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16. Abstract

In 1997, The Louisiana House of Representatives passed Bill Number 1698, which addresses warranties in state contracts for highway construction. This bill stated that every contract for the construction of or improvements to highways will include a warranty by the contractor as to the quality of materials and workmanship for duration of three years. The House has asked the Louisiana Department of Transportation and Development (DOTD) to promulgate rules and regulations to effectuate the purpose of warranties and submit such to the Joint Legislative Committee on Transportation, Highways, and Public Works for approval.

In response, DOTD formed a committee to supervise the development of warranties made up of representatives from DOTD, FHWA, and contractor organizations so as to conduct a comprehensive evaluation of warranties and to look at its impact on contracts and construction for highways in Louisiana. The purpose of the warranty is principally to ensure that DOTD has an assurance from the contractor on highway projects that constructed items shall be free of defects in materials and workmanship for a three-year period from the project initial acceptance date. But, there is also an obligation on the part of DOTD to ensure that contractors are treated fairly. This paper summarizes the efforts taken by the Department to meet the legislative directive to develop a warranties program for Louisiana that fulfills the legislative requirement and which also obeys federal regulations put in-place to ensure that contractors are treated fairly.

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Each research project has an advisory committee appointed by the LTRC Director. The Project Review Committee (PRC) is responsible for assisting the LTRC Administrator or Manager in the development of acceptable research problem statements, requests for proposals, review of research proposals, oversight of approved research projects, and implementation of findings.

LTRC appreciates the dedication of the following Project Review Committee members in guiding this research study to fruition.

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LTRC Administrator

Zhongjie “Doc” Zhang, Ph.D., P.E.

Members

Chris Abadie, LTRC
Phil Arena, FHWA
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Janice Williams, District 41
Bert Wintz, District 22

Directorate Implementation Sponsor

Richard Savoie
Chief Engineer, LADOTD

Implementation of Warranties in State Contracts for Highway Construction

by

Mark Martinez, P.E.
Pavement Research Engineer

LTRC Project No. 00-2P
State Project No. 736-99-1024

conducted for

Louisiana Department of Transportation and Development
Louisiana Transportation Research Center

April 2012

ABSTRACT

In 1997, The Louisiana House of Representatives passed Bill Number 1698, which addresses warranties in state contracts for highway construction. This bill stated that every contract for the construction of or improvements to highways will include a warranty by the contractor as to the quality of materials and workmanship for a duration of three years. The House has asked the Louisiana Department of Transportation and Development (DOTD) to promulgate rules and regulations to effectuate the purpose of warranties and submit such to the Joint Legislative Committee on Transportation, Highways, and Public Works for approval.

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INTRODUCTION

Act 1329 of the 1997 Regular Session and Act 161 of the 1998 First Extraordinary Session of the Louisiana Legislature required that DOTD initiate a program of warranties in state contracts for highway construction and maintenance. In response, a report was developed by a team of DOTD, Federal Highway Administration (FHWA), and industry representatives that presented a proposed experimental program and that also discussed both positive and negative attributes of warranties. Of significance was an indication from FHWA that blanket warranties would not be acceptable for federal funding in a form that the legislature envisioned. Further, the bonding companies consulted indicated that they might not participate or that cost would be prohibitive *[1]*.

This initial fact-gathering investigation led the team to propose two possible plans of action. The first called for an immediate, full implementation of a warranties program to see how the contractor and federal transportation community might react. The second was to develop a research plan that would attempt to tie warranties to performance specifications. These specifications were to be based on allowable distress over the warranty period. This report was forwarded to the Joint Transportation Committee (JTC) in January of 1998 and, subsequently, the legislature directed to have their original ruling amended so as to facilitate the report's findings and instructed the Department to implement the plan. The Department initiated the research study.

This report summarizes the research activities as well as the findings derived from this study and considers the principal factors presently impacting the implementation of warranties in Louisiana with a focus on making recommendations to help develop workable strategies.

OBJECTIVE

The aim of this research project was to develop warranty specifications based on performance requirements for state highway infrastructure construction projects that are in compliance with FHWA requirements and to assess their impact on the construction practice of DOTD. The following specific objectives were achieved under this study:

1. Determine the reliability and the applicability of current warranty requirements in state contracts for highway construction.
2. Evaluate the implementation of warranty requirements and their impact on the construction of highways, contractors, and DOTD.

SCOPE

The scope of this research project included a field investigation of warranties through systematic monitoring of performance on an array of warranty pilot projects in the following areas: asphaltic concrete pavements (new construction, overlay, microsurfacing, and chipseal); Portland cement concrete pavements; and field evaluations of traffic striping and pavement markings. These projects were to be of similar composition (e.g., cross section design in highway) and environmental conditions (e.g., traffic loading). The results were to be used to develop a performance/distress database for each selected construction item. Analysis of this database would then be used to investigate reliability of developed warranty requirements (acceptable limits of distresses within items) and to propose revisions for these requirements in future state contracts.

Implementation would require the development of preliminary draft warranty specifications for use on the proposed pilot projects. Development would be accomplished through examination of specifications used in other states, through the employment of Departmental and private sector expertise, and through comprehensive analysis of non-warranty performance data taken on existing non-warranty projects. Because of its availability and relevance to this research, the findings from a separate independent study that had monitored the progressive development of distress on 60 chipseal and 20 microsurfacing projects was included as well.

METHODOLOGY

Background

Research efforts began by developing an implementation plan that could provide the framework and outline the schedule of action items needed to facilitate the Act 1329 and Act 161 Legislative requirement. As expressed in an initial report submitted to the JTC in 1998, this effort had to adhere to a 1997 ruling made by the FHWA, 23 CFR 635.413, restricting what highway structures could be warranted *[1]*. This ruling stated that warranties could be applied to National Highway System (NHS) only if they were within prescribed limits and only with the advanced approval of the FHWA division administrator. This ruling required that warranties be for specific construction features that were within the contractor's power to control. The ruling prohibited all general project warranty or maintenance bonds (since they are broad or general in nature). Also, the ruling stipulated that a contractor cannot be held responsible for early deterioration that results from inaccurate DOTD design assumptions.

To achieve these ends, an initiative was proposed that logistically divided warranties into eight distinct areas of investigation. Warranties appraisal was to be performance based, which meant that warranty projects built as part of the plan were to be evaluated according to their pavement distress levels not being allowed to exceed critical limits for a duration of three years on any given warranty project subsequent to that project's acceptance, as was proposed in the report to the JTC. Functional details like distress limits, evaluation procedures, remediation, and so on were to be determined by the Department and expressed through formal introduction to DOTD's Standard Specifications once substantiated. That part of the plan, which LTRC would take a role in investigating, is summarized in Table 1, which shows the areas that the initiative covered along with the various distresses that would define them.

Because warranties development and deployment was a nascent concept for the Department, the policy team turned its attention to sources outside of Louisiana to find reasonable performance requirements and distress thresholds. Work done by other state agencies and reports based on research that had been conducted by the academic community proved invaluable in this regard. Examples are too numerous to fully cite, but a sampling can be found in the references section of this report *[2, 3, 4, 5, 6, 7, and 8]*. Comprehensive analysis of performance data collected on existing non-warranty jobs was also used to set thresholds.

Table 1
Proposed warranted items

Asphaltic Concrete Pavement (New Construction)	Asphaltic Concrete Pavement (Overlays)	Asphaltic Concrete Pavement (Microsurfacing)	Asphaltic Concrete Pavement (Chipseal)	Portland Cement Concrete Pavement	Raised Pavement Markings	Painted Traffic Striping	Plastic Pavement Markings
Surface Friction	Surface Friction	Surface Friction	Surface Friction	Cracking: corner breaks, longitudinal cracks, transverse cracks	Loss or Damage	Paint Blistering, Peeling, or Scaling	Loss, Peeling, or Flaking
Bleeding	Bleeding	Bleeding	Bleeding	Joint Deficiencies: seal damage, and joint spalling	Loss of Luminescence	Improper application of Paint	Improper application of Adhesive Material
Raveling	Raveling	Raveling	Loss of Cover Aggregate	Surface Defects: surface friction and popouts	Improper application of Adhesive Material	Deteration of Paint Thickness (Less Than Minimum)	Deteration of Material Thickness (Less Than Minimum)
Rutting	Rutting	Rutting		Miscellaneous Distresses: faulting of joints and cracks, and lane to shoulder separation			
Shoving	Shoving	Delamination					
Cracking	Cracking						
Potholes	Potholes						

This analysis called for finding at least five representative pavements from each of the eight warranty areas that shared similar characteristics (e.g., age, construction type, cross section, loading, etc.) that could be grouped and analyzed with results being used to refine thresholds. The focus was on pavements that were approximately three years of age at the time data was collected to reflect the three-year bond period on warranty projects being proposed.

Empirical Development of Performance Thresholds

The principal resource used in this archival analysis was ARAN data collected as part of a statewide inventory contract that the Department's Pavement Management Section had with Roadware Incorporated, who had developed the ARAN *[9, 10, and 11]*. Supplementing this was friction data and high-speed profiler data made available through LTRC on selected projects. The types of data warehoused in these archives can be found in Tables 2 and 3.

The principal difference between the ARAN data summaries listed in Table 2 and Table 3 is related to the means by which they were derived. Distresses falling into the Table 2 category were derived by automated means wherein the ARAN system automatically identifies, counts, and assesses the quality and quantity of distresses through ARAN's image processing software capable of "intelligent" pattern recognition. By comparison, distresses falling into the Table 3 category are arrived at completely by manual examination wherein high-resolution ARAN images are subjectively evaluated.

Because the ARAN contract called for the monitoring of the state's entire highway inventory according to Highway Performance Monitoring System (HPMS) directives, there was a rich supply of data available for analysis in all of the desired warranty areas in Table 1. The only other DOTD archival resource needed to carry out the analysis was the Department's Tracking of Projects (TOPS) database, which contained project development details such as project type, date of project acceptance, and so on. This was needed because the TOPS system provided a ready means of quickly determining the age of a pavement when it was ARAN tested (i.e., age was calculated by subtracting the ARAN test date from the TOPS project acceptance date).

