SAMPLE PCI = 9

SAMPLE UNIT=2 (RANDOM) SAMPLE SIZE= 4800.00 SF

| DISTRESS-TYPE | SEVERITY | QUANTITY | DENSITY % | DEDUCT VALUE |
|---|---|---|---|---|
| 41 ALLIGATOR CR | LOW | 120.00 (SF) | 2.50 | 29.3 |
| 41 ALLIGATOR CR | MEDIUM | 2.00 (SF) | .04 | 10.0 |
| 48 L & T CR | LOW | 167.00 (LF) | 3.48 | 11.3 |
| 48 L & T CR | MEDIUM | 150.00 (LF) | 3.13 | 19.9 |
| 52 WEATH/RAVEL | LOW | 4800.00 (SF) | 100.00 | 26.4 |

SAMPLE PCI = 46

INSPECTION REPORT

Site Name : Idaho Division of Aeronautics
Database Name : C:PRIESTR

Report Date: JUN/21/1995

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SAMPLE UNIT=3 (RANDOM) SAMPLE SIZE= 4800.00 SF

| DISTRESS-TYPE | SEVERITY | QUANTITY | DENSITY % | DEDUCT VALUE |
|---|---|---|---|---|
| 41 ALLIGATOR CR | MEDIUM | 2.00 (SF) | .04 | 10.0 |
| 48 L & T CR | LOW | 100.00 (LF) | 2.08 | 7.6 |
| 48 L & T CR | MEDIUM | 100.00 (LF) | 2.08 | 16.0 |
| 48 L & T CR | HIGH | 30.00 (LF) | .63 | 15.9 |
| 52 WEATH/RAVEL | LOW | 4800.00 (SF) | 100.00 | 26.4 |

SAMPLE PCI = 54

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PCI OF SECTION = 36 RATING = POOR

TOTAL NUMBER OF SAMPLE UNITS = 3
NUMBER OF RANDOM SAMPLE UNITS SURVEYED = 3
NUMBER OF ADDITIONAL SAMPLE UNITS SURVEYED = 0

FOR PROJECT LEVEL ANALYSIS:
RECOMMEND EVERY SAMPLE UNIT BE SURVEYED.
STANDARD DEVIATION OF PCI BETWEEN RANDOM UNITS SURVEYED = 24.0%

*** EXTRAPOLATED DISTRESS QUANTITIES FOR SECTION ***

| DISTRESS-TYPE | SEVERITY | QUANTITY | DENSITY % | DEDUCT VALUE |
|---|---|---|---|---|
| 41 ALLIGATOR CR | LOW | 620.00 (SF) | 3.87 | 33.6 |
| 41 ALLIGATOR CR | MEDIUM | 504.00 (SF) | 3.14 | 41.5 |
| 45 DEPRESSION | LOW | 20.00 (SF) | .12 | .3 |
| 48 L & T CR | LOW | 467.00 (LF) | 2.91 | 9.8 |
| 48 L & T CR | MEDIUM | 346.00 (LF) | 2.16 | 16.3 |
| 48 L & T CR | HIGH | 30.00 (LF) | .19 | 10.0 |
| 52 WEATH/RAVEL | LOW | 9600.00 (SF) | 59.86 | 21.7 |
| 52 WEATH/RAVEL | MEDIUM | 6437.00 (SF) | 40.14 | 38.3 |

*** PERCENT OF DEDUCT VALUES BASED ON DISTRESS MECHANISM ***

LOAD RELATED DISTRESSES = 43.77 PERCENT DEDUCT VALUES.
CLIMATE/DURABILITY RELATED DISTRESSES = 56.04 PERCENT DEDUCT VALUES.
OTHER RELATED DISTRESSES = .19 PERCENT DEDUCT VALUES.

INSPECTION REPORT

Site Name : Idaho Division of Aeronautics
Database Name : C:PRIESTR                                   Report Date: JUN/21/1995

Network ID : All
Branch Number : All
Section Number : All
Branch Use : All
Surface Type : All
Pavement Rank : All
Zone : All
Section Category : All
Section Area : All
Last Construction Date: All
Last Inspection Date : All

==========================================================================

Network ID - 00031
Branch Name - Runway 01/19                    Section Length - 2770.00 LF
Branch Number - R01PR                         Section Width - 48.00 LF
Section Number - 02    Family - DEFAULT       Section Area - 139397.00 SF

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Inspection Date: APR/25/1995
Riding Quality :    Safety:    Drainage Cond.:
Shoulder Cond. :    Overall Cond.:    F.O.D.:

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SAMPLE UNIT=1 (RANDOM)    SAMPLE SIZE= 4800.00 SF

| DISTRESS-TYPE | SEVERITY | QUANTITY | DENSITY % | DEDUCT VALUE |
|---|---|---|---|---|
| 41 ALLIGATOR CR | MEDIUM | 75.00 (SF) | 1.56 | 33.7 |
| 48 L & T CR | LOW | 200.00 (LF) | 4.17 | 12.9 |
| 48 L & T CR | MEDIUM | 175.00 (LF) | 3.65 | 21.7 |
| 48 L & T CR | HIGH | 80.00 (LF) | 1.67 | 24.9 |
| 52 WEATH/RAVEL | LOW | 4800.00 (SF) | 100.00 | 26.4 |

SAMPLE PCI = 39

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SAMPLE UNIT=6 (RANDOM)    SAMPLE SIZE= 4800.00 SF

| DISTRESS-TYPE | SEVERITY | QUANTITY | DENSITY % | DEDUCT VALUE |
|---|---|---|---|---|
| 41 ALLIGATOR CR | LOW | 220.00 (SF) | 4.58 | 35.3 |
| 41 ALLIGATOR CR | MEDIUM | 254.00 (SF) | 5.29 | 47.9 |
| 41 ALLIGATOR CR | HIGH | 40.00 (SF) | .83 | 34.4 |
| 45 DEPRESSION | LOW | 40.00 (SF) | .83 | 5.6 |
| 48 L & T CR | LOW | 40.00 (LF) | .83 | 4.6 |
| 48 L & T CR | MEDIUM | 60.00 (LF) | 1.25 | 12.4 |

---

SAMPLE UNIT=6 (RANDOM)    SAMPLE SIZE= 4800.00 SF
(continued)

| DISTRESS TYPE | SEVERITY | QUANTITY | DENSITY % | DEDUCT VALUE |
|---|---|---|---|---|
| 48 L & T CR | HIGH | 80.00 (LF) | 1.67 | 24.9 |
| 52 WEATH/RAVEL | LOW | 4800.00 (SF) | 100.00 | 26.4 |

SAMPLE PCI = 20

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INSPECTION REPORT

Site Name : Idaho Division of Aeronautics
Database Name : C:PRIESTR

Report Date: JUN/21/1995

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SAMPLE UNIT=11 (RANDOM)  SAMPLE SIZE= 4800.00 SF

| DISTRESS-TYPE | SEVERITY | QUANTITY | DENSITY % | DEDUCT VALUE |
|---|---|---|---|---|
| 41 ALLIGATOR CR | LOW | 60.00 (SF) | 1.25 | 22.6 |
| 41 ALLIGATOR CR | MEDIUM | 90.00 (SF) | 1.88 | 35.7 |
| 48 L & T CR | LOW | 75.00 (LF) | 1.56 | 6.3 |
| 48 L & T CR | MEDIUM | 75.00 (LF) | 1.56 | 13.9 |
| 48 L & T CR | HIGH | 75.00 (LF) | 1.56 | 24.2 |
| 52 WEATH/RAVEL | LOW | 4800.00 (SF) | 100.00 | 26.4 |
| 53 RUTTING | LOW | 100.00 (SF) | 2.08 | 18.7 |

SAMPLE PCI = 30

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SAMPLE UNIT=16 (RANDOM)  SAMPLE SIZE= 4800.00 SF

| DISTRESS-TYPE | SEVERITY | QUANTITY | DENSITY % | DEDUCT VALUE |
|---|---|---|---|---|
| 41 ALLIGATOR CR | LOW | 95.00 (SF) | 1.98 | 27.0 |
| 41 ALLIGATOR CR | MEDIUM | 40.00 (SF) | .83 | 27.4 |
| 48 L & T CR | LOW | 272.00 (LF) | 5.67 | 16.1 |
| 48 L & T CR | MEDIUM | 70.00 (LF) | 1.46 | 13.4 |
| 48 L & T CR | HIGH | 100.00 (LF) | 2.08 | 27.7 |
| 52 WEATH/RAVEL | LOW | 4800.00 (SF) | 100.00 | 26.4 |
| 53 RUTTING | LOW | 150.00 (SF) | 3.13 | 20.9 |

SAMPLE PCI = 26

---

SAMPLE UNIT=21 (RANDOM)  SAMPLE SIZE= 4800.00 SF

| DISTRESS-TYPE | SEVERITY | QUANTITY | DENSITY % | DEDUCT VALUE |
|---|---|---|---|---|
| 41 ALLIGATOR CR | LOW | 515.00 (SF) | 10.73 | 44.0 |
| 48 L & T CR | LOW | 80.00 (LF) | 1.67 | 6.5 |
| 48 L & T CR | HIGH | 40.00 (LF) | .83 | 18.0 |
| 52 WEATH/RAVEL | LOW | 4800.00 (SF) | 100.00 | 26.4 |
| 53 RUTTING | MEDIUM | 100.00 (SF) | 2.08 | 29.4 |
| 53 RUTTING | HIGH | 150.00 (SF) | 3.13 | 45.3 |

SAMPLE PCI = 20

---

PCI OF SECTION = 27  RATING = POOR

TOTAL NUMBER OF SAMPLE UNITS = 29
NUMBER OF RANDOM SAMPLE UNITS SURVEYED = 5
NUMBER OF ADDITIONAL SAMPLE UNITS SURVEYED = 0

FOR PROJECT LEVEL ANALYSIS:
RECOMMENDED MINIMUM OF 12 RANDOM SAMPLE UNITS TO BE SURVEYED.
STANDARD DEVIATION OF PCI BETWEEN RANDOM UNITS SURVEYED = 7.9%

INSPECTION REPORT

Site Name : Idaho Division of Aeronautics
Database Name : C:PRIESTR

Report Date: JUN/21/1995

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*** EXTRAPOLATED DISTRESS QUANTITIES FOR SECTION ***

| DISTRESS-TYPE | SEVERITY | QUANTITY | DENSITY % | DEDUCT VALUE |
|---|---|---|---|---|
| 41 ALLIGATOR CR | LOW | 5169.31 (SF) | 3.71 | 33.2 |
| 41 ALLIGATOR CR | MEDIUM | 2665.97 (SF) | 1.91 | 35.9 |
| 41 ALLIGATOR CR | HIGH | 232.33 (SF) | .17 | 20.9 |
| 45 DEPRESSION | LOW | 232.33 (SF) | .17 | .5 |
| 48 L & T CR | LOW | 3874.07 (LF) | 2.78 | 9.5 |
| 48 L & T CR | MEDIUM | 2207.12 (LF) | 1.58 | 14.0 |
| 48 L & T CR | HIGH | 2178.08 (LF) | 1.56 | 24.2 |
| 52 WEATH/RAVEL | LOW | 139397.00 (SF) | 100.00 | 26.4 |
| 53 RUTTING | LOW | 1452.05 (SF) | 1.04 | 15.5 |
| 53 RUTTING | MEDIUM | 580.82 (SF) | .42 | 19.1 |
| 53 RUTTING | HIGH | 871.23 (SF) | .63 | 30.3 |

*** PERCENT OF DEDUCT VALUES BASED ON DISTRESS MECHANISM ***

LOAD RELATED DISTRESSES = 67.51 PERCENT DEDUCT VALUES.
CLIMATE/DURABILITY RELATED DISTRESSES = 32.25 PERCENT DEDUCT VALUES.
OTHER RELATED DISTRESSES = .23 PERCENT DEDUCT VALUES.

INSPECTION REPORT

Site Name : Idaho Division of Aeronautics
Database Name : C:PRIESTR
Report Date: JUN/21/1995

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Inspection Date: AUG/20/1986
Riding Quality : Safety: Drainage Cond.:
Shoulder Cond. : Overall Cond.: F.O.D.:

---

SAMPLE UNIT=1 (RANDOM) SAMPLE SIZE= 5000.00 SF

| DISTRESS-TYPE | SEVERITY | QUANTITY | DENSITY % | DEDUCT VALUE |
|---|---|---|---|---|
| 48 L & T CR | LOW | 146.00 (LF) | 2.92 | 9.8 |
| 48 L & T CR | MEDIUM | 101.00 (LF) | 2.02 | 15.8 |

SAMPLE PCI = 79

---

SAMPLE UNIT=7 (RANDOM) SAMPLE SIZE= 5000.00 SF

| DISTRESS-TYPE | SEVERITY | QUANTITY | DENSITY % | DEDUCT VALUE |
|---|---|---|---|---|
| 48 L & T CR | LOW | 225.00 (LF) | 4.50 | 13.7 |
| 48 L & T CR | MEDIUM | 65.00 (LF) | 1.30 | 12.7 |

SAMPLE PCI = 81

---

SAMPLE UNIT=13 (RANDOM) SAMPLE SIZE= 5000.00 SF

| DISTRESS-TYPE | SEVERITY | QUANTITY | DENSITY % | DEDUCT VALUE |
|---|---|---|---|---|
| 48 L & T CR | LOW | 167.00 (LF) | 3.34 | 10.9 |
| 48 L & T CR | MEDIUM | 65.00 (LF) | 1.30 | 12.7 |

SAMPLE PCI = 82

---

SAMPLE UNIT=19 (RANDOM) SAMPLE SIZE= 5000.00 SF

| DISTRESS-TYPE | SEVERITY | QUANTITY | DENSITY % | DEDUCT VALUE |
|---|---|---|---|---|
| 48 L & T CR | LOW | 352.00 (LF) | 7.04 | 18.7 |
| 48 L & T CR | MEDIUM | 73.00 (LF) | 1.46 | 13.4 |

SAMPLE PCI = 76

---

SAMPLE UNIT=25 (RANDOM) SAMPLE SIZE= 5000.00 SF

| DISTRESS-TYPE | SEVERITY | QUANTITY | DENSITY % | DEDUCT VALUE |
|---|---|---|---|---|
| 48 L & T CR | LOW | 190.00 (LF) | 3.80 | 12.0 |

SAMPLE PCI = 87

---

PCI OF SECTION = 81 RATING = V. GOOD

TOTAL NUMBER OF SAMPLE UNITS = 29
NUMBER OF RANDOM SAMPLE UNITS SURVEYED = 5
NUMBER OF ADDITIONAL SAMPLE UNITS SURVEYED = 0

INSPECTION REPORT

Site Name : Idaho Division of Aeronautics
Database Name : C:PRIESTR

Report Date: JUN/21/1995

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FOR PROJECT LEVEL ANALYSIS:
RECOMMENDED MINIMUM OF 5 RANDOM SAMPLE UNITS TO BE SURVEYED.
STANDARD DEVIATION OF PCI BETWEEN RANDOM UNITS SURVEYED = 4.0%

*** EXTRAPOLATED DISTRESS QUANTITIES FOR SECTION ***

| DISTRESS-TYPE | SEVERITY | QUANTITY | DENSITY % | DEDUCT VALUE |
|---|---|---|---|---|
| 48 L & T CR | LOW | 6021.95 (LF) | 4.32 | 13.3 |
| 48 L & T CR | MEDIUM | 1695.07 (LF) | 1.22 | 12.3 |

*** PERCENT OF DEDUCT VALUES BASED ON DISTRESS MECHANISM ***

LOAD RELATED DISTRESSES = .00 PERCENT DEDUCT VALUES.
CLIMATE/DURABILITY RELATED DISTRESSES = 100.00 PERCENT DEDUCT VALUES.
OTHER RELATED DISTRESSES = .00 PERCENT DEDUCT VALUES.

# APPENDIX PR-6

# NETWORK MAINTENANCE REPORT

## INSPECTION REPORT

Site Name : Idaho Division of Aeronautics
Database Name : C:PRIESTR

Report Date: JUN/21/1995

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### *** EXTRAPOLATED DISTRESS QUANTITIES FOR SECTION ***

| DISTRESS-TYPE | SEVERITY | QUANTITY | DENSITY % | DEDUCT VALUE |
|---|---|---|---|---|
| 41 ALLIGATOR CR | MEDIUM | 340.00 (SF) | 10.04 | 56.3 |
| 45 DEPRESSION | LOW | 60.00 (SF) | 1.77 | 10.4 |
| 45 DEPRESSION | HIGH | 15.00 (SF) | .44 | 20.1 |
| 48 L & T CR | LOW | 12.00 (LF) | .35 | 3.8 |
| 48 L & T CR | MEDIUM | 124.00 (LF) | 3.66 | 21.7 |
| 52 WEATH/RAVEL | HIGH | 15.00 (SF) | .44 | 10.3 |

### *** PERCENT OF DEDUCT VALUES BASED ON DISTRESS MECHANISM ***

LOAD RELATED DISTRESSES = 45.94 PERCENT DEDUCT VALUES.
CLIMATE/DURABILITY RELATED DISTRESSES = 29.20 PERCENT DEDUCT VALUES.
OTHER RELATED DISTRESSES = 24.85 PERCENT DEDUCT VALUES.