Table 2

Automated ARAN data collection summary

Test Type and Data Collected	Units
1. ARAN Automated Distress Assessment System (testing done in both highway directions, annually):	
a. Joint Faulting[1]	
Maximum negative faulting / 10th mile segment	inches
Maximum positive faulting / 10th mile segment	inches
Average faulting / 10th mile segment	inches
Number of positive faulted joints / 10th mile segment	count
Number of negative faulted joints / 10th mile segment	count
b. Rutting	
Average rutting in left wheel-path / 10th mile segment	inches
Standard deviation of rutting in left wheel-path / 10th mile segment	—
Average rutting in right wheel-path / 10th mile segment	inches
Standard deviation of rutting in right wheel-path / 10th mile segment	—
Average rutting in both wheel-paths / 10th mile segment	inches
Standard deviation of rutting in both wheel-paths / 10th mile segment	—
c. Cracking	
Alligator/fatigue cracking (low, medium, and high severity) / 10th mile segment	feet^2
Longitudinal cracking (low, medium, and high severity) / 10th mile segment	linear feet
Transverse cracking (low, medium, and high severity) / 10th mile segment	linear feet
Low severity block cracking (low, medium, and high density) / 10th mile segment	linear feet
Medium severity block cracking (low, medium, and high density) / 10th mile segment	linear feet
High severity block cracking (low, medium, and high density) / 10th mile segment	linear feet
d. International Roughness Index (IRI)	
IRI (left wheel-path) /10th mile segment	inches/mile
IRI (right wheel-path) /10th mile segment	inches/mile
IRI (average of both wheel-paths) /10th mile segment	inches/mile
Standard deviation of IRI (left wheel-path) /10th mile segment	—
Standard deviation of IRI (right wheel-path) /10th mile segment	—
Standard deviation of IRI (average of both wheel-paths) /10th mile segment	—
e. Potholes	
Number of potholes / 10th mile segment	count
Area of potholes / 10th mile segment	feet^2
f. Patching	
Number of low severity patches / 10th mile segment	count
Number of medium severity patches / 10th mile segment	count
Number of high severity patches / 10th mile segment	count
Area of low severity patches / 10th mile segment	feet^2
Area of medium severity patches / 10th mile segment	feet^2
Area of high severity patches / 10th mile segment	feet^2

1. Collected automatically as part of operations, but meaningless on asphalt projects
2. "—" indicates that figure had not been archived in the ARAN database

Table 3

Manually assessed ARAN data collection summary

Test Type and Data Collected	Units
2. Manual Assessment of High-resolution ARAN images: (images collected in one highway direction, annually):	
a. Shoving	
Number of shoving occurrences / 10th mile segment	count
Area of shoving occurrences / 10th mile segment	feet^2
b. Raveling/Weathering	
Low severity raveling / 10th mile segment	feet^2
Medium severity raveling / 10th mile segment	feet^2
High severity raveling / 10th mile segment	feet^2
c. Bleeding/Flushing	
Low severity bleeding / 10th mile segment	feet^2
Medium severity bleeding / 10th mile segment	feet^2
High severity bleeding / 10th mile segment	feet^2
e. Cracking	
Corner cracks (low, medium, high) / 10th mile segment	count
Diagonal cracks (low, medium, high) / 10th mile segment	count & feet^2
Durability 'D' cracks (low, medium, high) / 10th mile segment	count & feet^2
Edge cracks (low, medium, high) / 10th mile segment	linear feet
f. Painted and Plastic Pavement Markings	
Loss of painted traffic striping / 10th mile segment	code based
Loss of plastic pavement markers (appliqués) / 10th mile segment	code based
Loss of pavement markers (raised) / 10th mile segment)	percentage
e. Other	
Delamination / 10th mile segment	count & feet^2
Transverse joint spalling (low, medium, high)/ 10th mile segment	count & linear feet
Longitudinal joint spalling (low, medium, high)/ 10th mile segment	count & linear feet
Blowups / 10th mile segment	count
Popouts / 10th mile segment	count
Scaling (low, medium, high) / 10th mile segment	feet^2
Transverse joint seal damage (low, medium, high) / 10th mile segment	count & linear feet
Longitudinal joint seal damage (low, medium, high) / 10th mile segment	count & linear feet

Quality Control Measures and Manual Assessment of Distress

Quality control checks were conducted on all data canvassed in the archival analysis to ensure the accuracy of distress figures being cited. Because they were originally collected by automated means that were prone to program error, checks on ARAN figures collected in association with Table 2 required close scrutiny. For example, ARAN's automated distress analyzer system, though capable of accurately tabulating the types, quantity, and quality of distresses listed in Table 2, still needed to be checked against their photo-logs because the software distress patterns were often misread (e.g., core holes were sometimes mistaken as pot holes). Also serving as an example, discontinuities in the pavement resulting from railroad crossings or bridge transitions were sometimes mistaken by the system for transverse cracks. Besides allowing for QA/QC, the availability of photo-logs also serve as a record of distress development that needs to be kept on file for use in litigation proceedings in the event that a warranty clause might be invoked. The guidelines used to appraise distresses (both for the ARAN automated analysis as well as for the manual appraisals) and to conduct quality control checks was the Strategic Highway Research Program's Distress Identification Manual (SHRP-DIM), which is the governing standard on the subject *[12]*.

Deployment

Once draft specifications were developed and became available, research began attempting to find prospective projects that could be built using them. These projects would be built as fully warranted constructions that were subject to the restrictions and penalties associated with warranties. They would be performance monitored over their three-year bond periods and they would have their warranty bonds invoked, if required. The findings from these investigations would be used to further develop and refine the draft specifications. This approach would also help familiarize the Department with warranties and was envisioned as a means of refining the provided draft specifications to better reflect Louisiana's specific needs.

Finding suitable projects for the pilot program that could be built with one of the draft warranty clauses as part of its contract would involve first isolating items listed on the Department's letting list that would meet the basic rules set forth by FHWA concerning warranty construction. Efforts began with attempts to select a number of asphalt projects because asphalt lettings were much better represented within DOTD's work program than were most other types of projects intended for warranty consideration. Wide coverage in the

work program also promised quicker isolation of a wider variety of highway classifications (ranging from Rural Collector to Urban Interstate), which was useful in that it helped to facilitate a more accurate model of Louisiana's asphalt pavement inventory. An added benefit of wide coverage was that it also helped make it easier to find projects that were sufficiently long enough, in terms of mileage, to yield enough data to produce results that were statistically relevant. By this reasoning, a number of prospective asphaltic pavement projects were selected and submitted to the Department for approval.

The initial plan projected that once they were constructed, each pilot project would be monitored during the first year of its service. Any relevant findings were to be used to develop specification refinements by the close of the first year's research. Continued monitoring of projects throughout the second year would suggest further refinements. This process would continue until final evaluations were completed at the end of the third year. Upon completion, the draft specifications were to undergo a final series of refinements in preparation for formal introduction to DOTD's Standard Specifications once the details were approved by the chief engineer. Throughout the entire three-year assessment, the contractor was to be kept informed of any shortfalls in performance with remediation being enforced at the close of the third year if considered necessary. A summary of the originally proposed project coverage and associated schedule of program development is provided in Tables 4 and 5.

Only two asphalt projects out of the prescribed five made it to bid with a warranty clause. These were SP 819-02-0012 that went to bid on March 28, 2001, and SP 450-03-0037 that went to bid on June 27, 2001. Both projects completed construction, with final acceptance being given for SP 819-02-0012 (asphalt new construction) on May 6, 2002. Acceptance on SP 450-03-0037 (asphalt overlay) came on June 6, 2002. Only one PCC project (SP 817-08-0023) made it to bid with a warranty clause in place. The PCC project is still being monitored as of the writing of this report in February 2012 (acceptance was given on September 1, 2009). It should be noted that during construction the contractor had pressed to have the warranty clause dropped because of perceived problems in the subgrade. For details relating to the specifics on the various projects discussed herein, see Appendix B.

Table 4

Selected construction projects

Construction Types	FY 98-99	FY 99-00
Asphalt Concrete Pavement	5	5
Asphalt Surface Treatment	5	5
Microsurfacing	3	3
Painting and Protective Coatings	3	3
Plastic Painting Markings	5	5
Raised Pavement Markings	5	5
Portland Cement Concrete Pavement	1	1
Structural Concrete	1	1

Table 5

Schedule of work

Action Item	Section Responsible	Completion Date
1. Identification and Construction of Projects		
a. Select Projects	Const./Maint./LTRC	11/30/98
b. Provide Specifications	LTRC	11/30/98
c. Construct Projects – FY98-99	Construction	6/30/99
d. Construct Projects – FY99-00	Construction	6/30/99
e. Full Implementation of Specifications	Chief Engineer	12/31/00
2. Research Study		
a. Develop Proposal and Initiate Study	LTRC	12/01/98
b. Conduct Research	LTRC	6/30/00
c. Recommend Revised Specifications	LTRC	6/30/00

Project Monitoring and Oversight

Two asphalt projects that received bids were successfully constructed and accepted as full warranty jobs by the Department during the summer of 2002. This made it possible to carry out the full array of oversight initiatives and monitoring operations that the warranties program envisioned in both of their cases. An ongoing monitoring effort continued for the entire three-year duration of each project's respective warranty bond, which included a program of walking surveys, friction testing, and high-speed profiler testing to be conducted by LTRC on a six-month cycle.

LTRC's data collection regimen tabulated totals for each distress type listed in each project's warranty contract as cited in Appendix B. Efforts routinely monitored non-reflective cracking, rutting, shoving, raveling, bleeding, and potholes over the three years that their warranty bonds were in effect. Procedurally, this involved tabulating the totals for each of these distress types on a 10^{th} mile basis, which meant that for each 10^{th} mile segment of the project, a measurement was made on that segment's total cracking, its rut average, its total shoving, the bleeding it exhibited, and the number of potholes it had present.

Neither contract carried a roughness or friction clause. But, friction and roughness figures were collected on each project because the Department is considering the establishment of warranties in both areas in the future. Procedurally, results from both friction and roughness tests were averaged over the entire project with tests conducted on a six-month cycle. Table 6 provides a summary of the entire testing plan that LTRC carried out.

The Portland cement concrete (PCC) project received bids and was successfully constructed and accepted as a full warranty job by the Department during the fall of 2009. This project is still being monitored as of the writing of this report in February 2012. As the monitoring effort is ongoing, the details will not be elaborated on herein. It can be related that, to date, the PCC project has shown no warranty related problems.

Table 6

LTRC data collection summary

Test Type	Data Collected	Units
1. Automated High-Speed Laser Profiler (testing conducted in both highway directions, bi-annually):		
a. Automated rutting test	Total average rutting, independent of wheel-path / 10^{th} mile segment	inch
	Standard deviation of total average rutting / 10^{th} mile segment	—
b. Automated profile test	IRI (left wheel-path) /10^{th} mile segment	in./mile
	IRI (right wheel-path) /10^{th} mile segment	in./mile
	IRI (average of both wheel-paths) /10^{th} mile segment	in./mile
2. Automated Friction Tester (testing conducted in both highway directions, bi-annually):		
a. Ribbed tire friction test	Friction number / 10^{th} mile segment	FN
	Average test vehicle speed recorded during testing / 10^{th} mile section	mph
b. Smooth tire friction test	Friction number / 10^{th} mile segment	FN
	Average test vehicle speed recorded during testing / 10^{th} mile section	mph
3. Manual Walking Survey (testing conducted in both highway directions, bi-annually):		
a. Crack survey	Clipboard survey of crack totals / 10^{th} mile segment	various
b. General inspection	Clipboard survey of shoving, bleeding, raveling, potholes, etc.	various
c. Potholes	Clipboard survey of number and area / 10^{th} mile segment	various

1. "—" indicates that figure is unitless

DISCUSSION OF RESULTS

Pilot Project Findings

A summary of the testing regimen and subsequent findings and projections associated with the two asphalt warranties pilot projects is provided in Tables 7 through 11 with additional summaries and details being provided in Appendices C through H. Distresses like potholes and pop-outs that are not represented in the tables and appendices or which are not mentioned in the discussion indicate that the distress did not appear. Table 7 shows the schedule of testing that the two projects underwent and covers high-speed profiler, friction, ARAN, and associated follow-up tests. Walking surveys of cracking were typically conducted concurrent with the laser profiler testing.

Table 8 provides a brief summary of friction and profiler testing results collected by LTRC on I-10. Table 9 gives I-10's projected three-year distress estimates. Table 10 provides a brief summary of friction and profiler testing results collected by LTRC on LA422. And, Table 11 gives LA422's projected three-year distress estimates. Detailed summaries of this testing is provided in Appendices C and D. A summary of ARAN based profiler testing on the projects is provided in Appendices E and F. Appendix G provides a summary of cracking development and Appendix H summarizes follow-up tests. An examination of the tables and appendices indicate that project performance remained within acceptable warranty limits throughout the duration of each project's three-year bond period in all but a few instances. The warranty specifications used on both asphalt projects were developed through examination of work done by other state agencies, by examination of academic research and by consultation of the Department's own internal expertise. No assessment of archival resources was used to establish warranty thresholds for either of the two asphalt projects covered herein.