INSPECTION REPORT

Site Name : Idaho Division of Aeronautics
Database Name : C:PRIESTR

Report Date: JUN/21/1995

Network ID : All
Branch Number : All
Section Number : All
Branch Use : All
Surface Type : All
Pavement Rank : All
Zone : All
Section Category : All
Section Area : All
Last Construction Date: All
Last Inspection Date : All

==========================================================================

Network ID - 00031
Branch Name - Taxiway 01
Branch Number - T01PR
Section Number - 01 Family - DEFAULT

Section Length - 85.00 LF
Section Width - 41.00 LF
Section Area - 3387.00 SF

==========================================================================

Inspection Date: APR/25/1995
Riding Quality : Safety: Drainage Cond.:
Shoulder Cond. : Overall Cond.: F.O.D.:

SAMPLE UNIT=1 (RANDOM) SAMPLE SIZE= 3387.00 SF

| DISTRESS-TYPE | SEVERITY | QUANTITY | DENSITY % | DEDUCT VALUE |
|---|---|---|---|---|
| 41 ALLIGATOR CR | MEDIUM | 340.00 (SF) | 10.04 | 56.3 |
| 45 DEPRESSION | LOW | 60.00 (SF) | 1.77 | 10.4 |
| 45 DEPRESSION | HIGH | 15.00 (SF) | .44 | 20.1 |
| 48 L & T CR | LOW | 12.00 (LF) | .35 | 3.8 |
| 48 L & T CR | MEDIUM | 124.00 (LF) | 3.66 | 21.7 |
| 52 WEATH/RAVEL | HIGH | 15.00 (SF) | .44 | 10.3 |

SAMPLE PCI = 23

PCI OF SECTION = 23 RATING = V. POOR

TOTAL NUMBER OF SAMPLE UNITS = 1
NUMBER OF RANDOM SAMPLE UNITS SURVEYED = 1
NUMBER OF ADDITIONAL SAMPLE UNITS SURVEYED = 0

FOR PROJECT LEVEL ANALYSIS:
RECOMMEND EVERY SAMPLE UNIT BE SURVEYED.
STANDARD DEVIATION OF PCI BETWEEN RANDOM UNITS SURVEYED = .0%

Network Maintenance Report

Site Name : Idaho Division of Aeronautics
Database Name : C:PRIESTR

Report Date: JUN/21/1995

Work Type Summary Table

| Work Type | Netwrk | Branch/ Section | Work-Qty | Cost ($) |
|---|---|---|---|---|
| Surface Treatment - Loc Fog Se | 00031 | A01PR 01 | 6.00 SF | 0 |
| | 00031 | R01PR 01 | 16037.00 SF | 802 |
| | 00031 | R01PR 02 | 139397.00 SF | 6970 |
| | | Total: | 155440.00 SF | 7772 |
| Surface Treatment - Loc Slurry | 00031 | R01PR 01 | 620.00 SF | 118 |
| | 00031 | R01PR 02 | 5169.31 SF | 982 |
| | 00031 | T01PR 01 | 15.00 SF | 3 |
| | | Total: | 5804.31 SF | 1103 |

Total cost of all work ($): 32816

Network Maintenance Report

Site Name : Idaho Division of Aeronautics
Database Name : C:PRIESTR Report Date: JUN/21/1995

Network ID : All
Branch Number : All
Section Number : All
Branch Use : All
Pavement Rank : All
Surface Type : All
Zone : All
Section Category : All
Last Construction Date: All
PCI : All

Work Type Summary Table

| Work Type | Netwrk | Branch/ Section | Work-Qty | Cost ($) |
|---|---|---|---|---|
| Patching - AC Deep | 00031 | A01PR 01 | 40.00 SF | 133 |
| | 00031 | A01PR 02 | 136.79 SF | 456 |
| | 00031 | R01PR 01 | 504.00 SF | 1678 |
| | 00031 | R01PR 02 | 3769.53 SF | 12553 |
| | 00031 | T01PR 01 | 340.00 SF | 1132 |
| | | Total: | 4790.32 SF | 15952 |
| Patching - AC Leveling | 00031 | A01PR 01 | 4.00 SF | 0 |
| | 00031 | A01PR 02 | 12.31 SF | 1 |
| | 00031 | T01PR 01 | 15.00 SF | 1 |
| | | Total: | 31.31 SF | 2 |
| Do Nothing | 00031 | A01PR 01 | 100.00 SF | 0 |
| | 00031 | A01PR 02 | 177.82 SF | 0 |
| | 00031 | R01PR 01 | 20.00 SF | 0 |
| | 00031 | R01PR 02 | 2265.20 SF | 0 |
| | 00031 | T01PR 01 | 60.00 SF | 0 |
| | | Total: | 2623.02 SF | 0 |
| Crack Sealing - AC | 00031 | A01PR 01 | 149.00 LF | 112 |
| | 00031 | A01PR 02 | 856.29 LF | 642 |
| | 00031 | A01PR 03 | 135.00 LF | 102 |
| | 00031 | R01PR 01 | 843.00 LF | 633 |
| | 00031 | R01PR 02 | 8259.28 LF | 6195 |
| | 00031 | T01PR 01 | 136.00 LF | 102 |
| | | Total: | 10378.57 LF | 7786 |
| Patching - AC Deep w/ Coal Tar | 00031 | A01PR 01 | 48.00 SF | 55 |
| | 00031 | A01PR 02 | 87.54 SF | 100 |
| | 00031 | A01PR 03 | 40.00 SF | 46 |
| | | Total: | 175.54 SF | 201 |

Network Maintenance Report

Site Name : Idaho Division of Aeronautics
Database Name : C:PRIESTR

Report Date: JUN/21/1995

Network ID : All
Branch Number : All
Section Number : All
Branch Use : All
Pavement Rank : All
Surface Type : All
Zone : All
Section Category : All
Last Construction Date: All
PCI : All

Network ID - 00031
Branch Name - Taxiway 01
Branch Number - T01PR
Section Number - 01

Section Length - 85.00 LF
Section Width - 41.00 LF
Section Area - 3387.00 SF

Inspection Date - APR/25/1995

Section PCI - 23

| Distress Type | Dis Sev | Dist-Qty Work-Qty | Work Type | Total Cost ($) |
|---|---|---|---|---|
| 41 ALLIGATOR CR | M | 340.00 SF | | |
| | | 340.00 SF | Patching - AC Deep | 1132 |
| 45 DEPRESSION | H | 15.00 SF | | |
| | | 15.00 SF | Patching - AC Leveling | 1 |
| 45 DEPRESSION | L | 60.00 SF | | |
| | | 60.00 SF | Do Nothing | 0 |
| 48 L & T CR | L | 12.00 LF | | |
| | | 12.00 LF | Crack Sealing - AC | 9 |
| 48 L & T CR | M | 124.00 LF | | |
| | | 124.00 LF | Crack Sealing - AC | 93 |
| 52 WEATH/RAVEL | H | 15.00 SF | | |
| | | 15.00 SF | Surface Treatment - Loc Slurry | 3 |
| | | | Total | 1238 |

# Network Maintenance Report

Site Name : Idaho Division of Aeronautics
Database Name : C:PRIESTR

Report Date: JUN/21/1995

Network ID : All
Branch Number : All
Section Number : All
Branch Use : All
Pavement Rank : All
Surface Type : All
Zone : All
Section Category : All
Last Construction Date: All
PCI : All

Network ID - 00031
Branch Name - Runway 01/19
Branch Number - R01PR
Section Number - 02

Section Length - 2770.00 LF
Section Width - 48.00 LF
Section Area - 139397.00 SF

Inspection Date - APR/25/1995

Section PCI - 27

| Distress Type | Dis Sev | Dist-Qty / Work-Qty | Work Type | Total Cost ($) |
|---|---|---|---|---|
| 41 ALLIGATOR CR | H | 232.33 SF | | |
| | | 232.33 SF | Patching - AC Deep | 774 |
| 41 ALLIGATOR CR | L | 5169.31 SF | | |
| | | 5169.31 SF | Surface Treatment - Loc Slurry | 982 |
| 41 ALLIGATOR CR | M | 2665.97 SF | | |
| | | 2665.97 SF | Patching - AC Deep | 8878 |
| 45 DEPRESSION | L | 232.33 SF | | |
| | | 232.33 SF | Do Nothing | 0 |
| 48 L & T CR | H | 2178.08 LF | | |
| | | 2178.08 LF | Crack Sealing - AC | 1634 |
| 48 L & T CR | L | 3874.07 LF | | |
| | | 3874.07 LF | Crack Sealing - AC | 2906 |
| 48 L & T CR | M | 2207.12 LF | | |
| | | 2207.12 LF | Crack Sealing - AC | 1655 |
| 52 WEATH/RAVEL | L | 139397.00 SF | | |
| | | 139397.00 SF | Surface Treatment - Loc Fog Se | 6970 |
| 53 RUTTING | H | 871.23 SF | | |
| | | 871.23 SF | Patching - AC Deep | 2901 |
| 53 RUTTING | L | 1452.05 SF | | |
| | | 1452.05 SF | Do Nothing | 0 |
| 53 RUTTING | M | 580.82 SF | | |
| | | 580.82 SF | Do Nothing | 0 |
| | | | Total | 26700 |

## Network Maintenance Report

Site Name : Idaho Division of Aeronautics
Database Name : C:PRIESTR

Report Date: JUN/21/1995

Network ID : All
Branch Number : All
Section Number : All
Branch Use : All
Pavement Rank : All
Surface Type : All
Zone : All
Section Category : All
Last Construction Date: All
PCI : All

Network ID - 00031
Branch Name - Runway 01/19
Branch Number - R01PR
Section Number - 01

Inspection Date - APR/25/1995

Section Length - 200.00 LF
Section Width - 48.00 LF
Section Area - 16037.00 SF
Section PCI - 36

| Distress Type | Dis Sev | Dist-Qty Work-Qty | Work Type | Total Cost ($) |
|---|---|---|---|---|
| 41 ALLIGATOR CR | L | 620.00 SF | | |
| | | 620.00 SF | Surface Treatment - Loc Slurry | 118 |
| 41 ALLIGATOR CR | M | 504.00 SF | | |
| | | 504.00 SF | Patching - AC Deep | 1678 |
| 45 DEPRESSION | L | 20.00 SF | | |
| | | 20.00 SF | Do Nothing | 0 |
| 48 L & T CR | H | 30.00 LF | | |
| | | 30.00 LF | Crack Sealing - AC | 23 |
| 48 L & T CR | L | 467.00 LF | | |
| | | 467.00 LF | Crack Sealing - AC | 350 |
| 48 L & T CR | M | 346.00 LF | | |
| | | 346.00 LF | Crack Sealing - AC | 260 |
| 52 WEATH/RAVEL | L | 9600.00 SF | | |
| | | 9600.00 SF | Surface Treatment - Loc Fog Se | 480 |
| 52 WEATH/RAVEL | M | 6437.00 SF | | |
| | | 6437.00 SF | Surface Treatment - Loc Fog Se | 322 |
| | | | Total | 3231 |

# Network Maintenance Report

Site Name : Idaho Division of Aeronautics
Database Name : C:PRIESTR

Report Date: JUN/21/1995

Network ID : All
Branch Number : All
Section Number : All
Branch Use : All
Pavement Rank : All
Surface Type : All
Zone : All
Section Category : All
Last Construction Date: All
PCI : All

Network ID - 00031
Branch Name - Apron 01
Branch Number - A01PR
Section Number - 03

Section Length - 75.00 LF
Section Width - 56.00 LF
Section Area - 3800.00 SF

Inspection Date - APR/25/1995

Section PCI - 75

| Distress Type | Dis Sev | Dist-Qty Work-Qty | Work Type | Total Cost ($) |
|---|---|---|---|---|
| 48 L & T CR | L | 50.00 LF | | |
| | | 50.00 LF | Crack Sealing - AC | 38 |
| 48 L & T CR | M | 85.00 LF | | |
| | | 85.00 LF | Crack Sealing - AC | 64 |
| 49 OIL SPILLAGE | | 40.00 SF | | |
| | | 40.00 SF | Patching - AC Deep w/ Coal Tar | 46 |
| | | | Total | 148 |

# Network Maintenance Report

Site Name : Idaho Division of Aeronautics
Database Name : C:PRIESTR

Report Date: JUN/21/1995

Network ID : All
Branch Number : All
Section Number : All
Branch Use : All
Pavement Rank : All
Surface Type : All
Zone : All
Section Category : All
Last Construction Date: All
PCI : All

Network ID - 00031
Branch Name - Apron 01
Branch Number - A01PR
Section Number - 02

Section Length - 230.00 LF
Section Width - 157.00 LF
Section Area - 28315.00 SF

Inspection Date - APR/25/1995

Section PCI - 70

| Distress Type | Dis Sev | Dist-Qty Work-Qty | Work Type | Total Cost ($) |
|---|---|---|---|---|
| 45 DEPRESSION | H | 12.31 SF | | |
| | | 12.31 SF | Patching - AC Leveling | 1 |
| 45 DEPRESSION | M | 177.82 SF | | |
| | | 177.82 SF | Do Nothing | 0 |
| 48 L & T CR | L | 637.43 LF | | |
| | | 637.43 LF | Crack Sealing - AC | 478 |
| 48 L & T CR | M | 218.86 LF | | |
| | | 218.86 LF | Crack Sealing - AC | 164 |
| 49 OIL SPILLAGE | | 19.15 SF | | |
| | | 19.15 SF | Patching - AC Deep w/ Coal Tar | 22 |
| 49 OIL SPILLAGE | | 68.39 SF | | |
| | | 68.39 SF | Patching - AC Deep w/ Coal Tar | 78 |
| 55 SLIPPAGE CR | | 136.79 SF | | |
| | | 136.79 SF | Patching - AC Deep | 456 |
| | | | Total | 1199 |

# Network Maintenance Report

Site Name : Idaho Division of Aeronautics
Database Name : C:PRIESTR

Report Date: JUN/21/1995

Network ID : All
Branch Number : All
Section Number : All
Branch Use : All
Pavement Rank : All
Surface Type : All
Zone : All
Section Category : All
Last Construction Date: All
PCI : All

Network ID - 00031
Branch Name - Apron 01
Branch Number - A01PR
Section Number - 01

Section Length - 110.00 LF
Section Width - 75.00 LF
Section Area - 7971.00 SF

Inspection Date - APR/25/1995

Section PCI - 55

| Distress Type | Dis Sev | Dist-Qty Work-Qty | Work Type | Total Cost ($) |
|---|---|---|---|---|
| 41 ALLIGATOR CR | M | 40.00 SF | | |
| | | 40.00 SF | Patching - AC Deep | 133 |
| 45 DEPRESSION | H | 4.00 SF | | |
| | | 4.00 SF | Patching - AC Leveling | 0 |
| 45 DEPRESSION | L | 100.00 SF | | |
| | | 100.00 SF | Do Nothing | 0 |
| 48 L & T CR | L | 15.00 LF | | |
| | | 15.00 LF | Crack Sealing - AC | 11 |
| 48 L & T CR | M | 134.00 LF | | |
| | | 134.00 LF | Crack Sealing - AC | 101 |
| 49 OIL SPILLAGE | | 48.00 SF | | |
| | | 48.00 SF | Patching - AC Deep w/ Coal Tar | 55 |
| 52 WEATH/RAVEL | L | 6.00 SF | | |
| | | 6.00 SF | Surface Treatment - Loc Fog Se | 0 |
| | | | Total | 300 |

# APPENDIX E

***Pavement Database Summary***

| Airport Name | State | R/W ID | Orig Const | Base Year | S-Depth | O/L Depth | Base | B-Depth | Subbase | SB-Depth | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Anacortes Airport | WA | R1 | 1968 | 1991 | 2 | 2 | DBST | 0 | base | 0 | Entire runway resurfaced w/2" AC in 1973 |
| Anacortes Airport | WA | R2 | 1968 | 1991 | 2 | 2 | base | 3 | subbase | 0 | Entire runway resurfaced w/2" AC in 1973 |
| Anacortes Airport | WA | R3 | 1968 | 1991 | 2 | 2 | base | 4 | subbase | 0 | Entire runway resurfaced w/2" AC in 1973 |
| Arlington Municipal Airport | WA | R1 | 1942 | 1976 | 5 | 2 | base | 8 | | 0 | Main runway. Overlaid 1976 w/2" AC over 3" AC |
| Arlington Municipal Airport | WA | R2 | 1942 | 1991 | 3 | | base | 6 | | 0 | Entire runway was reconstructed using fabric and asphalt |
| Auburn Municipal Airport | WA | R1 | 1968 | 1968 | 2 | | base | 18 | | 0 | |
| Auburn Municipal Airport | WA | R2 | 1983 | 1983 | 2 | | base | 3 | subbase | 6 | |
| Blaine Municipal Airport | WA | R1 | 1972 | 1992 | 4 | 2 | base | 8 | | 0 | Runway overlaid and widened in 1992 |
| Bowerman Field, Hoquiam | WA | R1 | 1943 | 1990 | 5.5 | 3 | base | 12 | | 0 | Entire runway overlaid w/3" AC in 1990 over 2.5" AC and base |
| Bowerman Field, Hoquiam | WA | R2 | 1943 | 1990 | 8 | 3 | base | 6 | subbase | 8 | Combined into main runway. Originally were PCC ends. |
| Bowerman Field, Hoquiam | WA | R3 | 1943 | 1990 | 8 | 3 | base | 6 | subbase | 8 | Combined into main runway. Originally were PCC ends. |
| Bowers Field, Ellensburg | WA | R1 | 1976 | 1987 | 3 | 2 | base | 6.5 | | 0 | 2" AC overlay applied to center in 1976 |
| Bowers Field, Ellensburg | WA | R3 | 1942 | 1942 | 2.5 | | base | 6 | | 0 | |
| Bowers Field, Ellensburg | WA | R4 | 1942 | 1942 | 2.5 | | base | 3 | subbase | 5 | |
| Bremerton National | WA | R1 | 1942 | 1974 | 5.5 | 3 | base | 6 | | 0 | 3" AC overlay applied in 1974 |