Pilot Project Findings: I-10

LTRC's monitoring effort indicated that some minor hairline cracking had begun to appear on I-10 as early as December of 2003. But, this cracking was not significant enough to warrant tracking until the May 2003 survey was taken. Subsequent surveys showed that the cracking had progressed steadily through June 2004. But, at no time were the distress levels observed to be in excess of performance thresholds. LTRC's crack evaluation summary is provided in Appendix G (Tables G-1, 2, and 3). An ARAN survey, conducted in February 2005, corroborated LTRC's findings.

Table 7
Testing schedule for warranty projects I-10 and LA 422

		Friction Tester		Laser Profiler		ARAN		Follow-up Inspections on LA422		
		422	I-10	422	I-10	422	I-10	Field Ins.	Dynaflect	Core
2002	May	Start		Start		Start		Start	Start	Start
	Jun		Start		Start		Start			
	Jul									
	Aug									
	Sep									
	Oct									
	Nov									
	Dec									
2003	Jan									
	Feb									
	Mar									
	Apr									
	May									
	Jun									
	Jul									
	Aug									
	Sep									
	Oct									
	Nov									
	Dec									
2004	Jan									
	Feb									
	Mar									
	Apr									
	May									
	Jun									
	Jul									
	Aug									
	Sep									
	Oct									
	Nov									
	Dec									
2005	Jan									
	Feb									
	Mar									
	Apr									
	May	End		End		End		End	End	End
	Jun		End		End		End			

A summary of the distress report from the ARAN survey is provided in Appendix G (Table G-4). The ARAN survey indicated that the cracking had advanced to a stage where distresses had exceeded warranty thresholds in a few locations (highlighted in grey in Table G-4). This proved to be misleading. Investigations showed that the ARAN system's automated distress analyzer and image recognition sub-systems had misclassified or over-estimated certain distresses (e.g., longitudinal cracks were misread as fatigue cracks). For this reason it was necessary to carry out quality control checks on the ARAN data. Once these checks had been carried out and adjustments were made (a process that involved visually inspecting the project's photo-logs alongside the ARAN crack estimates), the results were seen to come into better agreement with LTRC's walking survey results. The final assessment indicated that the pavement had remained within required tolerances in all areas for the duration of the project's three-year bond period. A summary of the "corrected" ARAN distresses is provided in Appendix G (Table G-5).

Table 8

Friction and roughness testing summary for I-10

PROJECT DETAILS

PROJECT	450-03-0037
PROJ NAME	Calcsieu Parish Line- Jct.LA 99
WORK TYPE	Rubblize PCCP and Overlay
PARISH	27-Jeff Davis
ROUTE1	I-10

BEG LIMITS	Calcasieu Ph Line
BEG LOG MI	0.00
END LIMITS	LA 99 Underpass
END LOG MI	10.68

DATE ASSGN	2/1/1987
SPEC YEAR	1992
BID DATE	6/27/2001
CONTR DATE	8/31/2001
WORK ORDER	10/10/2001
FINAL INSP	5/10/2002
ACCEPT DTE	6/6/2002

WARRANTY CLOSED 6/6/2005

FRICTION TESTING

			50 MPH 05/23/02	50 MPH 12/05/02	50 MPH 05/20/03	50 MPH 11/05/03	50 MPH 04/06/04	40 MPH 04/06/04	50 MPH 01/11/05	50 MPH 05/17/06
East Bound	Rib Tire	FN Max.	46.5	44.0	34.0	34.1	32.2	35.5	35.3	34.7
		FN Avg.	***44.0***	***39.4***	***30.9***	***32.2***	***30.7***	***32.9***	***32.9***	***31.8***
		FN Min.	40.7	36.5	28.1	29.0	28.4	30.1	30.1	28.2
		Stan. Dev.	1.44	1.91	1.29	1.36	1.04	1.46	1.30	1.51
		# of Test	22	22	22	22	21	21	22	22
	Smooth Tire	FN Max.	37.5	35.5	26.9	27.6	28.5	34.1	35.0	29.2
		FN Avg.	***34.1***	***32.1***	***23.9***	***23.9***	***23.3***	***27.7***	***28.5***	***25.2***
		FN Min.	31.3	28.0	20.7	19.7	19.6	22.0	23.2	20.3
		Stan. Dev.	2.02	1.84	1.85	1.85	2.35	3.18	3.00	2.60
		# of Test	22	22	22	22	21	21	22	22
West Bound	Rib Tire	FN Max.	45.4	42.1	32.3	31.7	32.4	36.4	35.4	34.2
		FN Avg.	***43.7***	***38.9***	***30.1***	***29.8***	***30.4***	***33.1***	***32.8***	***30.7***
		FN Min.	40.9	36.8	28.4	28.6	28.5	30.0	31.8	29.4
		Stan. Dev.	1.22	1.18	0.98	0.73	0.99	1.41	0.76	1.02
		# of Test	22	22	21	22	21	22	21	20
	Smooth Tire	FN Max.	36.2	43.2	26.5	24.9	26.3	29.9	36.4	28.2
		FN Avg.	***32.4***	***35.9***	***23.1***	***22.1***	***23.5***	***26.2***	***29.7***	***26.2***
		FN Min.	28.2	29.5	20.0	18.3	20.5	21.0	26.1	23.9
		Stan. Dev.	2.04	3.34	1.84	1.52	2.02	2.24	2.52	1.20
		# of Test	22	23	21	22	21	22	21	20

Note: Many tests were run at 50 mph for safety reasons (see text)

PROFILER

	FROM	TO	RUT AVG	RUT STD	IRI 1	IRI 2	AVG IRI
	(Miles)		(Inches)		(Inches/Mile)		
east 05-29-02	0.00	10.50	0.01	0.008	47	42	45
west 05-29-02	10.50	0.00	0.01	0.007	51	40	46
east 12-02-02	0.00	10.50	0.04	0.018	47	42	45
west 12-02-02	10.50	0.00	0.04	0.017	50	40	45
east 05-20-03	0.00	10.50	0.04	0.018	46	42	44
west 05-20-03	10.50	0.00	0.05	0.019	49	40	45
east 11-05-03	0.00	10.50	0.10	0.023	46	43	45
west 11-05-03	10.50	0.00	0.09	0.022	48	40	44
east 06-22-04	0.00	10.50	0.11	0.022	48	43	46
west 06-22-04	10.50	0.00	0.01	0.023	49	40	45
east 01-05-05	0.00	10.50	0.07	0.023	46	41	43
west 01-05-05	10.50	0.00	0.06	0.022	50	40	45
east 11-29-05	0.00	10.50	0.07	0.023	46	43	44
west 11-29-05	10.50	0.00	0.08	0.024	51	41	46
east 05-18-06	0.00	10.50	0.08	0.023	57	44	50
west 05-18-06	10.50	0.00	0.08	0.022	49	40	44

Friction and roughness tests were conducted on I-10 because the Department is considering establishment of a warranty requirement in both of these areas. A summary of test results can be found in Table 8. As regards friction testing, it is to be noted that ASTM E-501 and ASTM E-524 require that friction tests be conducted at 40 mph. However, given that I-10 is a high-speed, high-volume interstate, it was necessary to run the tests at 50 mph to prevent the friction tester from being rear-ended. Even with tests being conducted at this elevated speed, only one ribbed-tire test produced a friction number less than 30. Despite the fact that friction numbers did not fall significantly below the 30 threshold, testing showed that the ribbed-tire friction numbers had dropped significantly from around 44 to around 31 within the three years of testing. Given that the project was a Superpave design, this seemed excessive and the matter was, therefore, given closer scrutiny. The final determination was that the loss of friction resistance was largely due to the use of an aggregate source that has occasionally demonstrated early loss of friction.

Projected three-year distress estimates for the I-10 project are provided in Table 9. These estimates are based on the data collected by LTRC as summarized in Appendices C and G. ARAN data was not included in the estimates.

Table 9
Projected three-year distress estimates for I-10

3-Year Projected Distress based on LTRC testing (based on data found in Appendices C and G)		***Mean***	***Standard Deviation***	***Minimum***	***Maximum***
Average IRI (in/mile)		45.4	11.0	31	176
IRI 1 (in/mile)		49.3	12.1	31.7	172
IRI 2 (in/mile)		41.6	10.8	28	181
Rutting Standard Deviation		0.0228	0.0069	0	0.061
Rutting Average (inches)		0.0805	0.027	0	0.18
Friction Number	**Ribbed Tire**	30.6	1.28	28.1	46.5
	Smooth Tire	25.3	2.34	18.3	43.2
Cracking	**Low Transverse** (linear ft)	4.88	5.94	0	27.7
	Low Longitudinal (linear ft)	4.98	5.06	0	26.3
	Low Fatigue (ft^2)	0.92	2.16	0	8.46

Pilot Project Findings: LA 422

LA 422 began showing signs of cracking shortly after its first year of service, which developed steadily as the project aged. During the first year, many short hairline cracks began to appear (both longitudinal and transverse). The crack survey taken in May 2004 showed that the cracks were beginning to join into more continuous patterns. A summary of LTRC's cracking surveys are provided in Appendix G (Table G-6, 7, and 8). There was also a single low-severity patch (675 sq. ft.) in evidence located at mile 11.6 of the project.

Results from an ARAN test that became available in September 2004 showed that the emerging distress pattern had become more pronounced. ARAN classified most of the distresses as low-severity fatigue cracks. If it were confirmed that the cracks were fatigue cracks, this would mean that the project was in violation of its warranty clause at a number of locations and thus the warranty bond would have to be invoked. A summary of the "corrected" ARAN survey results are provided in Appendix G (Table G-9) with the possible violations highlighted in grey.

Manual inspection of photo-logs and preliminary field evaluations indicated that ARAN had misclassified the cracks in question. It was apparent that the cracks could not be fatigue cracks (as reported by ARAN) because the distress pattern was often located at some distance from the wheel-path where causative cyclical loading would be expected to occur. In addition, a clear pattern of transverse cracks started to form approximately every 20 to 40 ft. This pattern of crack development commonly develops on cement-treated base projects when the cement-treated material shrinks during curing. When this occurs, thin cracks in a cement-treated base will occur naturally every 30 ft. or so as the result of such shrinkage. Once it was confirmed that LA 422 had a cement-stabilized base course, it became clear that the cracks in question were reflective in nature.

Some of the cracks that appeared on LA 422, however, were not consistent with either reflective cracking or fatigue cracking. These cracks, running parallel to the roadway, developed quickly into long continuous fractures that were wider and more pronounced than the other cracks observed on the project. They were usually confined to isolated locations often adjacent to culverts, bridges, or fill sections. Field evaluations that included coring, the falling weight deflectometer (FWD), and visual inspections were carried out in April and May 2005. The core tests showed that the cracks extended through the entire thickness of the soil cement layer. The structural numbers (SN) shown in Table H-1 of Appendix H (west

bound lane) showed the problem areas also had particularly weak underlying support. For example, the area of the greatest cracking (station 7.670 to 7.682 in the right wheel path) was shown to have little to no strength. Appendix H-1 indicated that the SN values between these stations had ranged from -0.2 to 1.0, which can be seen was significantly lower than the SN figures found over the remainder of the project. What this implied was that the cracks in that vicinity were probably the result of slope failure. It was accepted that this was the case given that these cracks were typically found in close proximity to culverts, bridges, and fill sections.