| Airport Name | State | R/W ID | PCI #1 | Date #1 | PCI #2 | Date #2 | PCI #3 | Date #3 | Repair #1 | Date Rpr 1 | Repair #2 | Date Rpr 2 | Repair #3 | Date Rpr 3 | Repair #4 | Date Rpr 4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Anacortes Airport | WA | R1 | 96 | 1986 | 91 | 1989 | 94 | 1992 | Overlay | 1973 | Slurry seal | 1991 | | | | |
| Anacortes Airport | WA | R2 | 95 | 1986 | 90 | 1989 | 90 | 1992 | Overlay | 1973 | Slurry seal | 1991 | | | | |
| Anacortes Airport | WA | R3 | 100 | 1986 | 92 | 1989 | 100 | 1992 | Overlay | 1973 | Slurry seal | 1991 | | | | |
| Arlington Municipal Airport | WA | R1 | 77 | 1986 | 78 | 1989 | 80 | 1992 | | | | | | | | |
| Arlington Municipal Airport | WA | R2 | 89 | 1986 | 84 | 1989 | 100 | 1992 | Overlay | 1976 | Reconstruc | 1991 | | | | |
| Auburn Municipal Airport | WA | R1 | 81 | 1987 | 84 | 1991 | 0 | 0 | | | | | | | | |
| Auburn Municipal Airport | WA | R2 | 90 | 1987 | 87 | 1991 | 0 | 0 | | | | | | | | |
| Blaine Municipal Airport | WA | R1 | 72 | 1988 | 98 | 1992 | 0 | 0 | Overlay | 1992 | | | | | | |
| Bowerman Field, Hoquiam | WA | R1 | 77 | 1986 | 84 | 1989 | 88 | 1992 | Overlay | 1990 | | | | | | |
| Bowerman Field, Hoquiam | WA | R2 | 86 | 1986 | 84 | 1989 | 0 | 0 | Overlay | 1990 | | | | | | |
| Bowerman Field, Hoquiam | WA | R3 | 33 | 1986 | 26 | 1989 | 0 | 0 | Overlay | 1990 | | | | | | |
| Bowers Field, Ellensburg | WA | R1 | 67 | 1986 | 64 | 1989 | 62 | 1993 | Slurry seal | 1987 | | | | | | |
| Bowers Field, Ellensburg | WA | R3 | 57 | 1986 | 64 | 1989 | 53 | 1993 | | | | | | | | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Deer Park Airport | WA | R1 | 45 | 1986 | 76 | 1989 | 0 | 0 | | |
| Deer Park Airport | WA | R2 | 72 | 1986 | 74 | 1989 | 0 | 0 | | |
| Deer Park Airport | WA | R3 | 47 | 1986 | 39 | 1989 | 0 | 0 | | |
| Elma Municipal Airport | WA | R1 | 88 | 1988 | 83 | 1991 | 0 | 0 | | |
| Ephrata Municipal Airport | WA | R1 | 40 | 1987 | 33 | 1991 | 0 | 0 | | |
| Ephrata Municipal Airport | WA | R1A | 60 | 1987 | 55 | 1991 | 0 | 0 | Slurry seal | 1970 |
| Ephrata Municipal Airport | WA | R2 | 53 | 1987 | 43 | 1991 | 0 | 0 | Slurry seal | 1970 |
| Ephrata Municipal Airport | WA | R2A | 47 | 1987 | 26 | 1991 | 0 | 0 | | |
| Ephrata Municipal Airport | WA | R2B | 89 | 1987 | 84 | 1991 | 0 | 0 | | |
| Evergreen Field, Vancouver | WA | R1 | 55 | 1987 | 51 | 1991 | 0 | 0 | | |
| Evergreen Field, Vancouver | WA | R2 | 86 | 1987 | 77 | 1991 | 0 | 0 | | |
| Ferry County (Republic) Airport | WA | R1 | 65 | 1986 | 70 | 1991 | 0 | 0 | Chip seal | 1978 |
| Grand Couly Dam Airpot | WA | R1 | 86 | 1986 | 87 | 1989 | 0 | 0 | Overlay | 1980 |
| Grand Couly Dam Airport | WA | R2 | 84 | 1986 | 85 | 1989 | 0 | 0 | | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Bremerton National | WA | R1 | 86 | 1987 | 86 | 1991 | 0 | 0 | Overlay | 1974 | | | | | | |
| Bremerton National | WA | R2 | 83 | 1987 | 75 | 1991 | 0 | 0 | Overlay | 1974 | | | | | | |
| Bremerton National | WA | R3 | 86 | 1987 | 80 | 1991 | 0 | 0 | | | | | | | | |
| Bremerton National | WA | R4 | 88 | 1987 | 83 | 1991 | 0 | 0 | Overlay | 1974 | | | | | | |
| Bremerton National | WA | R5 | 82 | 1987 | 80 | 1991 | 0 | 0 | | | | | | | | |
| Cashmere-Dryden Airport | WA | R1 | 72 | 1988 | 69 | 1992 | 0 | 0 | Seal coat | 1976 | Seal coat | 1990 | DBST | 1984 | Seal Coat | 199 |
| Chehalis-Centralia Airport | WA | R1 | 84 | 1987 | 81 | 1991 | 0 | 0 | | | | | | | | |
| Chehalis-Centralia Airport | WA | R2 | 78 | 1987 | 67 | 1991 | 0 | 0 | | | | | | | | |
| Cle Elum Municipal Airport | WA | R1 | 56 | 1988 | 62 | 1992 | 0 | 0 | | | | | | | | |
| Colville Municipal Airport | WA | R1 | 62 | 1989 | 52 | 1993 | 0 | 0 | Seal coat | 1958 | TBST | 1987 | | | | |
| Concrete Municipal Airport | WA | R1 | 61 | 1986 | 34 | 1989 | 24 | 1992 | | | | | | | | |
| Connell City Airport | WA | R1 | 69 | 1987 | 79 | 1991 | 0 | 0 | Overlay | 1979 | | | | | | |
| Crest Airport, Kent | WA | R1 | 97 | 1987 | 90 | 1991 | 0 | 0 | Overlay | 1986 | | | | | | |
| Davenport Airport | WA | R1 | 82 | 1986 | 60 | 1989 | 61 | 1993 | BST | 1977 | Seal coat | 1984 | Seal coat | 1991 | | |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| Bremerton National | WA | R3 | 1942 | 1942 | 5 | | base | 4 | subbase | 6 | |
| Bremerton National | WA | R4 | 1942 | 1974 | 5 | 2 | base | 4 | subbase | 6 | 2" AC overlay applied in 1974 |
| Bremerton National | WA | R5 | 1942 | 1942 | 2.5 | | base | 6 | | 0 | |
| Cashmere-Dryden Airport | WA | R1 | 1951 | 1990 | | | base | 9 | | 0 | Seal coated several times. New DBST applied in 1984. |
| Chehalis-Centralia Airport | WA | R1 | 1942 | 1942 | 8 | | base | 6 | | 0 | |
| Chehalis-Centralia Airport | WA | R2 | 1942 | 1942 | 8 | | base | 6 | | 0 | |
| Cle Elum Municipal Airport | WA | R1 | 1987 | 1987 | | | base | 4 | | 0 | Less loose aggregate than in 1988 survey, so better PCI. |
| Colville Municipal Airport | WA | R1 | 1949 | 1987 | | 2 | DBST | 0 | base | 8 | 400' end of runway overlaid in 1993 w/2" AC |
| Concrete Municipal Airport | WA | R1 | 1947 | 1974 | | | base | 2 | subbase | 4 | Very low use. |
| Connell City Airport | WA | R1 | 1970 | 1979 | 2 | 2 | BST | 0 | | 0 | 2" AC overlay applied over existing BST |
| Crest Airport, Kent | WA | R1 | 1967 | 1986 | 2 | 2 | BST | 0 | gravel | 0 | 2" AC overlay applied over existing BST |
| Davenport Airport | WA | R1 | 1973 | 1977 | | | base | 8 | | 0 | |
| Deer Park Airport | WA | R1 | 1943 | 1943 | 1.5 | | base | 8 | | 0 | Data does not reflect downgrade. No repairs mentioned. |
| Deer Park Airport | WA | R2 | 1976 | 1976 | 2 | | base | 6 | | 0 | Survey results were inconsistent. |
| Deer Park Airport | WA | R3 | 1943 | 1943 | 1.5 | | base | 6 | | 0 | |
| Elma Municipal Airport | WA | R1 | 1976 | 1976 | 1.5 | | base | 6 | | 0 | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ione Municipal Airport | WA | R1 | 76 | 1986 | 76 | 1989 | 70 | 1992 | UNK | | | |
| Ione Municipal Airport | WA | R2 | 80 | 1989 | 80 | 1992 | 0 | 0 | | | | |
| Kelso-Longview | WA | R1 | 90 | 1987 | 82 | 1991 | 0 | 0 | | | | |
| Kennewick-Vista Field | WA | R1 | 69 | 1987 | 66 | 1992 | 0 | 0 | Chip seal | 1976 | | |
| Kennewick-Vista Field | WA | R2 | 68 | 1987 | 63 | 1992 | 0 | 0 | | | | |
| Lake Chelan Airport | WA | R1 | 93 | 1988 | 90 | 1993 | 0 | 0 | Seal coat | 1976 | | |
| Lind Airport | WA | R1 | 51 | 1987 | 51 | 1991 | 0 | 0 | Slurry seal | 1982 | | |
| Mansfield Airport | WA | R1 | 35 | 1988 | 27 | 1993 | 0 | 0 | Chip seal | 1979 | Chip seal | 1983 |
| Moses Lake Municipal Airport | WA | R1 | 89 | 1987 | 81 | 1991 | 0 | 0 | Slurry seal | | Overlay | 1984 |
| Moses Lake Municipal Airport | WA | R2 | 29 | 1987 | 18 | 1991 | 0 | 0 | | | | |
| New Warden Airport | WA | R1 | 77 | 1987 | 79 | 1991 | 0 | 0 | | | | |
| Oak Harbor Air Park | WA | R1 | 73 | 1988 | 68 | 1992 | 0 | 0 | Overlay | 1971 | | |
| Ocean Shores Airport | WA | R1 | 98 | 1986 | 95 | 1989 | 93 | 1992 | Overlay | 1987 | | |
| Odessa Municipal | WA | R1 | 79 | 1987 | 46 | 1991 | 0 | 0 | Reconstruc | 1985 | | |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| Ephrata Municipal Airport | WA | R1A | 1943 | 1970 | 3 | | base | 6 | | 0 | |
| Ephrata Municipal Airport | WA | R2 | 1943 | 1970 | 2.5 | | base | 6 | | 0 | |
| Ephrata Municipal Airport | WA | R2A | 1943 | 1943 | 6 | | base | 6 | | 0 | |
| Ephrata Municipal Airport | WA | R2B | 1983 | 1983 | 3 | | base | 7 | subbase | 12 | |
| Evergreen Field, Vancouver | WA | R1 | 1967 | 1967 | 2 | | base | 4 | | 0 | |
| Evergreen Field, Vancouver | WA | R2 | 1971 | 1971 | 2 | | base | 4 | | 0 | |
| Ferry County (Republic) Airport | WA | R1 | 1974 | 1978 | | | base | 5 | subbase | 6 | |
| Grand Couly Dam Airpot | WA | R1 | 1972 | 1980 | | 2 | base | 6 | | 0 | |
| Grand Couly Dam Airport | WA | R2 | 1980 | 1980 | 2 | | base | 5 | | 0 | |
| Harvey Field (Snohomish) | WA | R1 | 1970 | 1970 | 2 | | base | 12 | | 0 | Very small but active. |
| Ione Municipal Airport | WA | R1 | 1973 | 1973 | | | base | 4 | subbase | 8 | |
| Ione Municipal Airport | WA | R2 | 0 | 1989 | | | base | 4 | subbase | 10 | Runway extension |
| Kelso-Longview | WA | R1 | 1983 | 1983 | 3 | | base | 5 | subbase | 9 | |
| Kennewick-Vista Field | WA | R1 | 1942 | 1976 | 2 | | base | 6 | | 0 | |
| Kennewick-Vista Field | WA | R2 | 1942 | 1942 | 2 | | base | 6 | | 0 | |
| Lake Chelan Airport | WA | R1 | 0 | 1986 | 2 | | base | 5 | | 0 | |

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|---|---|---|---|---|---|---|---|---|---|---|
| Odessa Municipal | WA | R2 | 58 | 1987 | 50 | 1991 | 0 | 0 | Reconstruc | 1985 |
| Okanagan Legion Airport | WA | R1 | 76 | 1987 | 65 | 1992 | 0 | 0 | DBST | 1987 |
| Olympia Airport | WA | R1 | 55 | 1988 | 45 | 1991 | 0 | 0 | | |
| Olympia Airport | WA | R2 | 89 | 1988 | 85 | 1991 | 0 | 0 | | |
| Olympia Airport | WA | R3 | 86 | 1988 | 84 | 1991 | 0 | 0 | Overlay | 1980 |
| Omak Airport | WA | R1 | 68 | 1986 | 65 | 1989 | 61 | 1992 | Overlay | 1974 |
| Othello Municipal Airport | WA | R1 | 79 | 1987 | 74 | 1991 | 0 | 0 | Overlay | 1976 |
| Othello Municipal Airport | WA | R2 | 90 | 1991 | 0 | 0 | 0 | 0 | | |
| Packwood Airport | WA | R1 | 94 | 1988 | 90 | 1991 | 0 | 0 | Overlay | 1985 |
| Pangborn Field (Wenatchee) | WA | R1 | 63 | 1988 | 0 | 0 | 0 | 0 | Chip seal | 1974 |
| Pangborn Field (Wenatchee) | WA | R2 | 66 | 1988 | 0 | 0 | 0 | 0 | Chip seal | 1974 |
| Pangborn Field (Wenatchee) | WA | R4 | 55 | 1988 | 0 | 0 | 0 | 0 | | |
| Pangborn Field (Wenatchee) | WA | R5 | 90 | 1988 | 0 | 0 | 0 | 0 | | |
| Pearson Airpark (Vancouver) | WA | R1 | 58 | 1987 | 58 | 1991 | 0 | 0 | Chip seal | 1975 |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| Mansfield Airport | WA | R1 | 1973 | 1983 | | | base | 4 | | 0 | |
| Moses Lake Municipal Airport | WA | R1 | 1961 | 1984 | 2 | 2 | DBST | 0 | base | 6 | |
| Moses Lake Municipal Airport | WA | R2 | 1973 | 1973 | 0.75 | | | 0 | | 0 | |
| New Warden Airport | WA | R1 | 1977 | 1977 | 2 | | base | 6 | | 0 | Survey results are inconsistent. |
| Oak Harbor Air Park | WA | R1 | 1969 | 1971 | 2 | 2 | base | 3 | subbase | 7 | Twin engine commuter airport |
| Ocean Shores Airport | WA | R1 | 1985 | 1987 | 1 | 1 | DBST | 0 | base | 8 | 1" AC laid over existing DBST in 1987 |
| Odessa Municipal | WA | R1 | 1970 | 1985 | | | base | 6 | | 0 | |
| Odessa Municipal | WA | R2 | 1970 | 1985 | | | base | 3 | | 0 | |
| Okanagan Legion Airport | WA | R1 | 1955 | 1987 | | | base | 2 | | 0 | Low activity airport. Very soft ground in spring. |
| Olympia Airport | WA | R1 | 1942 | 1942 | 2.5 | | base | 6 | | 0 | |
| Olympia Airport | WA | R2 | 1980 | 1980 | 3 | | base | 10 | subbase | 6 | |
| Olympia Airport | WA | R3 | 1942 | 1980 | 5.5 | 3 | base | 6 | | 0 | 3" AC overlay applied in 1980 |
| Omak Airport | WA | R1 | 1943 | 1974 | 7 | 2.5 | | 0 | subbase | 12 | 2.5" AC overlay on 4.5" of AC in 1974 |
| Othello Municipal Airport | WA | R1 | 0 | 1976 | 2 | 2 | BST | 0 | base | 3 | 2" AC overlay over BST |
| Othello Municipal Airport | WA | R2 | 0 | 1991 | 3 | | base | 6 | | 0 | |
| Packwood Airport | WA | R1 | 1975 | 1985 | 2 | 2 | base | 2 | BST and gr | 0 | 2" new base and 2" new asphalt applied in 1985 |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Pierce County (Puyallup) | WA | R1 | 64 | 1986 | 98 | 1989 | 91 | 1992 | Reconstruc | 1988 | | | | |
| Port of Ilwaco Airport | WA | R1 | 71 | 1986 | 49 | 1989 | 36 | 1992 | | | | | | |
| Port of Willipa Harbor Airport | WA | R1 | 72 | 1986 | 58 | 1989 | 49 | 1992 | Reconstruc | 1971 | | | | |
| Port of Willipa Harbor Airport | WA | R2 | 68 | 1986 | 59 | 1989 | 46 | 1992 | Reconstruc | 1971 | | | | |
| Prosser Airport | WA | R1 | 88 | 1987 | 83 | 1992 | 0 | 0 | Reconstruc | 1977 | Chip seal | 1981 | Slurry seal | 1989 |
| Pru Field (Ritzville) | WA | R1 | 83 | 1987 | 77 | 1991 | 0 | 0 | Slurry seal | 1985 | | | | |
| Pullman-Moscow Regional Airpo | WA | R1 | 75 | 1986 | 70 | 1989 | 0 | 0 | Overlay | 1972 | Reconstruc | 1993 | | |
| Pullman-Moscow Regional Airpo | WA | R2 | 70 | 1986 | 48 | 1989 | 0 | 0 | Reconstruc | 1993 | | | | |
| Pullman-Moscow Regional Airpo | WA | R3 | 81 | 1986 | 68 | 1989 | 0 | 0 | Reconstruc | 1993 | | | | |
| Quillayute Airport | WA | R1 | 72 | 1986 | 69 | 1989 | 0 | 0 | | | | | | |
| Quincy Municipal Airport | WA | R1 | 72 | 1987 | 70 | 1991 | 0 | 0 | Slurry seal | 1980 | | | | |
| Quincy Municipal Airport | WA | R2 | 31 | 1987 | 0 | 0 | 0 | 0 | | | | | | |
| Richland Airport | WA | R1 | 86 | 1987 | 81 | 1992 | 0 | 0 | Overlay | 1979 | | | | |
| Richland Airport | WA | R2 | 94 | 1987 | 82 | 1992 | 0 | 0 | Overlay | 1979 | | | | |