Although it could definitively be established that slope failure was the cause of these cracks, it could not be conclusively determined if the onset of failure had begun in the embankment or in the base course. The core log report given in Table H-2 of Appendix H showed that the soil-cement layer had had significantly lower strength figures (soil cement modulus values ranged from 10.9 to 29.8) in the problem locations as compared to the rest of the project. But, it is possible that this base weakness occurred because the embankment failed beneath it. Such embankment failure would cause a loss of consolidation in the overlying base layer that would result in the base losing strength. In any event, the contractor agreed to repair those areas where shear failure appeared to have occurred. Given this and the fact that all other distresses were either below thresholds or were considered to be beyond contractor control, the warranty bond was not invoked and the contractor was released from further responsibility.

Although it was not a warranty bond requirement, LA 422 also underwent friction and roughness testing on a six-month cycle. As with the I-10 project, the reason for this testing was that the Department is considering establishment of a warranty requirement for both friction and roughness. A summary of test results can be found in Table 10. As previously noted, ASTM E-501 and ASTM E-524 require that friction testing is to be conducted at 40 mph. Table 10 shows most tests were run at this required speed. However, due to safety concerns, one test had to be conducted at 50 mph because the operator considered it unsafe to run the test at the required 40 mph.

The projected three-year distress estimates for the LA 422 project are provided in Table 11. These estimates are based on the data collected by LTRC as summarized in Appendices D and G. ARAN data was not included in the estimates.

Table 10

Friction and roughness testing summary for LA 422

PROJECT DETAILS

PROJECT	819-02-0012
PROJ NAME	LA 19 - LA 67
WORK TYPE	Ac Overlay
PARISH	19-E Feliciana
ROUTE1	LA 422

BEG LIMITS	LA 19
BEG LOG MI	0.00
END LIMITS	LA 67
END LOG MI	12.25

SPEC YEAR	1992
DATE ASSGN	7/29/1999
BID DATE	3/28/2001
CONTR DATE	5/14/2001
WORK ORDER	6/18/2001
FINAL INSP	4/24/2002
ACCEPT DTE	5/6/2002

WARRANTY CLOSED 5/6/2005

FRICTION TESTING

			40 MPH 12/02/02	40 MPH 01/08/03	40 MPH 05/19/03	40 MPH 11/04/03	40 MPH 06/02/04	40 MPH 01/12/05	50 MPH 05/11/06
East Bound	Rib Tire	FN Max.	62.8	59.9	57.5	56.0	56.4	55.2	55.2
		FN Avg.	***54.9***	***55.4***	***54.0***	***50.8***	***53.8***	***49.2***	***48.7***
		FN Min.	46.5	48.2	49.7	44.0	49.9	43.5	41.1
		Stan. Dev.	3.67	3.10	2.12	3.04	1.86	3.06	4.26
		# of Test	25	23	23	24	23	23	13
	Smooth Tire	FN Max.	70.0	53.0	47.5	41.3	56.9	45.7	41.8
		FN Avg.	***54.0***	***41.0***	***37.0***	***35.1***	***39.9***	***39.9***	***35.6***
		FN Min.	38.9	30.2	27.2	26.8	28.9	33.6	28.7
		Stan. Dev.	5.76	5.87	6.02	4.61	6.84	3.68	3.17
		# of Test	25	23	23	24	24	23	13
West Bound	Rib Tire	FN Max.	58.5	60.6	59.2	55.6	57.5	51.1	54.9
		FN Avg.	***54.4***	***56.4***	***54.9***	***51.1***	***53.1***	***47.5***	***51.7***
		FN Min.	46	49.3	47.2	39.7	47.4	43.2	46.4
		Stan. Dev.	3.32	2.92	2.53	3.02	2.11	2.16	2.39
		# of Test	24	23	23	23	24	24	13
	Smooth Tire	FN Max.	60.3	45.1	59.0	42.2	42.4	43.3	40.5
		FN Avg.	***54.7***	***41.3***	***41.1***	***36.5***	***38.9***	***38.2***	***37.9***
		FN Min.	48.1	34.2	32.4	30.7	33.4	33.9	33.2
		Stan. Dev.	3.40	3.01	5.23	2.98	2.56	2.56	1.98
		# of Test	24	23	24	24	24	24	13

Note: Some tests were run at 50 mph for safety reasons (see text)

PROFILER

	FROM (Miles)	TO (Miles)	RUT AVG (Inches)	RUT STD (Inches)	IRI 1 (Inches/Mile)	IRI 2 (Inches/Mile)	AVG IRI (Inches/Mile)
east 05-28-02	0.00	12.11	0.03	0.019	52	69	60
west 05-28-02	12.11	0.00	0.02	0.015	50	62	56
east 12-03-02	0.00	12.11	0.06	0.026	53	73	63
west 12-03-02	12.11	0.00	0.04	0.020	50	62	56
east 05-19-03	0.00	12.11	0.03	0.020	57	76	66
west 05-19-03	12.11	0.00	0.03	0.018	51	67	59
east 11-04-03	0.00	12.11	0.06	0.026	53	74	63
west 11-04-03	12.11	0.00	0.06	0.023	50	67	59
east 05-11-04	0.00	12.11	0.09	0.026	53	71	62
west 05-11-04	12.11	0.00	0.07	0.024	51	63	57
east 01-06-05	0.00	12.11	0.04	0.023	55	74	64
west 01-06-05	12.11	0.00	0.04	0.021	52	66	59
east 11-09-05	0.00	12.11	0.05	0.036	57	73	65
west 11-09-05	12.11	0.00	0.03	0.031	64	73	69
east 05-11-06	0.00	12.11	0.04	0.024	57	77	67
west 05-11-06	12.11	0.00	0.04	0.023	58	74	66

Table 11

Projected three-year distress estimates for LA 422

3-Year Projected Distress based on LTRC testing (based on data found in Appendices D and G)		*Mean*	*Standard Deviation*	*Minimum*	*Maximum*
Average IRI (in/mile)		64.1	20.4	39	93
IRI 1 (in/mile)		56.1	22.5	37.0	88
IRI 2 (in/mile)		72.1	21.0	37	119
Rutting Standard Deviation		0.0259	0.0107	0	0.055
Rutting Average (inches)		0.0459	0.021	0	0.1
Friction Number	**Ribbed Tire**	50.5	3.03	39.7	55.2
	Smooth Tire	37.5	3.53	26.8	41.8
Cracking	**Low Transverse** (linear ft)	0.718	1.15	0	4
	Low Longitudinal (linear ft)	29.2	64.4	0	333

Archival Analysis Findings

Some of the irregularities and eccentricities associated with the archival analysis should be elaborated on before a full summary of findings can be presented. Most relate to inconsistencies between what distress units of the warranty draft specifications require and what units these distresses were recorded in, as are found in archives. In the case of rutting, for example, the LA 422 warranty specification called for each 500-ft. segment to be subdivided 10 times so that rut figures could be monitored at 50-ft. intervals (see Appendix B). ARAN tabulates rut averages on a 528-ft. basis. Thus, it is not possible to achieve the 50-ft. resolution using ARAN. Even if it were possible to resolve the needed 50-ft. resolution from the raw data, the analysis would be significantly complicated by the fact that the larger 500-ft. interval requirement is not consistent with the 528-ft. interval that ARAN uses.

Another such irregularity needing special mention can be seen in the reporting of low-severity cracking. According to the Strategic Highway Research Program (SHRP) distress manual, low-severity longitudinal cracks should be reported in units of linear feet *[12]*. The image and description that SHRP provides to help identify such a crack is shown in Figure 1.

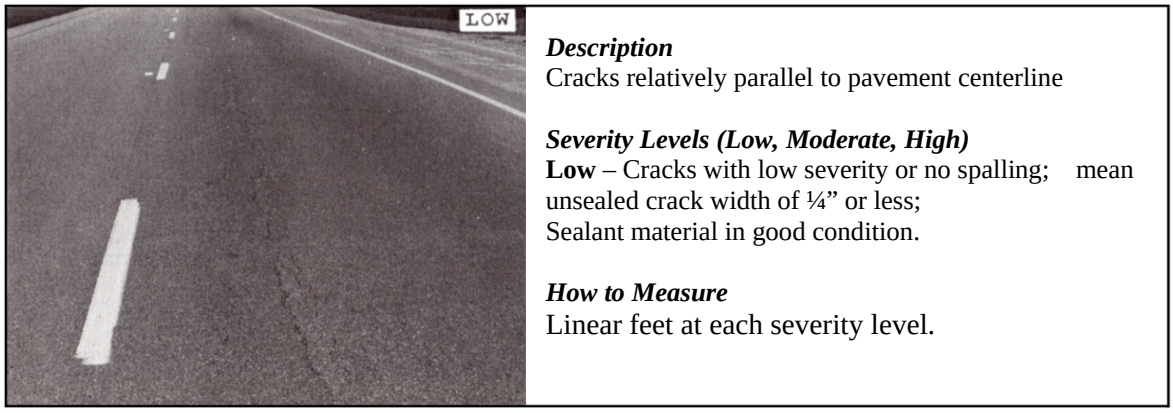


Figure 1
Identification of low-severity longitudinal cracks (SHRP Distress Manual)

The SHRP manual uses the same image to illustrate low-severity fatigue cracks. This fact illustrates that SHRP recognizes that the early stages of fatigue crack development can look similar to the early stages of longitudinal crack development. Engineering judgment must be used to make the distinction. SHRP recognizes this. For example, the SHRP manual stipulates that fatigue cracking "occurs only in areas subjected to repeated traffic loadings (usually in wheelpaths)." By contrast, all SHRP says about longitudinal cracking is that

cracks are “relatively parallel to the pavement centerline.” Thus, to distinguish a fatigue crack from a longitudinal crack, it is necessary to know something about the traffic loading.

These facts imply that SHRP expects that engineering judgment will be employed in the crack analysis process. Because ARAN’s automated crack evaluation algorithms cannot apply such judgment, it will often misclassify cracks. For example, if the ARAN system sees a crack in the wheelpath, it will automatically assume the crack to be a fatigue crack solely because it is located in the wheelpath. A field engineer’s examination of the project’s particulars along with a site inspection may prove ARAN wrong by revealing that the crack actually occurred because there was slope failure at the shoulder. A similar kind of miscalculation underlies how ARAN came to misclassify the cracks in the LA422 field study. For this reason, ARAN’s reporting of crack classification should not be used in the warranties analysis.

Research showed that crack quantities reported by ARAN could be accepted as reasonable provided ARAN crack classifications were ignored. An ARAN-based crack analysis was carried out as part of the archival analysis for this reason. Particularly useful in achieving this was the large body of high-resolution pavement surface photos collected for the Department by ARAN as part of an ongoing inventory contract. This photo archive allowed ARAN crack estimate totals to be verified. But, because the photo-logs could not be used to investigate the mechanism of crack development, it was not possible to use them to correct for misclassifications. It is to be noted that the crack classifications reported by ARAN are retained in the undertaken archival analysis. But, these are given for reporting purposes only and are not intended to be accepted as accurate on any level.

A final point needs to be made concerning ARAN’s handling of crack estimation. The SHRP manual stipulates that low-severity fatigue cracks should be measured in units of square feet instead of linear feet. Often, ARAN sees cracks in the wheelpath that are linear and hairline like. ARAN achieves the square foot measurement on low-severity fatigue cracks by arbitrarily assuming a 3-ft. wide zone around the crack. This is useful as it relates to the rehabilitation practice because it foresees the removal of 3-ft. of material to affect repairs. But, it leads to an over-estimation of the actual distress. This 3-ft. over-estimation was left in the summaries because attempting to apply a correction factor would complicate the issue.