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|---|---|---|---|---|---|---|---|---|---|---|
| Pangborn Field (Wenatchee) | WA | R2 | 1947 | 1974 | | AC | 3 | base | 8 | BST applied over existing asphalt |
| Pangborn Field (Wenatchee) | WA | R4 | 1947 | 1947 | 2 | base | 7 | | 0 | |
| Pangborn Field (Wenatchee) | WA | R5 | 1978 | 1978 | 3 | base | 6 | | 0 | |
| Pearson Airpark (Vancouver) | WA | R1 | 1966 | 1975 | | AC | 1.5 | | 0 | BST applied over existing asphalt |
| Pearson Airpark (Vancouver) | WA | R2 | 1966 | 1975 | | AC | 1.5 | | 0 | BST applied over existing asphalt |
| Pierce County (Puyallup) | WA | R1 | 1958 | 1988 | 2 | base | 4 | subbase | 6 | Very active GA airport |
| Port of Ilwaco Airport | WA | R1 | 1971 | 1971 | 1.5 | | 0 | | 0 | |
| Port of Willipa Harbor Airport | WA | R1 | 1948 | 1971 | 1 | base | 3 | subbase | 5 | |
| Port of Willipa Harbor Airport | WA | R2 | 1948 | 1971 | 1.25 | base | 3 | subbase | 7 | |
| Prosser Airport | WA | R1 | 1977 | 1989 | 2 | base | 6 | subbase | 1.5 | |
| Pru Field (Ritzville) | WA | R1 | 1978 | 1985 | | | 0 | | 0 | |
| Pullman-Moscow Regional Airpo | WA | R1 | 1948 | 1993 | 4 | base | 8 | subbase | 7 | Busy regional air carrier and GA. Totally reconstructed 1993. |
| Pullman-Moscow Regional Airpo | WA | R2 | 1968 | 1993 | 4 | base | 8 | subbase | 7 | Busy regional air carrier and GA. Totally reconstructed 1993. |
| Pullman-Moscow Regional Airpo | WA | R3 | 1968 | 1993 | 4 | base | 8 | subbase | 7 | Busy regional air carrier and GA. Totally reconstructed 1993. |
| Quillayute Airport | WA | R1 | 0 | 0 | 6 | | 0 | | 0 | |
| Quincy Municipal Airport | WA | R1 | 1977 | 1980 | | base | 3 | | 0 | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Richland Airport | WA | R3 | 96 | 1987 | 93 | 1992 | 0 | 0 | | | | |
| Rosalia Municipal Airport | WA | R1 | 68 | 1987 | 49 | 1991 | 0 | 0 | | | | |
| Sand Canyon (Cehwelah) Airpor | WA | R1 | 88 | 1986 | 70 | 1989 | 62 | 1993 | Overlay | 1979 | Slurry seal | 1985 |
| Sanderson Field (Shelton) | WA | R1 | 77 | 1988 | 72 | 1991 | 0 | 0 | Slurry seal | 1979 | | |
| Sekiu Airport | WA | R1 | 68 | 1988 | 61 | 1992 | 0 | 0 | Chip seal | 1987 | | |
| Sekiu Airport | WA | R2 | 88 | 1988 | 85 | 1992 | 0 | 0 | Chip seal | 1987 | | |
| Sequim Valley Airport | WA | R1 | 52 | 1988 | 42 | 1991 | 0 | 0 | | | | |
| Skagit Regional Airport | WA | R1 | 69 | 1986 | 0 | 0 | 0 | 0 | | | | |
| Skagit Regional Airport | WA | R2 | 64 | 1986 | 0 | 0 | 0 | 0 | | | | |
| Storm Field (Morton) | WA | R1 | 73 | 1988 | 68 | 1991 | 0 | 0 | TBST | 1987 | | |
| Sunnyside Airport | WA | R1 | 85 | 1987 | 80 | 1992 | 0 | 0 | Chip seal | 1985 | | |
| Tacoma Narrows Airport | WA | R1 | 84 | 1987 | 83 | 1991 | 0 | 0 | | | | |
| Tacoma Narrows Airport | WA | R2 | 82 | 1987 | 81 | 1991 | 0 | 0 | | | | |
| Walla Walla City/County Airport | WA | R1 | 81 | 1987 | 82 | 1992 | 0 | 0 | Overlay | 1970 | | |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| Richland Airport | WA | R1 | 1943 | 1979 | 4 | 2 | base | 6 | | 0 | 2" AC overlay over 2" AC |
| Richland Airport | WA | R2 | 1943 | 1979 | 4 | 2 | base | 8 | | 0 | 2" AC overlay over 2" AC |
| Richland Airport | WA | R3 | 1979 | 1979 | 3 | | base | 3 | subbase | 4 | |
| Rosalia Municipal Airport | WA | R1 | 1985 | 1985 | | | base | 3 | subbase | 3.5 | |
| Sand Canyon (Cehwelah) Airpor | WA | R1 | 1974 | 1985 | 1 | 1 | DBST | 0 | subbase | 12 | 1" AC applied over DBST in 1979 |
| Sanderson Field (Shelton) | WA | R1 | 1942 | 1979 | 2 | | base | 6 | | 0 | |
| Sekiu Airport | WA | R1 | 1972 | 1987 | 2 | | base | 6 | | 0 | Very low activity |
| Sekiu Airport | WA | R2 | 1979 | 1987 | 2 | | base | 6 | | 0 | Very low activity |
| Sequim Valley Airport | WA | R1 | 1985 | 1985 | | | base | 12 | | 0 | |
| Skagit Regional Airport | WA | R1 | 1942 | 1942 | 2 | | base | 4 | subbase | 6 | |
| Skagit Regional Airport | WA | R2 | 1942 | 1942 | 2 | | base | 4 | subbase | 12 | |
| Storm Field (Morton) | WA | R1 | 1970 | 1987 | | | | 0 | | 0 | |
| Sunnyside Airport | WA | R1 | 1975 | 1985 | 3 | | base | 6 | | 0 | |
| Tacoma Narrows Airport | WA | R1 | 0 | 0 | 2.5 | | base | 8 | subbase | 3 | |
| Tacoma Narrows Airport | WA | R2 | 0 | 0 | 2 | | base | 7 | subbase | 3 | |
| Walla Walla City/County Airport | WA | R1 | 1942 | 1972 | 1.5 | 1.5 | PCC | 6.5 | base | 6 | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Walla Walla City/County Airport | WA | R3 | 60 | 1987 | 48 | 1992 | 0 | 0 | | | | |
| Waterville Airport | WA | R1 | 65 | 1989 | 57 | 1993 | 0 | 0 | Slurry seal | 1988 | | |
| Whitman County Memorial Airpo | WA | R1 | 57 | 1986 | 40 | 1989 | 29 | 1993 | Slurry seal | 1981 | | |
| Wilbur Airport | WA | R1 | 92 | 1986 | 83 | 1989 | 75 | 1993 | Seal coat | 1983 | Overlay | 1985 |
| William R. Fairchild Int'l Airport | WA | R1 | 79 | 1988 | 0 | 0 | 0 | 0 | Overlay/slur | 1979 | | |
| William R. Fairchild Int'l Airport | WA | R2 | 86 | 1988 | 0 | 0 | 0 | 0 | Overlay/slur | 1979 | | |
| William R. Fairchild Int'l Airport | WA | R4 | 94 | 1988 | 0 | 0 | 0 | 0 | Overlay/slur | 1978 | | |
| Willard-Tekoa Field | WA | R1 | 90 | 1986 | 90 | 1989 | 85 | 1993 | Slurry seal | 1987 | | |
| Winlock (Toledo) Airport | WA | R1 | 49 | 1986 | 42 | 1989 | 36 | 1992 | | | | |
| Woodland State Airport | WA | R1 | 91 | 1987 | 88 | 1991 | 0 | 0 | | | | |
| Friday Harbor Airport | WA | R1 | 90 | 1988 | 0 | 0 | 0 | 0 | | | | |
| Godendale Airport | WA | R1 | 87 | 1989 | 89 | 1993 | 0 | 0 | Slurry seal | 1992 | | |
| Oroville Airport | WA | R1 | 79 | 1987 | 77 | 1992 | 0 | 0 | Chip seal | 1992 | | |
| [illegible] | WA | R1 | 73 | 1988 | 0 | 0 | 0 | 0 | | | | |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| Walla Walla City/County Airport | WA | R3 | 1942 | 1942 | 6.5 | | base | 6 | | 0 | |
| Waterville Airport | WA | R1 | 1976 | 1988 | | | base | 6 | | 0 | Small with low activity |
| Whitman County Memorial Airpo | WA | R1 | 1970 | 1981 | | | base | 6 | | 0 | |
| Wilbur Airport | WA | R1 | 1971 | 1985 | 2 | 2 | DBST | 0 | base | 6 | |
| William R. Fairchild Int'l Airport | WA | R1 | 1942 | 1979 | 4 | 2 | base | 6 | | 0 | 2" AC overlay applied over 2" AC |
| William R. Fairchild Int'l Airport | WA | R2 | 1942 | 1979 | 4 | 2 | base | 6 | | 0 | 2" AC overlay applied over 2" AC |
| William R. Fairchild Int'l Airport | WA | R4 | 1942 | 1978 | 4 | 2 | base | 6 | | 0 | 2" AC overlay applied over 2" AC |
| Willard-Tekoa Field | WA | R1 | 1975 | 1987 | 2 | | base | 4 | subbase | 12 | |
| Winlock (Toledo) Airport | WA | R1 | 1943 | 1943 | 2 | | base | 8 | | 0 | |
| Woodland State Airport | WA | R1 | 1984 | 1984 | | | | 0 | | 0 | |
| Friday Harbor Airport | WA | R1 | 0 | 0 | 2 | | base | 3 | subbase | 4 | |
| Godendale Airport | WA | R1 | 1984 | 1992 | | | base | 12 | | 0 | |
| Oroville Airport | WA | R1 | 1986 | 1992 | | | base | 6 | | 0 | |
| Wenthrop Airport | WA | R1 | 0 | 0 | 1 | | | 0 | | 0 | |
| Albany Municipal Airport | OR | R1 | 1959 | 1986 | 4 | 2 | base | 8 | | 0 | 2" AC overlay over 2" AC |
| Ashland Municipal Airport | OR | R1 | 1965 | 1986 | 3 | 2 | base | 4.5 | subbase | 3 | 2" AC overlay over 1" AC |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Albany Municipal Airport | OR | R1 | 99 | 1988 | 0 | 0 | 0 | 0 | Overlay | 1986 | | |
| Ashland Municipal Airport | OR | R1 | 91 | 1987 | 89 | 1991 | 0 | 0 | Overlay | 1986 | | |
| Ashland Municipal Airport | OR | R2 | 92 | 1987 | 88 | 1991 | 0 | 0 | | | | |
| Aurora State Airport | OR | R1 | 85 | 1986 | 81 | 1989 | 0 | 0 | Overlay | 1978 | | |
| Baker Municipal Airport | OR | R2 | 66 | 1986 | 0 | 0 | 0 | 0 | Seal coat | 1963 | | |
| Baker Municipal Airport | OR | R3 | 69 | 1986 | 66 | 1989 | 0 | 0 | Seal coat | 1963 | | |
| Baker Municipal Airport | OR | R4 | 88 | 1986 | 82 | 1989 | 0 | 0 | Reconstruc | 1983 | Fog Seal | 1984 |
| Bandon State Airport | OR | R1 | 72 | 1986 | 57 | 1989 | 0 | 0 | Chip seal | 1972 | | |
| Bend Municipal Airport | OR | R1 | 80 | 1986 | 79 | 1989 | 0 | 0 | | | | |
| Bend Municipal Airport | OR | R2 | 89 | 1986 | 79 | 1989 | 0 | 0 | | | | |
| Boardman Airport | OR | R1 | 57 | 1988 | 0 | 0 | 0 | 0 | Overlay | 1980 | | |
| Brookings State Airport | OR | R1 | 90 | 1986 | 88 | 1989 | 0 | 0 | | | | |
| Brookings State Airport | OR | R2 | 90 | 1986 | 91 | 1989 | 0 | 0 | | | | |
| Burns Municipal Airport | OR | R1 | 0 | | 0 | 0 | 0 | 0 | Reconstruc | 1987 | | |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| Aurora State Airport | OR | R1 | 1975 | 1978 | 5 | 2 | base | 2 | subbase | 13 | 2" AC overlay over 3" AC |
| Baker Municipal Airport | OR | R2 | 1942 | 1942 | 2.5 | | base | 15 | | 0 | R2 was not surveyed |
| Baker Municipal Airport | OR | R3 | 1942 | 1942 | 2.5 | | base | 15 | | 0 | |
| Baker Municipal Airport | OR | R4 | 1983 | 1983 | 2.5 | | base | 3 | subbase | 10 | Survey identified R4 and R5 separately, but are same structure. |
| Bandon State Airport | OR | R1 | 1966 | 1972 | 2 | | | 0 | | 0 | An overlay was scheduled for 1990. |
| Bend Municipal Airport | OR | R1 | 1977 | 1977 | 2 | | base | 9 | | 0 | |
| Bend Municipal Airport | OR | R2 | 1977 | 1984 | 2 | | base | 6 | | 0 | |
| Boardman Airport | OR | R1 | 1943 | 1980 | 3.5 | 1.5 | base | 2 | subbase | 8 | 1.5" AC overlay applied over 2" AC |
| Brookings State Airport | OR | R1 | 1968 | 1968 | 2.5 | | base | 4 | | 0 | |
| Brookings State Airport | OR | R2 | 1968 | 1968 | 1.5 | | base | 4 | | 0 | Rated higher due to survey inconsistencies. |
| Burns Municipal Airport | OR | R1 | 1942 | 1987 | 2 | 2 | comme | 0 | | 0 | 2" AC overlay, fabric, chip seal, 2" AC, 6" base, and 6" subbase. |
| Burns Municipal Airport | OR | R2 | 1942 | 1978 | 2 | | base | 6 | subbase | 6 | |
| Chiloquin State Airport | OR | R1 | 1961 | 1968 | 1.25 | | base | 4 | | 0 | |
| Christmas Valley Airport | OR | R1 | 1985 | 1985 | | | AC | 3 | 4 base/2 su | 0 | BST on top of 3" AC |
| Condon State Airport | OR | R1 | 1986 | 1986 | 5 | | base | 2 | | 0 | |
| Corvallis Municipal Airport | OR | R1 | 1942 | 1984 | 5.5 | 3 | base | 6 | subbase | 9 | 3" AC overlay applied over 2.5" AC |