New Asphalt

A canvas of archival resources yielded 33 newly construction asphalt projects ranging in age from 2.33 years old to 5.31 years old that were suitable for a warranties analysis. These projects represent 122 miles of roadway comprising some 1,220 tenth-mile long pavement segments (each segment representing some 45 distress types for a total of more than 54,900 distress figures suitable for analysis). The ARAN image archive for the dataset included 12,200 frames. A summary of the projects is found in Table 12 and a map illustrating their distribution is provided in Figure 2. The map also shows the locations of the two warranty projects that were built for this study.

Descriptive statistics were evaluated for each distress type. The results from this analysis are shown in Table 13. Manual assessment of photo-logs was carried out on a subset of the 33 projects to estimate bleeding, raveling, and shoving. Manpower and time restraints prevented a full examination of all 33 projects; project selection was based on pavement age – pavements between three to four years of age were given preference. A summary of this assessment is found in Table 14. LTRC archives contained results from 465 friction tests taken on 20 projects. A summary is provided in Table 15 which shows the mean, standard deviation, minimum value, and maximum value.

Items in Tables 13 and 15 that are highlighted in grey indicate that a relevant percentage of the samples tested exceed the proposed warranty requirements to some extent. “Mean” figures in the tables indicate the 50^{th} percentile performance level and “Mean-2s” or “Mean+2s” figures indicate the 5^{th} or 95^{th} percentile performance levels. If the testing and analysis techniques that underlie these estimates can be trusted, it means that the proposed warranty thresholds in the highlighted areas are either too restrictive or that construction and materials QA/QC are too lax.

As previously noted, ARAN can have difficulty distinguishing between fatigue cracking and longitudinal cracking. For this reason, fatigue and longitudinal crack estimates detailed in Table 13 can be only tentatively endorsed. This is particularly true for the low-severity fatigue cracking estimate since, as stated previously, ARAN often over-estimates such cracks by a factor of three. Edge cracking was not examined because ARAN’s camera aperture is not wide enough to consistently produce a clear shot of the pavement’s edge. On unpaved or problem shoulders, the operator tends to drive closer to the centerline of the road, which prevents the ARAN cameras from being able to capture clear shots of the pavement edge.

Table 12

Summary of asphalt projects found in archives

ID	DIST.	PROJECT NUMBER	PROJ. LEN.	AGE (yrs)	FROM-TO	1/10th MI. SEGMENTS ELIMINATED: (RR crossings, bridge/road, and OL)
1	7	197-03-0014	10.7	4.68493	1018 – 1125	1040-1, 1067
2	62	853-02-0012	10.2	4.83562	1000 – 1102	1061-2
3	8	133-02-0012	8.6	2.71507	1049 – 1134	1107-10, 1056, 1134
4	3	220-01-0006	8.1	4.78082	1000 – 1081	1061
5	7	827-03-0020	7.4	5.06027	1006 – 1080	1008-9
6	58	177-30-0018	6.3	4.85479	1000 – 1062	1062
7	58	039-03-0014	6.2	3.72329	1024 – 1085	1051, 1081
8	8	432-01-0014	5.8	4.52877	1552 – 1609	1552-3, 1583
9	8	029-03-0031	5.5	3.50137	1001 – 1058	1002, 1057-8
10	8	091-07-0016	5.4	4.47945	1000 – 1053	1039-42, 1053
11	62	262-03-0006	5.3	4.54795	1008 – 1060	1008, 1027
12	8	368-03-0025	4.9	4.46301	1030 – 1078	1078
13	3	243-02-0076	4.9	4.60548	1007 – 1055	1007, 1013, 1037
14	3	219-08-0010	3.9	4.74521	1002 – 1040	1002
15	3	857-68-0001	3.8	5.22740	1000 – 1037	1000, 1035
16	3	391-02-0004	3.7	4.96438	1055 – 1091	1069-73, 1081-2
17	8	123-04-0018	3.1	4.22740	1087 – 1117	1087-8, 1115
18	58	039-03-0011	2.5	5.30959	1000 – 1024	1002-3, 1005-6
19	61	861-08-0015	2.1	2.10411	1020 – 1040	1033
20	62	859-09-0015	1.8	2.60000	1000 – 1017	1008
21	61	804-13-0005	1.6	4.35890	1000 – 1015	--- OK ---
22	8	147-05-0009	1.1	3.27123	1000 – 1010	1008-9
23	8	147-05-0007	1.1	4.04658	1000 – 1010	
24	58	830-17-0005	1.1	4.87671	1000 – 1010	--- OK ---
25	7	827-19-0005	1.1	5.05753	1000 – 1010	1010
26	58	346-02-0015	1.0	2.82466	1053 – 1062	1061-2
27	7	827-25-0008	1.0	4.99178	1005 – 1014	1007, 1004
28	7	810-27-0009	0.9	4.70959	1008 – 1016	--- OK ---
29	58	813-31-0001	0.7	4.84932	1000 – 1006	--- OK ---
30	8	146-01-0024	0.7	3.59452	1078 – 1084	1078
31	8	146-01-0023	0.6	4.36986	1079 – 1084	
32	5	324-02-0016	0.5	2.32603	1057 – 1061	--- OK ---
33	5	833-09-0005	0.4	2.68767	1032 - 1035	1032, 1035

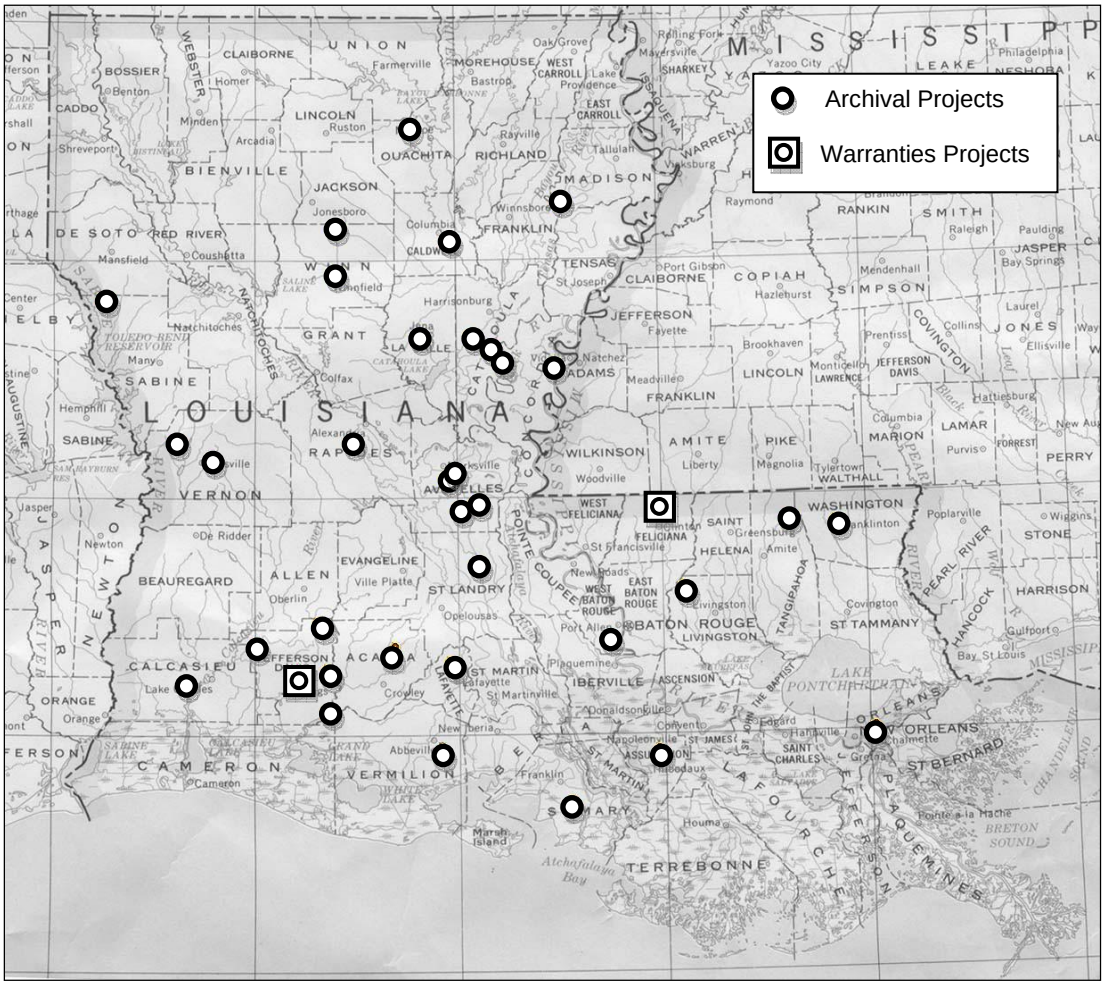


Figure 2
Distribution of new asphalt projects used in warranties analysis

Table 13

Statistical summary of new asphalt projects found in archives

(33 projects: 1220 segments) (Ages range from 2.33 to 5.31 yrs)		Units	Mean	Std Dev	Min	Max	Mean+ 2s	Warranty Requirement
Rutting	**Total avg**	in	0.1130	0.0409	0	0.35	0.1948	≤ 0.35
	Total std dev		0.0309	0.0413	0	0.30	0.1135	not specified
	5 Point left avg	in	0.0603	0.0618	0	0.37	0.1839	≤ 0.35
	5 Point left std dev		0.0295	0.0272	0	0.14	0.0839	not specified
	5 Point right avg	in	0.0212	0.0427	0	0.35	0.1066	≤ 0.35
	5 Point right std dev		0.0127	0.0275	0	0.22	0.0677	not specified
	5 Point total avg	in	0.0407	0.0357	0	0.25	0.1121	≤ 0.35
	5 Point total std dev		0.0474	0.0318	0	0.21	0.111	not specified
IRI	**Left wheel path**	IRI	67.9	15	50	180	97.9	not specified
	Left std dev		17.1	15	0	150	47.1	not specified
	Right wheel path	IRI	79.4	27	50	308	133.4	not specified
	Right std dev		26.4	25	0	213	76.4	not specified
	Avg left and right	IRI	73.7	19	50	236	111.7	not specified
	Avg std dev		24.3	21	0	173	66.3	not specified
Fatigue Cracking$_1$	**Low$_1$**	ft^2	237	320	0	2555	877	≤ 10
	Medium$_1$	ft^2	66.2	229	0	2071	524.2	≤ 10
	High$_1$	ft^2	0.115	3	0	109	6.115	= 0
Longitudinal Cracking	**Low**	Lin ft	23.0	50	0	529	123	≤ 50
	Medium	Lin ft	20.0	65	0	590	150	= 0
	High	Lin ft	0.331	6	0	174	12.331	= 0
Transverse Cracking	**Low**	Lin ft	75.9	89	0	444	253.9	≤ 50
	Medium	Lin ft	22.9	44	0	300	110.9	= 0
	High	Lin ft	0.0105	0	0	12	0.0105	= 0
Block Cracking	**Low**	ft^2	29.3	148	0	1581	325.3	≤ 10
	Medium	ft^2	3.77	60	0	1334	123.77	≤ 10
	High	ft^2	0	0	0	0	0	= 0
Random Cracking	**Low**	Lin ft	128	193	0	1581	514	not specified
	Medium	Lin ft	46.7	105	0	1337	256.7	not specified
	High	Lin ft	0.342	6	0	174	12.342	not specified
Potholes	**Number**	ft^2	0	0	0	0	0	= 0
	Area	ft^2	0	0	0	0	0	= 0
Patches	**Area (low)**	ft^2	7.73	83	0	1498	173.73	not specified
	Area (medium)	ft^2	2.46	29	0	568	60.46	not specified
	Area (high)	Count	0.689	13	0	285	26.689	not specified
	Number (low)	Count	0.0422	0.269	0	4	0.5802	not specified
	Number (medium)	Count	0.0246	0.181	0	3	0.3866	not specified
	Number (high)	Count	0.0096	0.129	0	3	0.2676	not specified

Note 1: Fatigue cracking may be overestimated by as much as a factor of three (see text for details)

Table 14

Summary of bleeding, raveling, and shoving on new asphalt projects found in archives

(10 projects: 264 segments) (Ages range from 2.33 to 5.31 yrs)		Units	Mean	Standard Deviation	Minimum	Maximum	Mean+2s
Bleeding	**Area**	ft^2	(of the 264 tenth mile segments looked at (26.4 miles of pavement) there were three instances of bleeding in evidence **(Both the Mean and 95th Percentile areas were under the 10 ft^2 threshold set by the warranties program)**				
	Number	Count	0.0114	0.106	0	1	0.2234
low Raveling	**Area**	ft^2	(of the 264 tenth mile segments looked at (26.4 miles of pavement) there was one instance of "low" raveling in evidence) **(Both the Mean and 95th Percentile area was under the 10 ft^2 threshold set by the warranties program)**				
	Number	Count	0.0038	0.0615	0	1	0.1268
Shoving	**Area**	ft^2	**(of the 264 tenth mile segments looked at (26.4 miles of pavement), no instances of shoving in evidence)**				
	Number	Count	0	0	0	0	0

Note 1: All results are based on manual inspection of photo-logs

Table 15

Summary of friction testing on new asphalt projects found in archives

(20 projects: 465 tests) (Ages range from 2.38 to 5.81 yrs)		Units	Number of Tests	Mean	Standard Deviation	Minimum	Maximum	Mean-2s	Warranty Requirement
Friction	**Treaded tire**	FN	280	40.46	4.72	28.3	55.4	31.0	≥ 30
	Bald tire	FN	185	30.08	6.98	13.6	51.9	16.1	≥ 30

Asphalt Overlay

A canvas of archival resources yielded 198 asphalt overlay projects ranging in age from 2.29 years old to 5.33 years old that were suitable for a warranties analysis. These projects represent 1,197 miles of roadway comprising some 11,970 tenth-mile long pavement segments (each segment representing some 45 distress types for a total of more than 538,650 distress figures suitable for analysis). The ARAN image archive for the dataset included 119,700 frames. A brief summary of the projects is found in Table 16.

Descriptive statistics were evaluated for each distress type. The results from this analysis are shown in Table 17. Manual assessment of photo-logs was carried out on a subset of the 198 projects to estimate bleeding, raveling, and shoving. Manpower and time restraints prevented a full examination of all 198 projects; project selection was based on pavement age with pavements between three to four years of age being given preference. A summary of this assessment is found in Table 18. LTRC archives contained results from 1740 friction tests taken on 144 projects. A summary is provided in Table 19.

Items in Tables 17 and 19 that are highlighted in grey indicate that a relevant percentage of the samples tested exceed the proposed warranty requirements to some extent. “Mean” figures in the tables indicate the 50^{th} percentile performance level and “Mean-2s” or “Mean+2s” figures indicate the 5^{th} or 95^{th} percentile performance levels. If the testing and analysis techniques that underlie these estimates can be trusted, it means that the proposed warranty thresholds in the highlighted areas are either too restrictive or that construction and materials QA/QC are too lax.

Concerning Table 19, it should be noted that some of the projects tested were known to make use of an aggregate source that has occasionally demonstrated a loss of friction. It was suspected that these projects may have influenced findings. Thus, two separate analyses were carried out. The first did not make a distinction between aggregate sources. For this analysis, projects utilizing the suspect aggregate were grouped together with those that did not. The results of this first analysis are given in Table 19 under the heading “Analysis I.” For the second analysis, the projects utilizing the suspect aggregate were removed from the database. The results of this second analysis are given in Table 19 under the heading “Analysis II.”

Table 16

Summary of asphalt overlay projects found in archives

ID	DIST.	PROJECT NUMBER	PROJ. LEN.(mi)	AGE (yrs)
1	61	219-01-0026	14.1	2.29
2	61	819-02-0012	21.9	2.41
3	8	015-01-0050	3.7	2.41
4	8	455-06-0044	9.1	2.46
5	8	015-30-0012	0.3	2.49
6	8	008-09-0053	17	2.50
7	8	023-05-0034	11.5	2.54
8	61	839-12-0007	8.8	2.54
9	8	023-01-0052	0.7	2.56
10	8	074-02-0022	13.2	2.62
11	8	053-05-0043	4.2	2.72
12	62	013-11-0030	5.5	2.85
13	62	832-12-0013	1.2	2.87
14	58	344-01-0018	8.5	2.88
15	58	354-02-0014	9.3	2.92
16	8	066-03-0023	11.1	2.93
17	8	455-05-0098	6.7	2.97
18	7	377-02-0008	20.8	2.97
19	62	058-04-0013	12.1	3.04
20	3	004-05-0031	22.6	3.04
21	7	195-03-0031	5.2	3.19
22	61	253-03-0008	3.9	3.22
23	61	253-04-0011	9.9	3.22
24	58	830-08-0012	6.4	3.25
25	2	005-04-0025	30.5	3.25
26	2	005-05-0069	9.8	3.25
27	61	013-05-0042	11.9	3.33
28	61	450-08-0045	4	3.33
29	61	229-03-0009	11.9	3.34
30	58	026-06-0049	7.2	3.34
31	8	022-03-0043	7.2	3.38
32	4	814-08-0001	1	3.41
33	4	860-12-0001	0.8	3.41
34	62	852-12-0015	5.2	3.42
35	61	804-41-0001	0.9	3.42
36	62	278-06-0010	7.8	3.42
37	62	452-90-0124	7.7	3.43
38	3	057-05-0026	21.1	3.44
39	61	804-16-0017	3.6	3.45
40	61	230-03-0024	4.3	3.49
41	62	272-04-0009	3.9	3.51
42	7	132-01-0013	3.8	3.54
43	7	190-01-0020	2.9	3.54
44	62	262-30-0006	6.9	3.54
45	4	043-06-0021	14.3	3.55
46	62	256-30-0014	3.2	3.59
47	8	822-16-0001	3.9	3.60
48	62	853-37-0006	3.6	3.62
49	8	015-04-0045	10.9	3.63
50	7	066-04-0025	19.8	3.64
51	58	125-03-0028	12.7	3.65
52	2	064-02-0025	5.8	3.65
53	61	819-17-0004	7.4	3.65
54	8	015-02-0017	4.4	3.70
55	8	455-04-0016	2.3	3.71
56	2	845-07-0030	11.1	3.77
57	2	006-05-0077	17.1	3.79
58	62	848-15-0006	3.9	3.79
59	5	015-31-0041	8.3	3.80
60	62	859-07-0004	2.4	3.85
61	61	008-03-0050	13.1	3.87
62	62	853-14-0003	5.4	3.88
63	62	454-04-0052	0.5	3.89
64	62	852-25-0013	5.2	3.89
65	2	046-06-0036	30.8	3.90
66	8	052-06-0028	2	3.91
67	8	417-02-0031	13.4	3.93
68	62	271-02-0009	7.3	3.95
69	3	455-03-0016	5.7	3.96
70	3	455-90-0006	0.8	3.96
71	3	455-02-0061	18.8	3.97
72	3	455-91-0007	5.6	3.97
73	61	231-02-0005	11.3	3.98
74	5	067-09-0038	9.4	4.00
75	2	005-09-0033	8.9	4.00
76	61	863-02-0025	16.4	4.01
77	3	213-06-0006	5	4.02
78	58	854-20-0006	1.1	4.02
79	58	854-24-0004	6.4	4.02
80	58	854-01-0011	4	4.03
81	3	241-02-0044	17.4	4.05
82	3	850-29-0006	6.8	4.05
83	61	224-02-0026	1.6	4.08
84	3	380-02-0008	7.2	4.10
85	3	206-01-0011	28.3	4.19
86	8	052-08-0046	0.6	4.22
87	7	191-03-0012	8.1	4.22
88	61	219-02-0018	0.8	4.22
89	62	047-04-0026	2	4.27
90	62	846-08-0010	0.9	4.27
91	62	859-28-0001	2.4	4.28
92	62	853-11-0007	3.8	4.29
93	5	185-01-0013	10.6	4.30
94	5	161-05-0007	1.4	4.31
95	5	842-13-0007	3.6	4.31
96	61	264-04-0014	5	4.32
97	7	810-29-0011	3	4.34
98	62	848-12-0014	2.6	4.36
99	62	848-17-0003	1.3	4.36
10	8	053-04-0033	6	4.36

Table 16

Summary of asphalt overlay projects found in archives (continued)

ID	DIST.	PROJECT NUMBER	PROJ. LEN. (mi)	AGE (yrs)
101	61	222-03-0009	12.5	4.41
102	7	031-09-0031	9.8	4.45
103	62	058-05-0015	17.2	4.48
104	8	022-02-0033	16.8	4.48
105	61	265-02-0013	9.4	4.48
106	3	850-01-0012	13.8	4.48
107	61	013-04-0036	5.2	4.50
108	5	071-04-0010	5.6	4.53
109	2	829-25-0006	6.4	4.53
110	58	015-07-0045	3.3	4.54
111	3	424-02-0072	13.3	4.55
112	62	017-04-0043	2.9	4.57
113	5	182-01-0015	8.7	4.57
114	2	284-30-0022	13.9	4.58
115	61	225-01-0014	1.2	4.58
116	62	059-01-0018	3.5	4.58
117	3	828-21-0011	2.4	4.58
118	61	847-01-0010	6.6	4.58
119	8	008-08-0025	12.2	4.59
120	62	268-01-0014	14.4	4.60
121	58	036-01-0022	11.4	4.60
122	5	167-02-0014	18	4.61
123	62	852-26-0012	4.1	4.61
124	2	826-11-0015	10.1	4.62
125	61	804-17-0010	3.3	4.63
126	61	228-07-0014	3.2	4.64
127	7	198-03-0021	10.5	4.64
128	58	026-07-0025	2.3	4.67
129	62	256-02-0024	14.8	4.67
130	61	061-04-0056	9.8	4.67
131	8	009-01-0074	2.4	4.68
132	2	450-15-0104	8.7	4.72
133	7	810-15-0013	3.9	4.72
134	5	038-04-0009	16.4	4.73
135	61	257-02-0013	2.4	4.73
136	61	257-03-0020	3.9	4.73
137	8	009-02-0017	5.9	4.73
138	3	066-07-0036	16.3	4.74
139	5	162-01-0026	10.7	4.77
140	62	846-05-0008	8.8	4.78
141	2	845-25-0001	1.1	4.79
142	62	853-07-0006	2	4.79
143	58	015-05-0039	3.4	4.80
144	5	070-06-0023	5.4	4.81
145	5	157-03-0018	1.2	4.81
146	2	248-02-0036	7.2	4.81
147	2	248-03-0010	10	4.81
148	2	064-01-0041	12.8	4.83
149	2	826-05-0015	1.5	4.83
150	2	826-08-0004	1.3	4.83
151	2	412-03-0010	9.9	4.83
152	62	059-02-0025	0.6	4.84
153	4	085-05-0023	4.2	4.85
154	61	230-01-0015	12.6	4.85
155	62	059-30-0007	3.2	4.86
156	2	046-31-0045	2	4.86
157	58	040-04-0027	8.9	4.88
158	5	154-02-0013	7.2	4.89
159	5	038-01-0030	8.2	4.89
160	2	282-02-0042	5.7	4.89
161	3	828-28-0007	6.4	4.90
162	3	213-02-0006	3.8	4.92
163	61	450-11-0041	7.5	4.93
164	62	279-04-0021	11.4	4.94
165	5	070-03-0016	8.4	4.95
166	62	266-03-0008	1.4	4.95
167	62	260-03-0010	19.5	4.95
168	2	407-03-0019	13.2	4.96
169	2	407-90-0007	0.8	4.96
170	61	450-12-0022	5	4.96
171	61	817-36-0004	3.1	4.97
172	2	007-02-0084	14.1	4.97
173	61	256-07-0012	10.1	4.98
174	2	826-45-0010	0.3	4.98
175	62	853-08-0012	0.3	5.00
176	3	147-02-0006	6.3	5.00
177	8	432-01-0016	11.8	5.04
178	4	451-01-0083	9.2	5.08
179	62	270-01-0009	4	5.10
180	2	284-02-0031	0.8	5.11
181	61	839-17-0005	3.2	5.12
182	61	839-26-0001	0.4	5.12
183	4	072-02-0011	10.3	5.15
184	2	148-01-0024	1.3	5.16
185	62	453-01-0046	2.5	5.19
186	62	018-30-0018	12.3	5.20
187	3	391-02-0006	3	5.20
188	3	375-01-0004	13.6	5.22
189	61	824-10-0007	5.3	5.22
190	8	033-01-0027	4.6	5.26
191	4	045-03-0024	20.2	5.26
192	5	067-07-0011	13.2	5.27
193	61	861-14-0013	16.6	5.27
194	2	450-37-0018	0.9	5.30
195	2	838-05-0011	6.7	5.33
196	4	814-02-0005	6.2	5.33
197	62	853-12-0013	6.6	5.33
198	8	835-17-0004	2.6	5.33