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|---|---|---|---|---|---|---|---|---|---|---|
| Chiloquin State Airport | OR | R1 | 25 | 1987 | 0 | 0 | 0 | 0 | Seal coat | 1968 |
| Christmas Valley Airport | OR | R1 | 90 | 1987 | 86 | 1991 | 0 | 0 | | |
| Condon State Airport | OR | R1 | 94 | 1987 | 78 | 1991 | 0 | 0 | | |
| Corvallis Municipal Airport | OR | R1 | 93 | 1988 | 0 | 0 | 0 | 0 | Overlay | 1984 |
| Corvallis Municipal Airport | OR | R2 | 55 | 1988 | 0 | 0 | 0 | 0 | | |
| Cottage Grove Airport | OR | R1 | 83 | 1988 | 0 | 0 | 0 | 0 | | |
| Cottage Grove Airport | OR | R2 | 85 | 1988 | 0 | 0 | 0 | 0 | | |
| County Squire Airpark | OR | R1 | 70 | 1988 | 0 | 0 | 0 | 0 | | |
| Creswell Municipal Airport | OR | R1 | 98 | 1988 | 0 | 0 | 0 | 0 | | |
| Florence Municipal Airport | OR | R1 | 95 | 1988 | 0 | 0 | 0 | 0 | Reconstruc | 1985 |
| Gold Beach Municipal Airport | OR | R1 | 90 | 1986 | 88 | 1989 | 0 | 0 | | |
| Hermiston Municipal Airport | OR | R1 | 80 | 1988 | 0 | 0 | 0 | 0 | Overlay | 1977 |
| Hermiston Municipal Airport | OR | R2 | 87 | 1988 | 0 | 0 | 0 | 0 | | |
| Hood River Airport | OR | R1 | 96 | 1987 | 92 | 1991 | 0 | 0 | | |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Cottage Grove Airport | OR | R1 | 1966 | 1966 | 1.5 | | base | 7 | | 0 | |
| Cottage Grove Airport | OR | R2 | 1970 | 1970 | 1.5 | | base | 7 | | 0 | |
| County Squire Airpark | OR | R1 | 1976 | 1976 | 2 | | base | 6 | | 0 | |
| Creswell Municipal Airport | OR | R1 | 1987 | 1987 | 2 | | base | 4 | subbase | 12 | |
| Florence Municipal Airport | OR | R1 | 1968 | 1985 | 2 | | base | 6 | | 0 | |
| Gold Beach Municipal Airport | OR | R1 | 1964 | 1964 | 1 | | base | 6 | | 0 | |
| Hermiston Municipal Airport | OR | R1 | 1959 | 1977 | 3.5 | 2 | base | 3.5 | | 0 | 2" AC overlay applied over 1.5" AC |
| Hermiston Municipal Airport | OR | R2 | 1977 | 1977 | 3 | | base | 6 | | 0 | |
| Hood River Airport | OR | R1 | 1986 | 1986 | 2 | | base | 9 | | 0 | |
| Hood River Airport | OR | R2 | 1986 | 1986 | 2 | | base | 13 | | 0 | |
| Hood River Airport | OR | R3 | 1986 | 1986 | 2 | | base | 6 | | 0 | |
| Independence State Airport | OR | R1 | 1974 | 1974 | 2 | | base | 2 | subbase | 6 | |
| Illinois Valley Airport | OR | R1 | 1953 | 1977 | 2 | 2 | BST | 0 | 4 base/6 su | 0 | 2" AC overlay applied over BST |
| Illinois Valley Airport | OR | R2 | 1960 | 1960 | 3 | | | 0 | | 0 | |
| John Day State Airport | OR | R1 | 1962 | 1962 | 2 | | base | 9 | | 0 | |
| John Day State Airport | OR | R3 | 1982 | 1982 | 2 | | base | 4 | subbase | 9 | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Hood River Airport | OR | R2 | 95 | 1987 | 90 | 1991 | 0 | 0 | | |
| Hood River Airport | OR | R3 | 91 | 1987 | 91 | 1991 | 0 | 0 | | |
| Independence State Airport | OR | R1 | 91 | 1986 | 88 | 1989 | 0 | 0 | | |
| Illinois Valley Airport | OR | R1 | 87 | 1987 | 83 | 1991 | 0 | 0 | Overlay | 1977 |
| Illinois Valley Airport | OR | R2 | 93 | 1987 | 91 | 1991 | 0 | 0 | | |
| John Day State Airport | OR | R1 | 68 | 1986 | 71 | 1989 | 0 | 0 | | |
| John Day State Airport | OR | R3 | 93 | 1986 | 92 | 1989 | 0 | 0 | | |
| Josephine State/County Airport | OR | R1 | 72 | 1986 | 81 | 1991 | 0 | 0 | | |
| La Grande Municipal Airport | OR | R1 | 51 | 1986 | 54 | 1989 | 0 | 0 | | |
| La Grande Municipal Airport | OR | R2 | 72 | 1986 | 68 | 1989 | 0 | 0 | Overlay | 1974 |
| La Grande Municipal Airport | OR | R3 | 88 | 1986 | 78 | 1989 | 0 | 0 | | |
| Lake County Airport | OR | R1 | 71 | 1987 | 68 | 1991 | 0 | 0 | Overlay | 1985 |
| Lexington Airport | OR | R1 | 69 | 1987 | 88 | 1991 | 0 | 0 | | |
| Lebanon State Airport | OR | R1 | 88 | 1988 | 0 | 0 | 0 | 0 | Overlay | |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| La Grande Municipal Airport | OR | R1 | 1942 | 1942 | 2 | | base | 4 | subbase | 4.5 | Survey results are inconsistent |
| La Grande Municipal Airport | OR | R2 | 1942 | 1974 | 6 | 4 | base | 4 | subbase | 4.5 | 4" AC overlay over 2" AC |
| La Grande Municipal Airport | OR | R3 | 1974 | 1984 | 2 | | base | 6 | subbase | 4.5 | Portion of R1 with different specs |
| Lake County Airport | OR | R1 | 1943 | 1975 | 3.75 | 1.75 | base | 11 | subbase | 4.5 | 1.75" AC overlay applied over 2" AC and slurry sealed |
| Lexington Airport | OR | R1 | 1965 | 1965 | | | base | 4 | subbase | 10 | Survey results are inconsistent |
| Lebanon State Airport | OR | R1 | 0 | 0 | 3.5 | 1.5 | base | 6 | | 0 | 1.5" AC overlay applied over 2" AC |
| Lebanon State Airport | OR | R2 | 1972 | 1972 | 2 | | base | 6.5 | | 0 | |
| Madras City/County Airport | OR | R1 | 1943 | 1977 | 4 | 2 | base | 7.5 | subbase | 9 | 2" AC overlay applied over 2" AC. Survey results are inconsistent. |
| Madras City/County Airport | OR | R2 | 1943 | 1943 | 2 | | base | 4 | subbase | 10 | Survey results are inconsistent. |
| Madras City/County Airport | OR | R3 | 1943 | 1943 | 9.5 | | | 0 | | 0 | |
| Madras City/County Airport | OR | R4 | 1943 | 1943 | 3 | | base | 6 | subbase | 10 | |
| McDermitt State Airport | OR | R1 | 1965 | 1965 | 2 | | base | 3 | subbase | 7 | Climate related problems. Very low activity. |
| McMinnville Municipal Airport | OR | R1 | 1943 | 1943 | 2 | | base | 6 | subbase | 8 | |
| McMinnville Municipal Airport | OR | R2 | 1943 | 1980 | 2 | | base | 6 | subbase | 10 | |
| NewHalam Bay State Airport | OR | R1 | 1965 | 1979 | | | base | 6 | | 0 | TBST applied over old BST surface |
| North Bend Municipal Airport | OR | R1 | 1943 | 1977 | 5 | 2 | base | 6 | subbase | 4.5 | 2" AC overlay applied over 3" AC and BST |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Madras City/County Airport | OR | R1 | 84 | 1986 | 95 | 1991 | 0 | 0 | Overlay | 1977 |
| Madras City/County Airport | OR | R2 | 16 | 1986 | 98 | 1991 | 0 | 0 | | |
| Madras City/County Airport | OR | R3 | 46 | 1986 | 0 | 0 | 0 | 0 | | |
| Madras City/County Airport | OR | R4 | 39 | 1986 | 0 | 0 | 0 | 0 | | |
| McDermitt State Airport | OR | R1 | 96 | 1986 | 76 | 1989 | 0 | 0 | | |
| McMinnville Municipal Airport | OR | R1 | 56 | 1988 | 0 | 0 | 0 | 0 | | |
| McMinnville Municipal Airport | OR | R2 | 61 | 1988 | 0 | 0 | 0 | 0 | Slurry seal | 1980 |
| NewHalam Bay State Airport | OR | R1 | 80 | 1987 | 77 | 1991 | 0 | 0 | TBST | 1979 |
| North Bend Municipal Airport | OR | R1 | 90 | 1988 | 0 | 0 | 0 | 0 | Overlay | 1977 |
| North Bend Municipal Airport | OR | R2 | 88 | 1988 | 0 | 0 | 0 | 0 | Overlay | 1977 |
| North Bend Municipal Airport | OR | R2A | 90 | 1988 | 0 | 0 | 0 | 0 | Overlay | 1977 |
| North Bend Municipal Airport | OR | R3 | 75 | 1988 | 0 | 0 | 0 | 0 | Chip seal | 1952 |
| Oakridge State Airport | OR | R1 | 70 | 1991 | 0 | 0 | 0 | 0 | | |
| Ontario Municipal Airport | OR | R1 | 84 | 1986 | 70 | 1989 | 0 | 0 | Reconstruc | 1977 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| North Bend Municipal Airport | OR | R2A | 1943 | 1977 | 4.25 | 2 | base | 6.25 | subbase | 4 | 2" AC overlay applied over 2.25" AC and BST |
| North Bend Municipal Airport | OR | R3 | 1943 | 1952 | | | AC | 3 | 5.5 base/4 | 0 | BST applied over 3" AC |
| Oakridge State Airport | OR | R1 | 0 | 0 | | | BST | 0 | subbase | 5 | TBST applied over existing BST |
| Ontario Municipal Airport | OR | R1 | 1977 | 1977 | 2 | | base | 6 | subbase | 6 | |
| Oregon City Airpark | OR | R1 | 1972 | 1972 | 1 | | | 0 | | 0 | |
| Pacific City/State Airport | OR | R1 | 1950 | 1950 | 2 | | base | 4 | | 0 | |
| Pinehurst State Airport | OR | R1 | 1956 | 1985 | 1 | 1 | BST | 0 | | 0 | 1" AC overlay applied over BST |
| Pendleton Municipal Airport | OR | R1 | 1942 | 1974 | 10 | 7 | base | 7 | subbase | 6 | 7" AC overlay applied over 3" AC |
| Pendleton Municipal Airport | OR | R2 | 1942 | 1974 | 9 | 7 | base | 8 | | 0 | 7" AC overlay applied over 3" AC |
| Pendleton Municipal Airport | OR | R3 | 1942 | 1978 | 5 | 3 | base | 8 | | 0 | 3" AC overlay applied over 2" AC |
| Pendleton Municipal Airport | OR | R4 | 1942 | 1978 | 7.5 | 5.5 | base | 8 | | 0 | 5.5" AC overlay applied over 2" AC |
| Pendleton Municipal Airport | OR | R5 | 1942 | 1978 | 12 | 10 | base | 5 | | 0 | 10" AC overlay applied over 2" AC |
| Pendleton Municipal Airport | OR | R6 | 1942 | | | | AC | 2 | base | 8 | BST applied over 2" AC |
| Prineville Airport | OR | R1 | 1979 | 1979 | 2 | | base | 3 | subbase | 3.5 | |
| Prineville Airport | OR | R2 | 1979 | 1979 | 2 | | base | 6 | | 0 | |
| Prineville Airport | OR | R3 | 1979 | 1979 | | | base | 6 | | 0 | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Oregon City Airpark | OR | R1 | 45 | 1988 | 0 | 0 | 0 | 0 | | |
| Pacific City/State Airport | OR | R1 | 79 | 1987 | 75 | 1991 | 0 | 0 | | |
| Pinehurst State Airport | OR | R1 | 83 | 1987 | 76 | 1991 | 0 | 0 | Overlay | 1985 |
| Pendleton Municipal Airport | OR | R1 | 98 | 1988 | 0 | 0 | 0 | 0 | Overlay | 1974 |
| Pendleton Municipal Airport | OR | R2 | 97 | 1988 | 0 | 0 | 0 | 0 | Overlay | 1974 |
| Pendleton Municipal Airport | OR | R3 | 82 | 1988 | 0 | 0 | 0 | 0 | Overlay | 1978 |
| Pendleton Municipal Airport | OR | R4 | 66 | 1988 | 0 | 0 | 0 | 0 | Overlay | 1978 |
| Pendleton Municipal Airport | OR | R5 | 87 | 1988 | 0 | 0 | 0 | 0 | Overlay | 1978 |
| Pendleton Municipal Airport | OR | R6 | 61 | 1988 | 0 | 0 | 0 | 0 | Chip seal | |
| Prineville Airport | OR | R1 | 87 | 1986 | 83 | 1989 | 0 | 0 | | |
| Prineville Airport | OR | R2 | 86 | 1986 | 85 | 1989 | 0 | 0 | | |
| Prineville Airport | OR | R3 | 39 | 1986 | 31 | 1989 | 0 | 0 | | |
| Port of Astoria Airport | OR | R1 | 87 | 1987 | 79 | 1991 | 0 | 0 | Overlay | 1980 |
| Port of Astoria Airport | OR | R1A | 77 | 1987 | 68 | 1991 | 0 | 0 | Overlay | 1980 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Port of Astoria Airport | OR | R1A | 1944 | 1980 | 0.75 | 0.75 | PCC | 9 | subbase | 9 | .75" AC overlay applied over 6-9" PCC base |
| Port of Astoria Airport | OR | R2 | 1944 | 1944 | 2.5 | | base | 13 | | 0 | Survey results are inconsistent. |
| Roberts Field/Redmond Airport | OR | R1 | 1975 | 1975 | 4 | | base | 7 | subbase | 17 | |
| Roberts Field/Redmond Airport | OR | R2 | 0 | 0 | 3 | | base | 2 | subbase | 10 | |
| Prospect State Airport | OR | R1 | 1962 | 1986 | | | BST | 0 | base | 6 | Survey results are inconsistent. |
| Roseburg Municipal Airport | OR | R1 | 1951 | 1986 | 2 | | base | 6 | subbase | 6 | |
| Scappoose Industrial Airport | OR | R1 | 1943 | 1986 | 2 | | base | 6 | subbase | 12 | |
| Seaside State Airport | OR | R1 | 1964 | 1964 | 1.75 | | base | 6 | | 0 | |
| Siletz Bay State Airport | OR | R1 | 1971 | 1971 | 1.5 | | base | 4.5 | subbase | 5 | |
| Sportsman Airpark, Newberg | OR | R1 | 1965 | 1965 | 2 | | base | 4 | subbase | 10 | |
| Newport Municipal Airport | OR | R1 | 1944 | 1944 | 5 | 3 | base | 6 | subbase | 9 | 3" AC overlay applied over 2" AC |
| Newport Municipal Airport | OR | R2 | 1944 | 1984 | 2 | | base | 6 | subbase | 9 | |
| Newport Municipal Airport | OR | R3 | 1944 | 1944 | 4 | | base | 6 | subbase | 5 | |
| Sunriver Airport | OR | R1 | 1970 | 1985 | 2 | 2 | DBST | 0 | base | 14 | |
| Sutherlin Municipal Airport | OR | R1 | 1971 | 1971 | 2 | | base | 12 | | 0 | |
| The Dalles Municipal Airport | OR | R1 | 1943 | 1965 | 2.25 | | base | 6.75 | | 0 | |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Roberts Field/Redmond Airport | OR | R1 | 88 | 1986 | 0 | 0 | 0 | 0 | PFC | 1981 | | |
| Roberts Field/Redmond Airport | OR | R2 | 92 | 1986 | 0 | 0 | 0 | 0 | | | | |
| Prospect State Airport | OR | R1 | 54 | 1987 | 68 | 1991 | 0 | 0 | DBST | 1986 | | |
| Roseburg Municipal Airport | OR | R1 | 77 | 1987 | 57 | 1991 | 0 | 0 | Slurry seal | 1986 | | |
| Scappoose Industrial Airport | OR | R1 | 65 | 1987 | 64 | 1991 | 0 | 0 | Slurry seal | 1986 | | |
| Seaside State Airport | OR | R1 | 88 | 1987 | 83 | 1991 | 0 | 0 | | | | |
| Siletz Bay State Airport | OR | R1 | 80 | 1988 | 0 | 0 | 0 | 0 | | | | |
| Sportsman Airpark, Newberg | OR | R1 | 57 | 1986 | 0 | 0 | 0 | 0 | | | | |
| Newport Municipal Airport | OR | R1 | 91 | 1988 | 0 | 0 | 0 | 0 | Overlay | 1984 | | |
| Newport Municipal Airport | OR | R2 | 69 | 1988 | 0 | 0 | 0 | 0 | Slurry seal | 1984 | | |
| Newport Municipal Airport | OR | R3 | 74 | 1988 | 0 | 0 | 0 | 0 | | | | |
| Sunriver Airport | OR | R1 | 92 | 1986 | 79 | 1989 | 0 | 0 | Seal coat | 1973 | Overlay | 1985 |
| Sutherlin Municipal Airport | OR | R1 | 90 | 1987 | 0 | 0 | 0 | 0 | | | | |
| The Dalles Municipal Airport | OR | R1 | 79 | 1988 | 0 | 0 | 0 | 0 | Slurry seal | 1965 | | |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| The Dalles Municipal Airport | OR | R3 | 1943 | 1943 | 2.25 | | base | 6.75 | | 0 | |
| Tillamook Airport | OR | R1 | 1943 | 1983 | 3.5 | 1.5 | base | 6 | subbase | 10 | 1.5" AC overlay over 2" AC |
| Tillamook Airport | OR | R2 | 1943 | 1983 | 2 | | base | 6 | subbase | 10 | BST applied over 2" AC.Survey results are inconsistent. |
| Tri-city State Airport | OR | R1 | 1970 | 0 | 1.5 | | base | 6 | | | BST applied over 1.5" AC |
| Wasco State Airport | OR | R1 | 1987 | 1987 | | | base | 4 | subbase | 6 | |
| Arco (Butte County) Airport | ID | R1 | 1979 | 1990 | 2 | | base | 4 | subbase | 4 | |
| Bear Lake County Airport | ID | R1 | 1942 | 1942 | 2 | | base | 6 | subbase | 10 | |
| Bear Lake County Airport | ID | R2 | 1984 | 1984 | 2 | | base | 2 | subbase | 4 | |
| Buhl Municipal Airport | ID | R1 | 1983 | 1992 | 2 | | base | 4 | subbase | 6 | Crack and fog sealed in 1992. |
| Burley Municipal Airport | ID | R1 | 0 | 1992 | 4.5 | 2 | base | 12 | | 0 | Overlayed w/2" AC in 1980, and 2" AC in 1992 |
| Burley Municipal Airport | ID | R2 | 0 | 1992 | 4.2 | | base | 10 | | 0 | |
| Caldwell Airport | ID | R1 | 1975 | 1987 | 2 | | base | 8 | subbase | 12 | Runway reconstructed in 1987 |
| Caldwell Airport | ID | R2 | 1975 | 1987 | 2 | | base | 8 | subbase | 12 | Runway combined w/R1 in 1987 when reconstructed |
| Challis Airport | ID | R1 | 1973 | 1991 | 2 | 2 | BST | 0 | base | 6 | Overlayed w/2" AC in 1986. Slurry sealed in 1991. Fog sealed in 1977/1986. |
| Coeur D'alene Air Terminal | ID | R1 | 0 | 1973 | 5 | 3 | base | 6 | | 0 | 3" AC overlay over 2" AC |
| Coeur D'alene Air Terminal | ID | R2 | 0 | 1973 | 5 | 3 | base | 6 | | 0 | 3" AC overlay over 2" AC |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| The Dalles Municipal Airport | OR | R2 | 79 | 1988 | 0 | 0 | 0 | 0 | | | | |
| The Dalles Municipal Airport | OR | R3 | 79 | 1988 | 0 | 0 | 0 | 0 | | | | |
| Tillamook Airport | OR | R1 | 92 | 1987 | 89 | 1991 | 0 | 0 | Overlay | 1983 | | |
| Tillamook Airport | OR | R2 | 77 | 1987 | 100 | 1991 | 0 | 0 | Chip seal | 1983 | | |
| Tri-city State Airport | OR | R1 | 88 | 1987 | 77 | 1991 | 0 | 0 | Chip seal | | | |
| Wasco State Airport | OR | R1 | 87 | 1987 | 0 | 0 | 0 | 0 | | | | |
| Arco (Butte County) Airport | ID | R1 | 66 | 1986 | 84 | 1993 | 0 | 0 | Reconstruc | 1990 | | |
| Bear Lake County Airport | ID | R1 | 27 | 1986 | 2 | 1993 | 0 | 0 | | | | |
| Bear Lake County Airport | ID | R2 | 96 | 1986 | 57 | 1993 | 0 | 0 | Fog seal | | | |
| Buhl Municipal Airport | ID | R1 | 69 | 1986 | 84 | 1994 | 0 | 0 | Slurry seal | 1992 | | |
| Burley Municipal Airport | ID | R1 | 67 | 1986 | 94 | 1993 | 0 | 0 | Overlay | 1980 | Overlay | 1992 |
| Burley Municipal Airport | ID | R2 | 56 | 1986 | 90 | 1993 | 0 | 0 | Overlay | 1992 | | |
| Caldwell Airport | ID | R1 | 94 | 1986 | 88 | 1994 | 0 | 0 | Slurry seal | 1986 | Reconstruc | 1987 |
| Caldwell Airport | ID | R2 | 100 | 1986 | 0 | 0 | 0 | 0 | Slurry seal | 1986 | Reconstruc | 1987 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Coeur D'alene Air Terminal | ID | R4 | 0 | 1973 | 3 | | base | 8 | | 0 | |
| Craigmont Municipal Airport | ID | R1 | 1975 | 1975 | 1 | | base | 5 | subbase | 10 | BST applied over 1" AC, 5" base, and 10" subbase. Crack sealed. |
| Driggs Municipal Airport | ID | R1 | 1975 | 1991 | 4 | 2 | base | 4 | subbase | 6 | Overlayed w/2" AC over 2" AC. Part 2 reconstructed w/4" AC and 4" base. |
| Gooding Municipal Airport | ID | R1 | 1978 | 1989 | 2 | | base | 8 | | 0 | |
| Grangeville (Idaho Co.) Airport | ID | R1 | 1965 | 1988 | 5 | | base | 12 | subbase | 12 | Crack sealed |
| Grangeville (Idaho Co.) Airport | ID | R2 | 1983 | 1988 | 4 | | base | 18 | | 0 | |
| Grangeville (Idaho Co.) Airport | ID | R3 | 1983 | 1988 | 4 | | base | 18 | | 0 | |
| Jerome County Airport | ID | R1 | 0 | 1975 | | | | 0 | | 0 | BST applied over 7.5" AC, 3.5" base. R1 no longer valid at 1994 survey. |
| Jerome County Airport | ID | R2 | 1981 | 1987 | 2 | | base | 4 | subbase | 6 | |
| Kellogg (Shoshone Co.) Airport | ID | R1 | 0 | 1980 | 2 | 1 | base | 4 | subbase | 24 | Overlayed with 1" AC over 1" AC in 1980 |
| Kellogg (Shoshone Co.) Airport | ID | R2 | 0 | 1980 | 2 | 1 | base | 4 | subbase | 24 | Overlayed with 1" AC over 1" AC in 1980 |
| Kellogg (Shoshone Co.) Airport | ID | R3 | 0 | 1983 | 1.5 | | base | 5 | | 0 | |
| Kellogg (Shoshone Co.) Airport | ID | R4 | 0 | 1980 | 4 | 3 | base | 5 | subbase | 24 | Overlayed with 3" AC over 1" AC in 1980 |
| Kellogg (Shoshone Co.) Airport | ID | R5 | 0 | 1980 | 4 | 3 | base | 4 | subbase | 24 | Overlayed with 3" AC over 1" AC in 1980 |
| McCall Municipal Airport | ID | R1 | 1974 | 1990 | 6.5 | 3.5 | base | 6 | | 0 | Overlayed with 3.5" AC over 3" AC in 1990 |
| Mountain Home Municipal Airpor | ID | R1 | 1973 | 1993 | 4 | 2 | base | 7.5 | subbase | 8 | Overlayed with 2" AC over 2" AC |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Coeur D'alene Air Terminal | ID | R1 | 77 | 1986 | 0 | 0 | 0 | 0 | Overlay/Slu | 1973 | | |
| Coeur D'alene Air Terminal | ID | R2 | 79 | 1986 | 0 | 0 | 0 | 0 | Overlay/Slu | 1973 | | |
| Coeur D'alene Air Terminal | ID | R3 | 79 | 1986 | 0 | 0 | 0 | 0 | Overlay/Slu | 1973 | | |
| Coeur D'alene Air Terminal | ID | R4 | 89 | 1986 | 0 | 0 | 0 | 0 | Slurry seal | 1973 | | |
| Craigmont Municipal Airport | ID | R1 | 57 | 1986 | 56 | 1995 | 0 | 0 | Fog seal | 1987 | | |
| Driggs Municipal Airport | ID | R1 | 81 | 1986 | 98 | 1993 | 0 | 0 | Overlay | 1991 | | |
| Gooding Municipal Airport | ID | R1 | 86 | 1986 | 77 | 1994 | 0 | 0 | Slurry seal | 1985 | Slurry seal | 1989 |
| Grangeville (Idaho Co.) Airport | ID | R1 | 71 | 1986 | 78 | 1995 | 0 | 0 | Overlay | 1983 | Slurry seal | 1988 |
| Grangeville (Idaho Co.) Airport | ID | R2 | 73 | 1986 | 82 | 1988 | 0 | 0 | Slurry seal | 1988 | | |
| Grangeville (Idaho Co.) Airport | ID | R3 | 73 | 1986 | 79 | 1995 | 0 | 0 | Slurry seal | 1988 | | |
| Jerome County Airport | ID | R1 | 65 | 1986 | 0 | 0 | 0 | 0 | | | | |
| Jerome County Airport | ID | R2 | 90 | 1986 | 82 | 1994 | 0 | 0 | Slurry seal | 1987 | Fog seal | 1991 |
| Kellogg (Shoshone Co.) Airport | ID | R1 | 94 | 1986 | 62 | 1995 | 0 | 0 | Overlay | 1980 | | |
| Kellogg (Shoshone Co.) Airport | ID | R2 | 94 | 1986 | 60 | 1995 | 0 | 0 | Overlay | 1980 | | |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Orofino Municipal Airport | ID | R1 | 1969 | 1980 | 2 | | base | 4 | subbase | 4 | Crack sealed. |
| Priest River Municipal Airport | ID | R1 | 1975 | 1980 | 2.5 | | base | 6 | | 0 | |
| Rexburg (Madison County) Airp | ID | R1 | 1972 | 1991 | 4 | | base | 6 | subbase | 6 | Runway reconstructed with 4" AC in 1991. |
| Rexburg (Madison County) Airp | ID | R3 | 1977 | 1991 | 4 | | base | 6 | subbase | 6 | Runway reconstructed with 4" AC in 1991. |
| Rexburg (Madison County) Airp | ID | R4 | 1977 | 1977 | 2.5 | | base | 8 | subbase | 12 | Runway no longer applicable after reconstruction of R1 and R3 in1991. |
| St. Maries Municipal Airport | ID | R1 | 1978 | 1987 | 3.5 | 2 | base | 11 | | 0 | Runway overlayed w/2" AC over 1.5" AC in 1987. 3 New runway sections were built in 1987. |
| Sandpoint Airport | ID | R1 | 1952 | 1988 | 2 | | base | 10 | subbase | 3 | Runway reconstructed w/2" AC in 1988. |
| Sandpoint Airport | ID | R2 | 0 | 0 | 2 | | | 0 | | 0 | No longer valid after R1 reconstruction. |
| Soda Springs Airport | ID | R1 | 1969 | 1992 | 4.5 | 2 | base | 0 | | 0 | Overlayed with 2" AC over 2.5" AC. |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Kellogg (Shoshone Co.) Airport | ID | R3 | 40 | 1986 | 22 | 1995 | 0 | 0 | Slurry seal | 1983 | | |
| Kellogg (Shoshone Co.) Airport | ID | R4 | 96 | 1986 | 82 | 1995 | 0 | 0 | Overlay | 1980 | | |
| Kellogg (Shoshone Co.) Airport | ID | R5 | 93 | 1986 | 80 | 1995 | 0 | 0 | Overlay | 1980 | | |
| McCall Municipal Airport | ID | R1 | 87 | 1986 | 82 | 1993 | 0 | 0 | Slurry seal | 1985 | Overlay | 1990 |
| Mountain Home Municipal Airpor | ID | R1 | 70 | 1986 | 93 | 1993 | 0 | 0 | Overlay | 1993 | | |
| Nampa Municipal Airport | ID | R1 | 91 | 1986 | 48 | 1994 | 0 | 0 | Fog seal | 1982 | Slurry seal | 1985 |
| Orofino Municipal Airport | ID | R1 | 81 | 1986 | 59 | 1995 | 0 | 0 | Slurry seal | 1980 | | |
| Priest River Municipal Airport | ID | R1 | 86 | 1986 | 27 | 1995 | 0 | 0 | Slurry seal | 1980 | | |
| Rexburg (Madison County) Airp | ID | R1 | 63 | 1986 | 99 | 1991 | 0 | 0 | Reconstruc | 1991 | | |
| Rexburg (Madison County) Airp | ID | R3 | 71 | 1986 | 99 | 1991 | 0 | 0 | Reconstruc | 1991 | | |
| Rexburg (Madison County) Airp | ID | R4 | 61 | 1986 | 0 | 0 | 0 | 0 | Slurry seal | | | |
| St. Maries Municipal Airport | ID | R1 | 59 | 1986 | 67 | 1995 | 0 | 0 | Overlayed | 1987 | | |
| Sandpoint Airport | ID | R1 | 24 | 1986 | 83 | 1995 | 0 | 0 | Reconstruc | 1988 | | |
| Sandpoint Airport | ID | R2 | 45 | 1986 | 0 | 0 | 0 | 0 | | | | |

# APPENDIX F

***Modeling Equation Summary***

| Evaluation Category | Sub Category | Regression Category | $R^2$ | T-ratio | SEE | b0 | b1 | Mean Square | RMSE |
|---|---|---|---|---|---|---|---|---|---|
| **Less 3 inches AC & Less 8 inches base** | All | **Linear** | **28.2** | **4.06** | **17.630** | **94.0** | **0.9950** | **310.8298** | **17.63** |
| | | **Logarithmic** | **36.6** | **4.93** | **16.570** | **78.1** | **1.3900** | **274.4663** | **16.57** |
| | | Power | 23.2 | 3.56 | 0.318 | 73.8 | 0.0190 | 0.1010565 | 0.32 |
| | | Exponential | 18.0 | 3.04 | 0.328 | 92.1 | 0.0140 | 0.10789372 | 0.33 |
| | | **Power = 1.25** | **23.1** | | | **92.0** | **0.3840** | **332.9953** | **18.25** |
| | | Power = 1.5 | 18.6 | | | 90.4 | 0.1450 | 352.55767 | 18.78 |
| | | Power = 1.75 | 14.8 | | | 89.0 | 0.0540 | 369.04362 | 19.21 |
| | | Power = 2 | 11.7 | | | 88.0 | 0.0200 | 382.49788 | 19.56 |
| | | Power = 2.25 | 9.2 | | | 87.1 | 0.0070 | 393.22315 | 19.83 |
| | | Power = 2.5 | 7.2 | | | 86.4 | 0.0030 | 401.62922 | 20.04 |
| | | Power = 2.75 | 5.7 | | | 85.8 | 0.0010 | 408.14181 | 20.20 |
| | | Power = 3 | 4.6 | | | 85.4 | 0.0003 | 413.15198 | 20.33 |
| | WA | **Linear** | **60.7** | **5.13** | **17.470** | **100.4** | **2.3800** | **305.2892** | **17.47** |
| | | Logarithmic | 44.3 | 3.68 | 20.800 | 68.4 | 2.0100 | 432.6021 | 20.80 |
| | | Power | 31.1 | 2.77 | 0.421 | 61.8 | 0.0310 | 0.1776097 | 0.42 |
| | | Exponential | 43.6 | 3.62 | 0.381 | 101.1 | 0.0370 | 0.1453555 | 0.38 |
| | | **Power = 1.25** | **60.5** | | | **99.2** | **1.1200** | **306.78992** | **17.52** |
| | | Power = 1.5 | 59.7 | | | 98.0 | 0.5200 | 313.40365 | 17.70 |
| | | Power = 1.75 | 58.3 | | | 96.9 | 0.2400 | 323.67612 | 17.99 |
| | | Power = 2 | 56.7 | | | 95.7 | 0.1100 | 336.57137 | 18.35 |
| | | Power = 2.25 | 54.8 | | | 94.6 | 0.0500 | 351.28946 | 18.74 |
| | | Power = 2.5 | 52.7 | | | 93.5 | 0.0230 | 367.19658 | 19.16 |
| | | Power = 2.75 | 50.6 | | | 92.5 | 0.0100 | 383.79066 | 19.59 |
| | | Power = 3 | 48.4 | | | 91.4 | 0.0050 | 400.67841 | 20.02 |
| | OR | **Linear** | **54.7** | **4.79** | **5.620** | **95.6** | **0.4610** | **31.63643** | **5.62** |
| | | **Logarithmic** | **80.2** | **8.76** | **3.720** | **87.1** | **0.8030** | **13.8635** | **3.72** |
| | | Power | 76.9 | 7.95 | 0.045 | 86.8 | 0.0090 | 0.0020185 | 0.04 |
| | | Exponential | 55.0 | 4.82 | 0.063 | 95.5 | 0.0050 | 0.00392762 | 0.06 |
| | | **Power = 1.25** | **50.3** | | | **94.9** | **0.1820** | **34.76425** | **5.90** |
| | | Power = 1.5 | 47.1 | | | 94.3 | 0.0720 | 36.96883 | 6.08 |
| | | Power = 1.75 | 44.8 | | | 93.9 | 0.0290 | 38.5802 | 6.21 |
| | | Power = 2 | 43.0 | | | 93.5 | 0.0110 | 39.82067 | 6.31 |
| | | Power = 2.25 | 41.6 | | | 93.2 | 0.0050 | 40.82989 | 6.39 |
| | | Power = 2.5 | 40.4 | | | 93.0 | 0.0020 | 41.69195 | 6.46 |
| | | Power = 2.75 | 39.3 | | | 92.8 | 0.0010 | 42.4558 | 6.52 |
| | | Power = 3 | 38.3 | | | 92.6 | 0.0003 | 43.14909 | 6.57 |
| **Less 3 inches AC & More 8 inches base** | All | **Linear** | **73.0** | **10.13** | **7.160** | **97.6** | **1.7000** | **51.2939** | **7.16** |
| | | Logarithmic | 46.8 | 5.78 | 10.050 | 83.4 | 1.1000 | 100.9217 | 10.05 |
| | | Power | 39.2 | 4.95 | 0.140 | 82.1 | 0.0130 | 0.0194977 | 0.14 |
| | | **Exponential** | **69.9** | **9.39** | **0.098** | **98.1** | **0.0220** | **0.00965831** | **0.10** |

| Evaluation Category | Sub Category | Regression Category | $R^2$ | T-ratio | SEE | b0 | b1 | Mean Square | RMSE |
|---|---|---|---|---|---|---|---|---|---|
| | | **Power = 1.25** | **68.8** | | | **96.3** | **0.7880** | **59.119** | **7.69** |
| | | Power = 1.5 | 64.5 | | | 95.2 | 0.3620 | 67.32312 | 8.21 |
| | | Power = 1.75 | 60.3 | | | 94.4 | 0.1660 | 75.27056 | 8.68 |
| | | Power = 2 | 56.4 | | | 93.7 | 0.0760 | 82.75769 | 9.10 |
| | | Power = 2.25 | 52.7 | | | 93.2 | 0.0340 | 89.74503 | 9.47 |
| | | Power = 2.5 | 49.3 | | | 92.7 | 0.0160 | 96.25078 | 9.81 |
| | | Power = 2.75 | 46.1 | | | 92.3 | 0.0070 | 102.30914 | 10.11 |
| | | Power = 3 | 43.1 | | | 92.0 | 0.0030 | 107.95507 | 10.39 |
| | WA | **Linear** | **71.5** | **5.93** | **9.770** | **98.6** | **1.6900** | **95.5153** | **9.77** |
| | | Logarithmic | 49.9 | 3.73 | 13.000 | 78.4 | 1.4100 | 168.0943 | 12.97 |
| | | Power | 42.8 | 3.24 | 0.187 | 76.4 | 0.0180 | 0.0348016 | 0.19 |
| | | Exponential | 65.9 | 5.20 | 0.144 | 99.0 | 0.0220 | 0.02075633 | 0.14 |
| | | **Power = 1.25** | **68.7** | | | **97.4** | **0.7750** | **104.99043** | **10.25** |
| | | Power = 1.5 | 65.5 | | | 96.4 | 0.3550 | 115.65005 | 10.75 |
| | | Power = 1.75 | 62.2 | | | 95.5 | 0.1620 | 126.73317 | 11.26 |
| | | Power = 2 | 58.9 | | | 94.7 | 0.0740 | 137.90903 | 11.74 |
| | | Power = 2.25 | 55.6 | | | 94.0 | 0.0330 | 149.00813 | 12.21 |
| | | Power = 2.5 | 52.3 | | | 93.4 | 0.0150 | 159.92278 | 12.65 |
| | | Power = 2.75 | 49.1 | | | 92.8 | 0.0070 | 170.5713 | 13.06 |
| | | Power = 3 | 46.1 | | | 92.2 | 0.0030 | 180.88664 | 13.45 |
| | OR | **Linear** | **72.2** | **7.56** | **4.990** | **98.0** | **2.0200** | **24.8579** | **4.99** |
| | | Logarithmic | 57.2 | 5.43 | 6.180 | 87.1 | 0.8270 | 38.2479 | 6.18 |
| | | Power | 53.5 | 5.03 | 0.074 | 86.7 | 0.0090 | 0.00548456 | 0.07 |
| | | Exponential | 71.4 | 7.41 | 0.058 | 98.1 | 0.0230 | 0.00337391 | 0.06 |
| | | **Power = 1.25** | **68.0** | | | **97.1** | **1.0800** | **28.63607** | **5.35** |
| | | Power = 1.5 | 63.8 | | | 96.3 | 0.5760 | 32.33912 | 5.69 |
| | | Power = 1.75 | 60.1 | | | 95.7 | 0.3050 | 35.72731 | 5.98 |
| | | Power = 2 | 56.7 | | | 95.2 | 0.1620 | 38.72935 | 6.22 |
| | | Power = 2.25 | 53.8 | | | 94.8 | 0.0860 | 41.34673 | 6.43 |
| | | Power = 2.5 | 51.2 | | | 94.5 | 0.0450 | 43.6121 | 6.60 |
| | | Power = 2.75 | 49.1 | | | 94.2 | 0.0240 | 45.56923 | 6.75 |
| | | Power = 3 | 47.2 | | | 94.0 | 0.0130 | 47.26298 | 6.87 |
| **World War II** | All | **Linear** | **64.3** | **7.47** | **16.030** | **100.1** | **0.9660** | **257.084** | **16.03** |
| | | Logarithmic | 63.3 | 7.32 | 16.250 | 63.7 | 2.2600 | 264.079 | 16.25 |
| | | Power | 23.7 | 3.10 | 0.630 | 55.1 | 0.0370 | 0.3967093 | 0.63 |
| | | Exponential | 25.9 | 3.29 | 0.621 | 102.3 | 0.0160 | 0.3850515 | 0.62 |
| | | **Power = 1.25** | **64.4** | | | **100.0** | **0.3680** | **256.46184** | **16.01** |
| | | Power = 1.5 | 64.4 | | | 99.9 | 0.1400 | 256.34761 | 16.01 |
| | | Power = 1.75 | 64.3 | | | 99.8 | 0.0530 | 256.73406 | 16.02 |
| | | Power = 2 | 64.2 | | | 99.6 | 0.0200 | 257.61028 | 16.05 |