Table 17

Statistical summary of asphalt overlay projects found in archives

(198 projects: 11,975 segments) (Ages range from 2.29 to 5.33 yrs)		Units	Mean	Std Dev	Min	Max	Mean+2s	Warranty Requirement
Rutting	**Total average**	in	0.114	0.0925	0	0.68	0.299	≤ 0.35
	Total std dev		0.0425	0.0460	0	0.57	0.1345	not specified
	Left average	in	0.116	0.0967	0	0.76	0.3094	≤ 0.35
	Left std dev		0.0286	0.0295	0	0.43	0.0876	not specified
	Right average	in	0.108	0.100	0	0.87	0.308	≤ 0.35
	Right std dev		0.0356	0.0500	0	0.78	0.1356	not specified
IRI	**Left wheel path**	IRI	72.4	30.2	30	547	132.8	not specified
	Left std dev		19.3	15.8	0	222	50.9	not specified
	Right wheel path	IRI	85.5	40.8	31	632	167.1	not specified
	Right std dev		25.4	23.4	0	310	72.2	not specified
	Avg left and right	IRI	78.9	33.7	31	589	146.3	not specified
	Avg std dev		24.9	21.0	0	253	66.9	not specified
Fatigue Cracking[1]	**Low[1]**	ft^2	50.4	171	0	2049	392.4	≤ 10
	Medium[1]	ft^2	5.75	68.7	0	1581	143.15	≤ 10
	High[1]	ft^2	0.143	5.81	0	466	11.763	= 0
Longitudinal Cracking	**Low**	Lin ft	10.7	50.2	0	1047	111.1	≤ 50
	Medium	Lin ft	1.96	19.1	0	476	40.16	= 0
	High	Lin ft	0.0297	1.5	0	134	3.0297	= 0
Transverse Cracking	**Low**	Lin ft	25.5	71.9	0	1044	169.3	≤ 50
	Medium	Lin ft	2.50	13.4	0	312	29.3	= 0
	High	Lin ft	0.0732	1.42	0	67	2.9132	= 0
Block Cracking	**Low**	ft^2	4.43	63.0	0	1583	130.43	≤ 10
	Medium	ft^2	8.14	137	0	2639	282.14	≤ 10
	High	ft^2	0.136	11.5	0	1153	23.136	= 0
Random Cracking	**Low**	Lin ft	38.6	119	0	1583	276.6	not specified
	Medium	Lin ft	12.5	139	0	2639	290.5	not specified
	High	Lin ft	0.233	11.7	0	1153	23.633	not specified
Potholes	**Number**	ft^2	0.00238	0.0512	0	2	0.10478	= 0
	Area	ft^2	0.00444	0.150	0	13	0.30444	= 0
Patches	**Area (low)**	ft^2	1.48	35.1	0	2346	71.68	not specified
	Area (medium)	ft^2	1.07	26.2	0	1688	53.47	not specified
	Area (high)	Count	0.558	27.5	0	2428	0.983	not specified
	Number (low)	Count	0.0165	0.179	0	6	0.0193	not specified
	Number (medium)	Count	0.0223	0.449	0	35	0.0293	not specified
	Number (high)	Count	0.00814	0.209	0	17	0.42614	not specified

Note 1: Fatigue cracking may be overestimated by as much as a factor of three (see text for details)

Table 18
Summary of bleeding, raveling, and shoving on asphalt overlay projects found in archives

(33 Projects comprising 163.2 miles of data - Ages ranging from 2.5 yrs to 3.45 yrs)

District	Parish	Project	Age	Number of Segments	Milling		Bleeding	Raveling
					Number	Area (ft^2)	Area (ft^2)	Area (ft^2)
2	55	005-04-0025	3.25	160	0	0	0	(36+36)+(16)+(10+30)=128
2	55	005-05-0069	3.25	52	0	0	0	0
3	20	057-05-0026	3.44	109	0	0	0	0
3	23	004-05-0031	3.04	97	16	(60)+(360+360)+(216+216)+(432+432)+(108+108)+(36+36+36)+(360+360)+(432+432)=3984	0	(48)+(16)=64
4	14	814-08-0001	3.41	5	0	0	0	0
4	60	860-12-0001	3.41	6	0	0	0	0
7	6	377-02-0008	2.97	115	0	0	0	0
7	10	195-03-0031	3.19	28	1	12	0	0
8	35	053-05-0043	2.72	22	0	0	0	0
8	40	008-09-0053	2.50	87	0	0	0	0
8	40	074-02-0022	2.62	66	0	0	0	0
8	40	015-30-0012	2.82	4	0	0	0	0
8	40	455-05-0098	2.98	70	0	0	0	0
8	58	066-03-0023	2.93	58	0	0	0	0
8	64	023-05-0034	2.54	64	6	(504)+(360)+(432)+(432)+(360)+(216)=2304	0	0
8	64	022-03-0043	3.38	41	0	0	0	0
58	13	354-02-0014	2.92	51	0	0	0	0
58	21	344-01-0018	2.88	50	0	0	0	0
58	21	026-06-0049	3.34	37	0	0	0	0
58	30	830-08-0012	3.25	36	0	0	0	0
61	4	804-41-0001	3.42	9	0	0	0	0
61	4	804-16-0017	3.45	20	0	0	0	0
61	17	253-03-0008	3.22	23	0	0	0	0
61	17	253-04-0011	3.22	54	0	0	0	0
61	17	013-05-0042	3.33	64	0	0	0	0
61	24	229-03-0009	3.34	61	1	360	0	0
61	39	839-12-0007	2.54	45	0	0	0	0
61	61	450-08-0045	3.33	20	0	0	0	0
62	32	832-12-0013	2.87	9	0	0	0	0
62	52	013-11-0030	2.85	30	0	0	0	(72+40)=112
62	52	852-12-0015	3.42	29	1	360	0	0
62	53	278-06-0010	3.42	43	0	0	0	0
62	59	058-04-0013	3.04	67	0	0	0	0
			Sum:	***1632***	***25***	***7020***	***0***	***304***
			Mean:	***0.015***	***4.3***		***0***	***0.19***
			Std Dev:	***0.425***	***39.6***		***0***	***2.8***
			Min:	***0***	***0***		***0***	***0***
			Max:	***16***	***504***		***0***	***72***
			Mean + 2s:	***0.865***	***83.5***		***0***	***5.79***
			Warranty Requirement:		***not specified***		***≤ 10***	***≤ 10***

Table 19
Summary of friction testing on
asphalt overlay projects found in archives

	Analysis I_1		Analysis II_2	
	Treaded Tire	**Bald Tire**	**Treaded Tire**	**Bald Tire**
Units	Friction Number	Friction Number	Friction Number	Friction Number
Number of Tests Conducted	980	760	578	279
Number of Projects Involved	65	56	54	26
Mean	40.8	25.8	42.5	26.4
Standard Deviation	10.01	8.02	10.7	7.69
Minimum	26.1	4.56	28.7	4.56
Maximum	74.6	55.1	74.5	45.75
Mean-2s	20.78	9.76	21.1	11.02
Warranty Requirement	≥ 30	≥ 30	≥ 30	≥ 30

1. Projects utilizing suspect aggregate source included in analysis.
2. Projects utilizing suspect aggregate source not included in analysis.

PCCP

A canvas of archival resources produced 11 Portland cement concrete pavement (PCCP) projects ranging in age from 2.87 years old to 5.05 years old that were suitable for a warranties analysis. These projects represent 14 miles of roadway comprising some 140 tenth-mile long pavement segments (each segment representing 34 distress types for a total of more than 4,760 distress figures suitable for analysis). The ARAN image archive for the dataset included 1,400 frames. A summary of the projects is found in Table 20 and a map illustrating their distribution is provided in Figure 3. Figure 3 also shows the position of SP 817-08-002, the PCCP warranty project currently being monitored. It should be noted that all of the PCCP projects analyzed were jointed concrete pavement (JCP) as there were not enough continuously reinforced concrete pavement (CRCP) projects represented in the archives to carry out a proper CRCP analysis.

Descriptive statistics for distresses observed on these projects are shown in Table 21. With regards to Table 21, the fatigue, longitudinal, and transverse crack estimates cannot be fully endorsed for reasons relating to ARAN operations. Note that the SHRP distress manual does account for PCCP fatigue cracking. Despite this, ARAN will interpret some of the cracks it sees on the PCCP projects as fatigue cracks. As previously discussed, such misclassified "fatigue" cracks are typically over-estimated by a factor of three.

Manual assessment of photo-logs was carried out on the 8 projects to estimate corner breaks, joint spalling, and joint seal damage. A summary of this assessment is found in Table 22. Note that it was not possible to carry out an assessment on all of the 11 PCCP projects listed in Table 20 due to problems with photolog quality and availability (only projects 1,2,3,4 and 6 could be analyzed). To improve coverage, an additional three projects were introduced from archives. These are marked with an "X" in Table 22. LTRC archives contained results from 123 friction tests taken on 14 projects. A summary is provided in Table 23. Lane-to-shoulder separation was not examined because ARAN's camera aperture was not wide enough to consistently produce clear shots of the pavement's edge.

Items in Tables 21, 22, and 23 highlighted in grey indicate that a relevant percentage of the samples tested exceed proposed warranty requirements to some extent. "Mean" figures in the tables indicate the 50^{th} percentile performance level and "Mean-2s" or "Mean+2s" figures indicate the 5^{th} or 95^{th} percentile performance levels. If the analysis techniques that underlie these estimates can be trusted, it means the proposed warranty thresholds in the highlighted areas are either too restrictive or that construction and materials QA/QC are too lax.