| Evaluation Category | Sub Category | Regression Category | $R^2$ | T-ratio | SEE | b0 | b1 | Mean Square | RMSE |
|---|---|---|---|---|---|---|---|---|---|
| | | Power = 2.25 | 64.0 | | | 99.4 | 0.0080 | 258.96176 | 16.09 |
| | | Power = 2.5 | 63.8 | | | 99.2 | 0.0030 | 260.77067 | 16.15 |
| | | Power = 2.75 | 63.5 | | | 98.9 | 0.0010 | 263.01625 | 16.22 |
| | | Power = 3 | 63.1 | | | 98.6 | 0.0004 | 265.67519 | 16.30 |
| | WA | **Linear** | **70.2** | **7.67** | **12.960** | **99.7** | **0.8910** | **168.0221** | **12.96** |
| | | **Logarithmic** | **70.7** | **7.77** | **12.850** | **66.0** | **2.1100** | **165.128** | **12.85** |
| | | Power | 61.3 | 6.29 | 0.218 | 62.8 | 0.0290 | 0.0474558 | 0.22 |
| | | Exponential | 60.9 | 6.24 | 0.219 | 99.7 | 0.0120 | 0.047877 | 0.22 |
| | | **Power = 1.25** | **69.9** | | | **99.6** | **0.3390** | **169.8604** | **13.03** |
| | | Power = 1.5 | 69.4 | | | 99.4 | 0.1290 | 172.12782 | 13.12 |
| | | Power = 1.75 | 69.0 | | | 99.2 | 0.0590 | 174.80887 | 13.22 |
| | | Power = 2 | 68.4 | | | 99.0 | 0.0180 | 177.88528 | 13.34 |
| | | Power = 2.25 | 67.8 | | | 98.7 | 0.0070 | 181.33637 | 13.47 |
| | | Power = 2.5 | 67.1 | | | 98.4 | 0.0030 | 185.13932 | 13.61 |
| | | Power = 2.75 | 66.4 | | | 98.1 | 0.0010 | 189.26959 | 13.76 |
| | | Power = 3 | 65.6 | | | 97.7 | 0.0004 | 193.70131 | 13.92 |
| **Overlays** | All | **Linear** | **71.9** | **14.68** | **6.230** | **98.1** | **1.6200** | **38.8535** | **6.23** |
| | | Logarithmic | 57.2 | 10.60 | 7.700 | 83.8 | 1.0300 | 59.2302 | 7.70 |
| | | Power | 51.7 | 9.48 | 0.099 | 83.1 | 0.0120 | 0.00975887 | 0.10 |
| | | Exponential | 69.4 | 13.82 | 0.079 | 98.3 | 0.0190 | 0.006176 | 0.08 |
| | | **Power = 1.25** | **69.1** | | | **97.1** | **0.7930** | **42.75238** | **6.54** |
| | | Power = 1.5 | 66.0 | | | 96.2 | 0.3850 | 47.13334 | 6.87 |
| | | Power = 1.75 | 62.7 | | | 95.5 | 0.1860 | 51.62241 | 7.18 |
| | | Power = 2 | 59.5 | | | 94.8 | 0.0900 | 56.04595 | 7.49 |
| | | Power = 2.25 | 56.4 | | | 94.2 | 0.0430 | 60.32781 | 7.77 |
| | | Power = 2.5 | 53.5 | | | 93.7 | 0.0210 | 64.43967 | 8.03 |
| | | Power = 2.75 | 50.6 | | | 93.3 | 0.0100 | 68.37575 | 8.27 |
| | | Power = 3 | 47.9 | | | 92.9 | 0.0050 | 72.13976 | 8.49 |
| | WA | **Linear** | **48.3** | **6.26** | **8.830** | **97.7** | **1.2500** | **78.043** | **8.83** |
| | | Logarithmic | 39.6 | 5.25 | 9.550 | 85.3 | 0.9500 | 91.1439 | 9.55 |
| | | Power | 35.5 | 4.81 | 0.120 | 84.4 | 0.0110 | 0.01448245 | 0.12 |
| | | Exponential | 46.5 | 6.04 | 0.110 | 97.9 | 0.0150 | 0.01201261 | 0.11 |
| | | **Power = 1.25** | **46.2** | | | **96.8** | **0.5970** | **81.11239** | **9.01** |
| | | Power = 1.5 | 44.3 | | | 96.0 | 0.2850 | 94.13091 | 9.70 |
| | | Power = 1.75 | 42.4 | | | 95.3 | 0.1360 | 86.84651 | 9.32 |
| | | Power = 2 | 40.7 | | | 94.8 | 0.0650 | 89.40264 | 9.46 |
| | | Power = 2.25 | 39.2 | | | 94.3 | 0.0310 | 91.6976 | 9.58 |
| | | Power = 2.5 | 37.8 | | | 93.9 | 0.0150 | 93.79272 | 9.68 |
| | | Power = 2.75 | 36.6 | | | 93.5 | 0.0070 | 95.72284 | 9.78 |
| | | Power = 3 | 35.4 | | | 93.1 | 0.0030 | 97.52083 | 9.88 |

| Evaluation Category | Sub Category | Regression Category | $R^2$ | T-ratio | SEE | b0 | b1 | Mean Square | RMSE |
|---|---|---|---|---|---|---|---|---|---|
| | OR | **Linear** | **77.0** | **9.67** | **5.280** | **97.2** | **1.6800** | **27.8836** | **5.28** |
| | | Logarithmic | 72.9 | 8.69 | 5.720 | 83.2 | 1.0600 | 32.7401 | 5.72 |
| | | Power | 68.2 | 7.75 | 0.073 | 82.7 | 0.0120 | 0.00527449 | 0.07 |
| | | Exponential | 76.3 | 9.49 | 0.063 | 97.3 | 0.0190 | 0.00393462 | 0.06 |
| | | **Power = 1.25** | **73.4** | | | **96.3** | **0.8510** | **32.19368** | **5.67** |
| | | Power = 1.5 | 70.1 | | | 95.6 | 0.4300 | 36.16444 | 6.01 |
| | | Power = 1.75 | 67.1 | | | 95.0 | 0.2170 | 39.75198 | 6.30 |
| | | Power = 2 | 64.5 | | | 94.5 | 0.1090 | 42.98321 | 6.56 |
| | | Power = 2.25 | 62.1 | | | 94.1 | 0.0550 | 45.90311 | 6.78 |
| | | Power = 2.5 | 59.9 | | | 93.7 | 0.0280 | 48.55798 | 6.97 |
| | | Power = 2.75 | 57.9 | | | 93.4 | 0.0140 | 50.98972 | 7.14 |
| | | Power = 3 | 56.0 | | | 93.1 | 0.0070 | 53.23419 | 7.30 |
| | ID | **Linear** | **73.8** | **5.31** | **6.990** | **101.7** | **2.3500** | **48.8716** | **6.99** |
| | | Logarithmic | 37.4 | 2.44 | 10.810 | 86.0 | 0.8940 | 116.74987 | 10.81 |
| | | Power | 33.4 | 2.24 | 0.138 | 84.9 | 0.0100 | 0.01899172 | 0.14 |
| | | Exponential | 72.9 | 5.19 | 0.088 | 102.8 | 0.0290 | 0.00772113 | 0.09 |
| | | Power = 1.25 | 77.5 | | | 100.8 | 1.2700 | 42.03379 | 6.48 |
| | | Power = 1.5 | 79.0 | | | 99.8 | 0.6660 | 39.14521 | 6.26 |
| | | **Power = 1.75** | **79.1** | | | **98.8** | **0.3430** | **38.91337** | **6.24** |
| | | Power = 2 | 78.4 | | | 97.9 | 0.1750 | 40.3181 | 6.35 |
| | | Power = 2.25 | 77.1 | | | 97.1 | 0.0890 | 42.66339 | 6.53 |
| | | Power = 2.5 | 75.6 | | | 96.4 | 0.0450 | 45.50886 | 6.75 |
| | | Power = 2.75 | 73.9 | | | 95.9 | 0.0230 | 48.58658 | 6.97 |
| | | Power = 3 | 72.3 | | | 95.4 | 0.0110 | 51.73676 | 7.19 |
| **BSTs** | All | **Linear** | **37.2** | **4.43** | **19.280** | **87.9** | **2.5400** | **371.5842** | **19.28** |
| | | **Logarithmic** | **55.8** | **6.45** | **16.180** | **66.3** | **2.1200** | **261.807** | **16.18** |
| | | Power | 42.7 | 4.96 | 0.299 | 62.2 | 0.0300 | 0.0894526 | 0.30 |
| | | Exponential | 35.6 | 4.27 | 0.317 | 86.5 | 0.0400 | 0.1006071 | 0.32 |
| | | **Power = 1.25** | **31.7** | | | **85.5** | **1.1600** | **404.40242** | **20.11** |
| | | Power = 1.5 | 27.4 | | | 83.7 | 0.5350 | 429.76442 | 20.73 |
| | | Power = 1.75 | 24.1 | | | 82.4 | 0.2470 | 449.40402 | 21.20 |
| | | Power = 2 | 21.5 | | | 81.4 | 0.1150 | 464.78085 | 21.56 |
| | | Power = 2.25 | 19.4 | | | 80.6 | 0.0530 | 476.99081 | 21.84 |
| | | Power = 2.5 | 17.8 | | | 80.0 | 0.0250 | 486.83391 | 22.06 |
| | | Power = 2.75 | 16.4 | | | 79.5 | 0.0120 | 494.89231 | 22.25 |
| | | Power = 3 | 15.3 | | | 79.1 | 0.0060 | 501.59164 | 22.40 |
| | WA | **Linear** | **35.6** | **3.64** | **19.370** | **85.5** | **2.2800** | **375.3172** | **19.37** |
| | | **Logarithmic** | **61.6** | **6.21** | **14.950** | **64.9** | **2.2000** | **223.4812** | **14.95** |
| | | Power | 47.3 | 4.65 | 0.282 | 61.2 | 0.0310 | 0.0795368 | 0.28 |
| | | Exponential | 35.9 | 3.66 | 0.311 | 84.0 | 0.0370 | 0.0968845 | 0.31 |

| Evaluation Category | Sub Category | Regression Category | $R^2$ | T-ratio | SEE | b0 | b1 | Mean Square | RMSE |
|---|---|---|---|---|---|---|---|---|---|
| | | **Power = 1.25** | **30.1** | | | **83.3** | **1.0300** | **407.36924** | **20.18** |
| | | Power = 1.5 | 26.2 | | | 81.7 | 0.4670 | 430.20501 | 20.74 |
| | | Power = 1.75 | 23.3 | | | 80.6 | 0.2150 | 446.76619 | 21.14 |
| | | Power = 2 | 21.2 | | | 79.8 | 0.1000 | 459.07611 | 21.43 |
| | | Power = 2.25 | 19.6 | | | 79.2 | 0.0470 | 468.47308 | 21.64 |
| | | Power = 2.5 | 18.3 | | | 78.7 | 0.0220 | 475.84466 | 21.81 |
| | | Power = 2.75 | 17.3 | | | 78.3 | 0.0110 | 484.78786 | 22.02 |
| | | Power = 3 | 16.5 | | | 78.0 | 0.0050 | 486.71047 | 22.06 |
| | OR | **Linear** | **48.7** | **2.58** | **19.890** | **97.6** | **3.9100** | **395.6286** | **19.89** |
| | | Logarithmic | 42.4 | 2.27 | 21.070 | 70.4 | 1.8800 | 443.906 | 21.07 |
| | | Power | 32.1 | 1.82 | 0.382 | 65.1 | 0.0270 | 0.14596085 | 0.38 |
| | | Exponential | 39.2 | 2.12 | 0.362 | 97.6 | 0.0590 | 0.13080626 | 0.36 |
| | | **Power = 1.25** | **45.7** | | | **95.9** | **2.0900** | **418.83874** | **20.47** |
| | | Power = 1.5 | 42.3 | | | 94.3 | 1.1000 | 444.84974 | 21.09 |
| | | Power = 1.75 | 38.8 | | | 92.8 | 0.5780 | 471.6701 | 21.72 |
| | | Power = 2 | 35.4 | | | 91.4 | 0.3010 | 498.10742 | 22.32 |
| | | Power = 2.25 | 32.1 | | | 90.2 | 0.1560 | 523.41885 | 22.88 |
| | | Power = 2.5 | 29.0 | | | 89.0 | 0.0810 | 547.15705 | 23.39 |
| | | Power = 2.75 | 26.2 | | | 88.0 | 0.0410 | 569.08529 | 23.86 |
| | | Power = 3 | 23.6 | | | 87.1 | 0.0210 | 589.11742 | 24.27 |
| **Slurry Seals** | All | **Linear** | **52.4** | **7.71** | **15.900** | **89.0** | **2.8700** | **252.912** | **15.90** |
| | | **Logarithmic** | **64.6** | **9.93** | **13.710** | **65.6** | **2.1800** | **188.084** | **13.71** |
| | | Power | 49.0 | 7.20 | 0.264 | 62.1 | 0.0300 | 0.0695422 | 0.26 |
| | | Exponential | 47.5 | 7.00 | 0.267 | 87.7 | 0.0440 | 0.0715308 | 0.27 |
| | | **Power = 1.25** | **45.4** | | | **86.3** | **1.3100** | **290.194** | **17.04** |
| | | Power = 1.5 | 39.5 | | | 84.3 | 0.5970 | 321.67875 | 17.94 |
| | | Power = 1.75 | 34.6 | | | 82.8 | 0.2700 | 347.87548 | 18.65 |
| | | Power = 2 | 30.5 | | | 81.6 | 0.1220 | 369.59151 | 19.22 |
| | | Power = 2.25 | 27.1 | | | 80.6 | 0.0550 | 384.62531 | 19.61 |
| | | Power = 2.5 | 24.3 | | | 79.9 | 0.0250 | 402.67281 | 20.07 |
| | | Power = 2.75 | 21.9 | | | 79.2 | 0.0110 | 415.30787 | 20.38 |
| | | Power = 3 | 19.9 | | | 78.7 | 0.0050 | 425.99083 | 20.64 |
| | WA | **Linear** | **52.2** | **6.27** | **14.890** | **88.7** | **2.5400** | **221.6534** | **14.89** |
| | | **Logarithmic** | **69.4** | **9.04** | **11.910** | **66.9** | **2.0900** | **141.73** | **11.91** |
| | | Power | 56.9 | 6.89 | 0.209 | 64.3 | 0.0280 | 0.0436814 | 0.21 |
| | | Exponential | 48.9 | 5.87 | 0.228 | 87.3 | 0.0360 | 0.0517714 | 0.23 |
| | | **Power = 1.25** | **44.5** | | | **86.1** | **1.1300** | **257.28084** | **16.04** |
| | | Power = 1.5 | 38.3 | | | 84.1 | 0.5060 | 286.03025 | 16.91 |
| | | Power = 1.75 | 33.4 | | | 82.6 | 0.2260 | 308.83373 | 17.57 |
| | | Power = 2 | 29.5 | | | 81.5 | 0.1010 | 326.85337 | 18.08 |

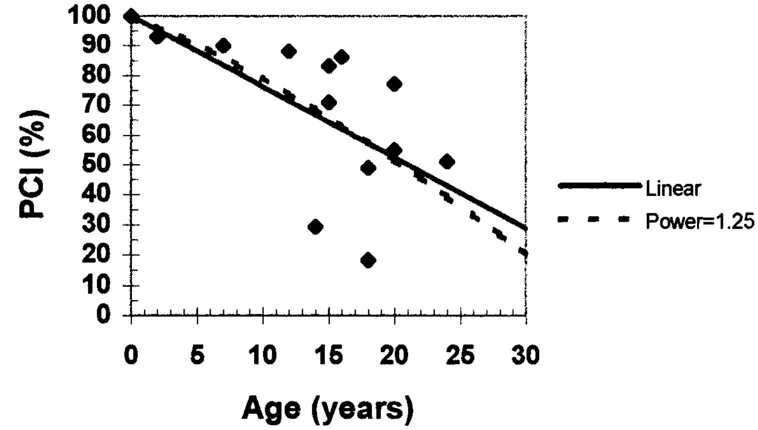
| Evaluation Category | Sub Category | Regression Category | $R^2$ | T-ratio | SEE | b0 | b1 | Mean Square | RMSE |
|---|---|---|---|---|---|---|---|---|---|
| | | Power = 2.25 | 26.4 | | | 90.7 | 0.0450 | 341.13703 | 18.47 |
| | | Power = 2.5 | 24.0 | | | 80.0 | 0.0200 | 352.53829 | 18.78 |
| | | Power = 2.75 | 22.0 | | | 79.5 | 0.0090 | 361.72236 | 19.02 |
| | | Power = 3 | 20.4 | | | 79.1 | 0.0040 | 369.19695 | 19.21 |
| | ID | **Linear** | **63.9** | **4.21** | **19.050** | **94.0** | **4.1000** | **362.9328** | **19.05** |
| | | Logarithmic | 54.2 | 3.44 | 21.460 | 60.8 | 2.5100 | 460.3299 | 21.46 |
| | | Power | 42.4 | 2.71 | 0.433 | 53.8 | 0.0400 | 0.1876423 | 0.43 |
| | | Exponential | 57.9 | 3.71 | 0.370 | 93.9 | 0.0700 | 0.1372008 | 0.37 |
| | | **Power = 1.25** | **60.9** | | | **91.7** | **2.0500** | **393.65136** | **19.84** |
| | | Power = 1.5 | 57.9 | | | 89.9 | 1.0200 | 423.55716 | 20.58 |
| | | Power = 1.75 | 55.1 | | | 88.3 | 0.5060 | 451.55016 | 21.25 |
| | | Power = 2 | 52.5 | | | 87.0 | 0.2520 | 477.40393 | 21.85 |
| | | Power = 2.25 | 50.2 | | | 86.0 | 0.1250 | 501.18907 | 22.39 |
| | | Power = 2.5 | 48.0 | | | 85.1 | 0.0620 | 523.06756 | 22.87 |
| | | Power = 2.75 | 46.0 | | | 84.3 | 0.0310 | 543.21677 | 23.31 |
| | | Power = 3 | 44.2 | | | 83.6 | 0.0150 | 561.80253 | 23.70 |
| **Chip Seals** | All | **Linear** | **46.4** | **4.37** | **17.540** | **89.8** | **2.5100** | **307.7696** | **17.54** |
| | | **Logarithmic** | **63.8** | **6.23** | **14.420** | **65.9** | **2.1500** | **207.9436** | **14.42** |
| | | Power | 49.0 | 4.60 | 0.271 | 62.3 | 0.0300 | 0.073615 | 0.27 |
| | | Exponential | 35.4 | 3.47 | 0.305 | 86.8 | 0.0350 | 0.0932975 | 0.31 |
| | | **Power = 1.25** | **39.7** | | | **87.5** | **1.1500** | **346.44402** | **18.61** |
| | | Power = 1.5 | 34.1 | | | 85.6 | 0.5240 | 378.99526 | 19.47 |
| | | Power = 1.75 | 29.3 | | | 84.1 | 0.2380 | 406.05136 | 20.15 |
| | | Power = 2 | 25.5 | | | 82.9 | 0.1080 | 428.41565 | 20.70 |
| | | Power = 2.25 | 22.3 | | | 81.9 | 0.0490 | 446.87057 | 21.14 |
| | | Power = 2.5 | 19.6 | | | 81.0 | 0.0220 | 462.11244 | 21.50 |
| | | Power = 2.75 | 17.4 | | | 80.4 | 0.0100 | 474.73316 | 21.79 |
| | | Power = 3 | 15.6 | | | 79.8 | 0.0050 | 485.22276 | 22.03 |
| | WA | **Linear** | **39.0** | **2.88** | **18.990** | **90.0** | **2.9600** | **360.5996** | **18.99** |
| | | **Logarithmic** | **52.4** | **3.78** | **16.780** | **69.0** | **1.9600** | **281.5074** | **16.78** |
| | | Power | 37.1 | 2.77 | 0.324 | 64.7 | 0.0280 | 0.10479403 | 0.32 |
| | | Exponential | 30.4 | 2.38 | 0.340 | 87.9 | 0.0440 | 0.11593231 | 0.34 |
| | | **Power = 1.25** | **32.7** | | | **87.7** | **1.4100** | **397.90575** | **19.95** |
| | | Power = 1.5 | 27.4 | | | 86.0 | 0.6640 | 429.19832 | 20.72 |
| | | Power = 1.75 | 23.0 | | | 84.6 | 0.3120 | 455.02885 | 21.33 |
| | | Power = 2 | 19.4 | | | 83.5 | 0.1460 | 476.17917 | 21.82 |
| | | Power = 2.25 | 16.5 | | | 82.7 | 0.0680 | 493.43745 | 22.21 |
| | | Power = 2.5 | 14.1 | | | 82.0 | 0.0320 | 507.5171 | 22.53 |
| | | Power = 2.75 | 12.2 | | | 81.4 | 0.0150 | 519.02753 | 22.78 |
| | | Power = 3 | 10.6 | | | 81.0 | 0.0070 | 528.4712 | 22.99 |

# APPENDIX G

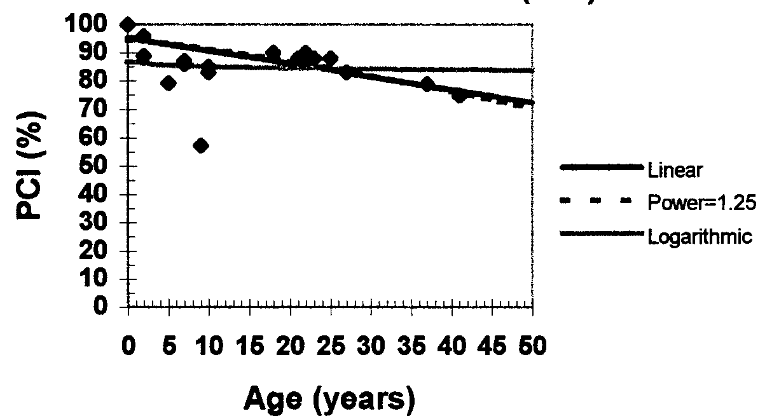
***Individual State***

***Regression Plots***

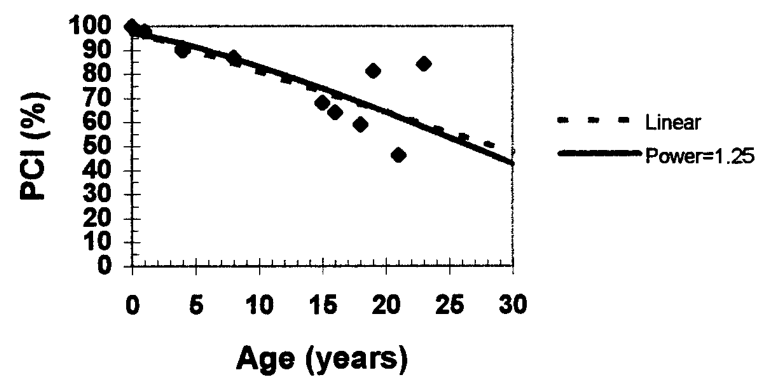
## Less than 3 inches AC, Less than 8 inches Base (WA)



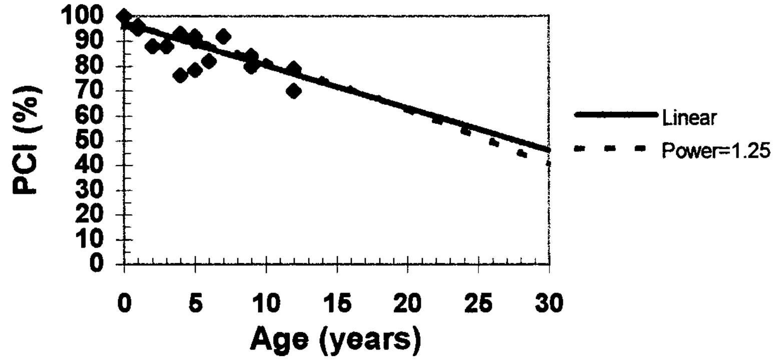

## Less than 3 inches AC, Less than 8 inches Base (OR)



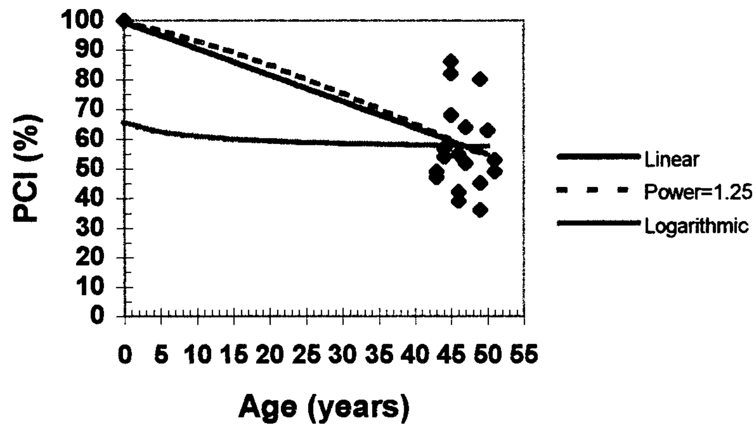

## Less than 3 inches AC, More than 8 inches Base (WA)



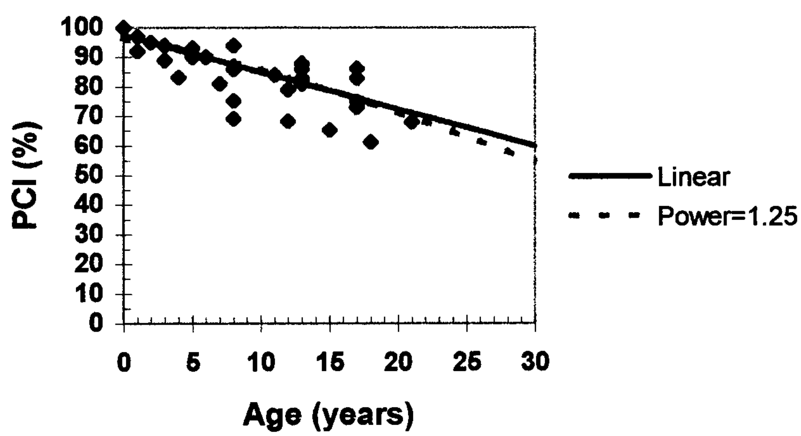
## Less than 3 inches AC, More than 8 inches Base (OR)



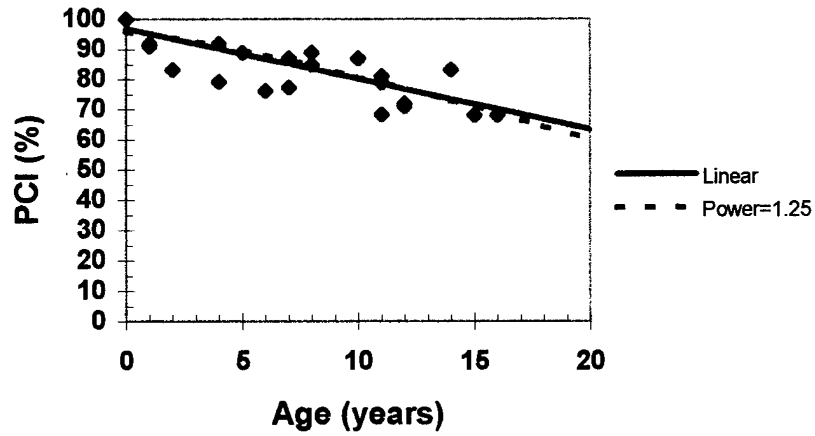

## World War Two (WA)



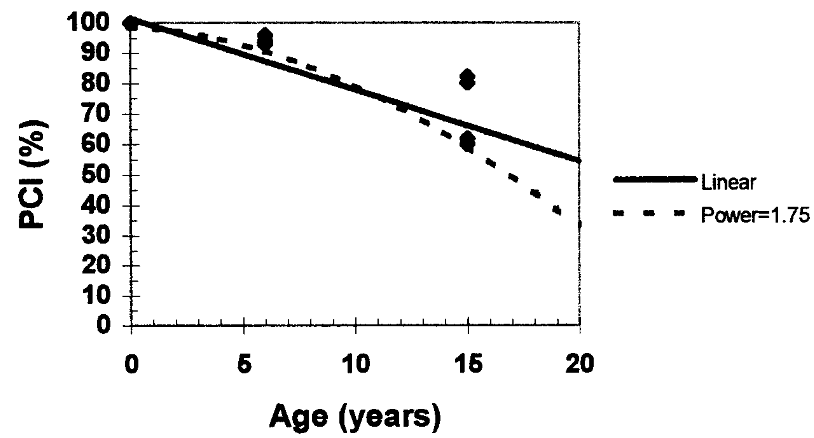

## Overlay Pavements (WA)



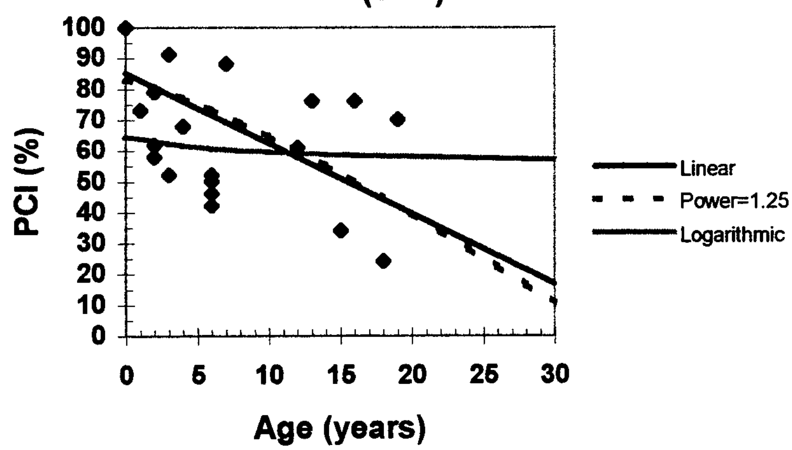
## Overlay Pavements (OR)

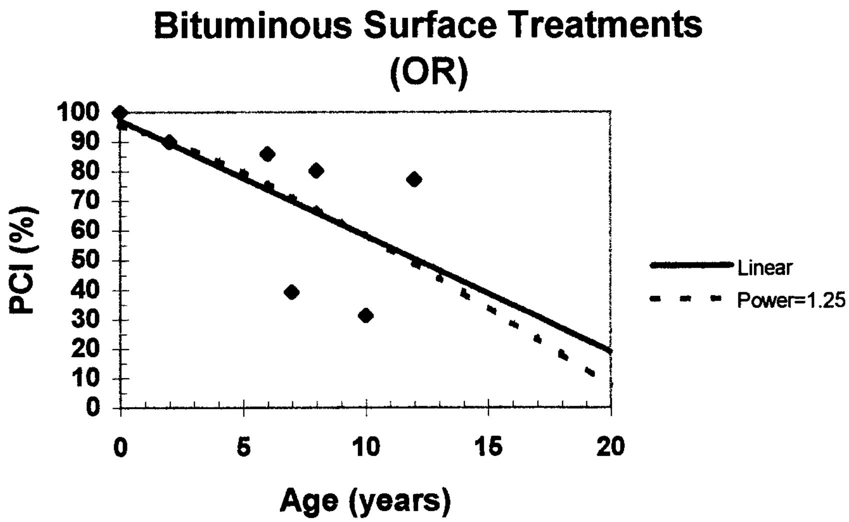


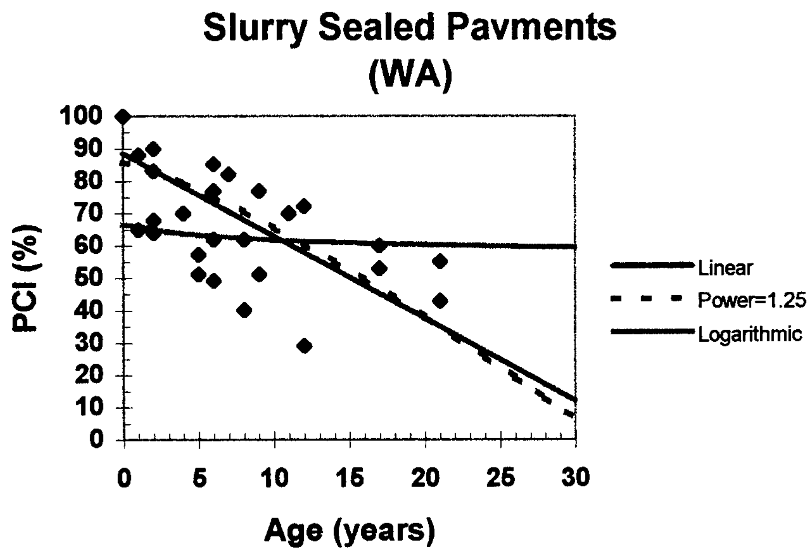

## Overlay Pavements (ID)

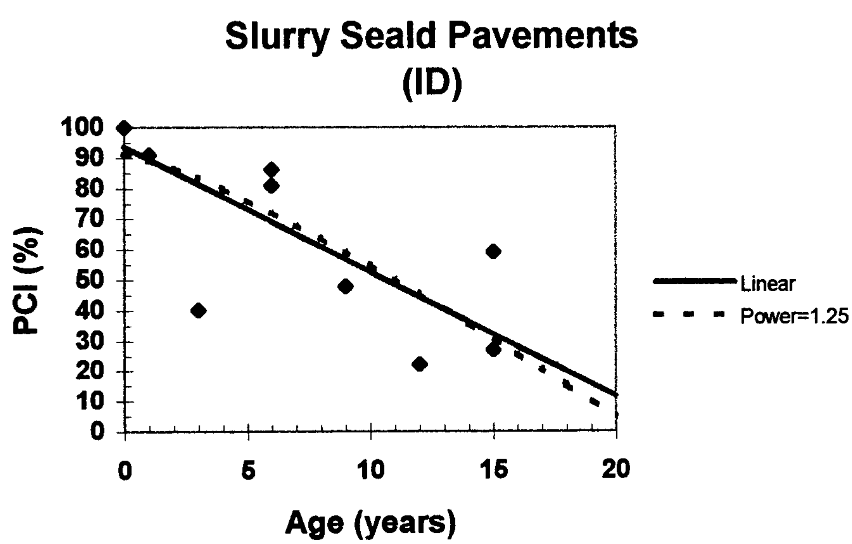


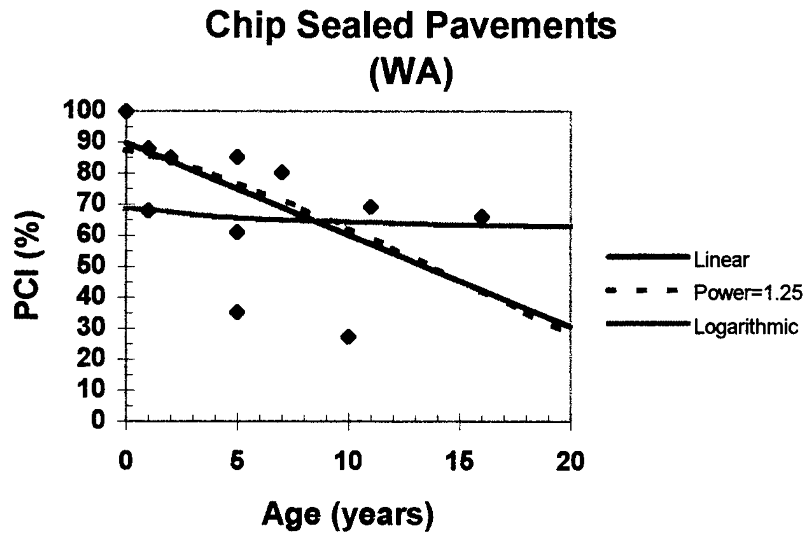

## Bituminous Surface Treatments (WA)




Bituminous Surface Treatments
(OR)
100
90
80
70
60
50
40
30
20
10
0
PCI (%)
0
5
10
15
20
Age (years)
Linear
Power=1.25


Slurry Sealed Pavments
(WA)
100
90
80
70
60
50
40
30
20
10
0
PCI (%)
0
5
10
15
20
25
30
Age (years)
Linear
Power=1.25
Logarithmic


Slurry Seald Pavements
(ID)
100
90
80
70
60
50
40
30
20
10
0
PCI (%)
0
5
10
15
20
Age (years)
Linear
Power=1.25



Chip Sealed Pavements
(WA)
100
90
80
70
60
50
40
30
20
10
0
PCI (%)
0
5
10
15
20
Age (years)
Linear
Power=1.25
Logarithmic