Table 20

Summary of PCCP projects found in archives

ID	DIST.	PROJECT NUMBER	PROJ. LEN.	AGE (yrs)	FROM-TO	1/10th MI. SEGMENTS ELIMINATED: (RR crossings, Problem bridge/road, and OL)
1	4	451-04-0029	6.1	4.60548	1074-1134	1120
2	8	455-05-0037	2.1	5.05479	1260-1280	1278-80
3	4	455-08-0030	1.7	4.01096	1070-1086	--- OK ---
4	5	315-02-0037	1.6	4.89589	1005-1020	1013
5	61	258-32-0011	0.8	2.90137	1002-1009	1007-8
6	8	008-30-0037	0.6	3.12603	1041-1046	--- OK ---
7	4	455-08-0037	0.6	4.73973	1105-1110	1105-6
8	61	817-40-0004	0.2	3.77534	1036, 1037	--- OK ---
9	4	102-02-0020	0.1	2.86849	1000	--- OK ---
10	8	025-01-0025	0.1	3.38356	1130	--- OK ---
11	3	828-39-0021	0.1	3.58904	1021	--- OK ---

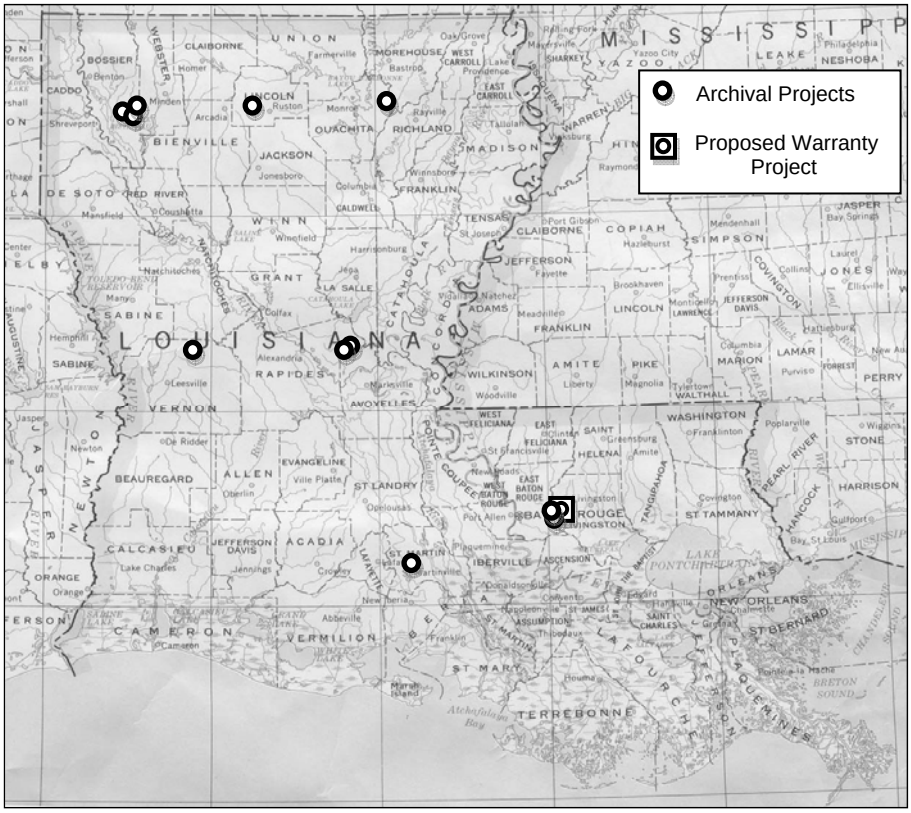


Figure 3

Distribution of PCCP projects used in warranties analysis

Table 21

Statistical summary of PCCP projects found in archives

(11 projects: 136 segments) (Ages range from 2.87 to 5.05 yrs)		Units	Mean	Std Dev	Min	Max	Mean+2s	Warranty Requirement
Faulting	**Max negative**	in	0.0230	0.077	0	0.450	0.177	≤ 0.125
	Max positive	in	0.0242	0.097	0	0.860	0.2182	≤ 0.125
	Average	in	0.0347	0.095	0	0.613	0.2247	not specified
	No. of positive	Count	0.0882	0.310	0	2	0.7082	= 0
	No. of negative	Count	0.0956	0.319	0	2	0.7336	= 0
IRI	**Left wheel path**	IRI	96.0	41.4	55	364	178.8	not specified
	Left std dev		22.2	18.2	0	178	58.6	not specified
	Right wheel path	IRI	113	45.8	64	391	204.6	not specified
	Right std dev		28.7	21.7	0	144	72.1	not specified
	Avg left and right	IRI	104	42.7	63	377	189.4	not specified
	Avg std dev		28.4	18.2	9	145	64.8	not specified
Fatigue Cracking	**Low**	ft^2	0	0	0	0	0	not specified
	Medium	ft^2	0.176	2.06	0	24	4.296	not specified
	High	ft^2	0	0	0	0	0	not specified
Longitudinal Cracking	**Low**	Lin ft	0.897	5.03	0	50	10.957	= 0
	Medium	Lin ft	1.68	8.61	0	73	18.9	= 0
	High	Lin ft	0.632	6.96	0	81	14.552	= 0
Transverse Cracking	**Low**	Lin ft	0.507	2.37	0	16	5.247	= 0
	Medium	Lin ft	0.669	4.72	0	49	10.109	= 0
	High	Lin ft	0.235	2.07	0	22	4.375	= 0
Block Cracking	**Low**	ft^2	0	0	0	0	0	not specified
	Medium	ft^2	0	0	0	0	0	not specified
	High	ft^2	0	0	0	0	0	not specified
Random Cracking	**Low**	Lin ft	1.40	5.48	0	50	12.36	not specified
	Medium	Lin ft	2.35	12.1	0	98	26.55	not specified
	High	Lin ft	0.868	7.35	0	81	15.568	not specified
Potholes	**Number**	ft^2	0	0	0	0	0	not specified
	Area	ft^2	0	0	0	0	0	not specified
Patches	**Area (low)**	ft^2	11.7	123	0	1429	257.7	not specified
	Area (medium)	ft^2	0.316	3.36	0	39	7.036	not specified
	Area (high)	Count	2.99	24.1	0	241	51.19	not specified
	Number (low)	Count	0.0735	0.579	0	6	1.2315	not specified
	Number (medium)	Count	0.0147	0.121	0	1	0.2567	not specified
	Number (high)	Count	0.118	0.751	0	7	1.62	not specified
Popouts		(SEE TABLE 22)						
Corner Cracks								
Longitudinal Joints (spall and seal damage)								
Transverse Joints (spall and seal damage)								

Note 1: Fatigue cracking may be overestimated by as much as a factor of three (see text for details)

Table 22

Summary of PCCP popouts, corner breaks, joint spalling, and joint seal damage

PCCP[1]				Popouts	Corner Cracks			Longitudinal Joints						Transverse Joints					
								Spall Count			Seal Damage Count			Spall Count			Seal Damage Count		
ID[2]	Pavement Age (yrs)	Joint Count	Lane Miles (mi)	Count (count)	# min	# mod	# high	# min	# mod	# high	# min	# mod	# high	# min	# mod	# high	# min	# mod	# high
6	3.13	146	0.6	0	0	0	0	0	0	0	0	0	0	5	0	0	6	2	0
X	3.72	11	0.2	0	0	0	0	0	0	0	0	0	0	1	2	0	7	3	3
3	4.01	293	1.7	4	1	0	0	14	4	0	1	0	0	4	0	0	11	5	1
X	4.48	7	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	6	0	0
1	4.61	1647	6.1	13	0	0	0	3	0	0	0	0	0	22	0	0	99	16	1
4	4.90	392	1.5	0	0	0	0	0	0	0	2	0	0	14	2	0	27	6	0
2	5.05	979	3.9	4	0	0	0	7	1	0	0	0	0	5	0	0	33	3	0
X	5.31	23	0.4	0	0	0	0	0	0	0	0	0	0	0	0	0	12	5	0
	SUM:	3498	14.5	21	1	0	0	24	5	0	3	0	0	51	4	0	201	40	5
	Count/ 3498 Joints:							0.00686	0.00143	0	0.000858	0	0	0.0146	0.00114	0	0.0575	0.0114	0.00143
	Count/ 14.5 Miles:			1.45	0.000286	0	0												
	Mean Count/ 0.1 mi. segment:			0.144	0.00689	0	0	0.164	0.0343	0	0.0205	0	0	0.349	0.0274	0	1.38	0.274	0.0343
	Std. Dev./ 0.1 mi. segment:			0.455	0.0828	0	0	0.715	0.217	0	0.142	0	0	0.594	0.202	0	1.53	0.670	0.217
	Min. Count/ 0.1 mi. segment:			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Max. Count/ 0.1 mi. segment:			3	1	0	0	7	2	0	1	0	0	2	2	0	7	3	2
	Mean+2s/ 0.1 mi. segment:			1.05	0.172	0	0	1.59	0.468	0	0.305	0	0	1.54	0.431	0	4.44	1.61	0.468
	Warranty Requirement			= 0	= 0	= 0	= 0	=0	= 0	= 0	= 0	= 0	= 0	= 0	= 0	= 0	= 0	= 0	= 0

Note 1: Warranty requirements specify that no popouts, corner cracks, joint spalls or joint seal damage allowed during warranty period: areas of warranty failure highlighted in grey

Note 2: ID listings are referenced to Table 20. Project selection was based on image quality and availability. Projects marked "X", not part of Table 20 list, were added to increase coverage.

Table 23

Summary of friction testing on PCCP projects found in archives

(14 projects: 123 tests) (Ages range from 2.44 to 5.38 yrs)		Units	Number of Tests	Mean	Standard Deviation	Minimum	Maximum	Mean-2s	Warranty Requirement
Friction	**Treaded tire**	FN	63	45.79	6.99	29.3	59.7	31.8	≥ 30
	Bald tire	FN	60	28.74	9.72	15.1	49.7	9.3	≥ 30

Microsurfacing

A technical assistance study conducted between 1997 and 2002 that looked exclusively at the performance of microsurfacing and chipseal projects was used to analyze microsurface bleeding and rutting *[5]*. The study examined 24 microsurfacing projects (92.3 total miles) that ranged in age from between 5 months to 69 months and consulted both visual inspections and ARAN surveys. As part of the study, each project was retested approximately four times as they aged (with retesting included, the total coverage equals some 343.7 miles worth of data). A summary of the projects is found in Table 24 and a map illustrating their distribution is provided in Figure 4. The rutting data (which had been quality control checked as part of the original study) was analyzed and a statistical summary was prepared. The results are provided in Table 25.

For the original study, bleeding was evaluated using a specially developed coding system. This coding system classified segment distress in terms of severity and extant. Four severity levels were recognized (none, slight, moderate, and severe) and four extent levels were recognized (none, < 10% of surface, 10% to 30% of surface, and > 30% of surface). Each segment was graded in both areas and an index was assigned. A breakdown of the coding system accompanied by a summary of how the pavements scored is provided in Table 26. Table 27 provides a statistical summary of the score breakdown found in Table 26. It shows that the "mean plus 95th percentile" estimate has an index value equaling 1.12. Since this value falls into the 0.1 to 3.6 range, it indicates that 95 percent of the pavement segments tested showed no signs of distress in terms of either severity or extant. The SHRP Distress Manual describes the severity levels in greater detail.

Table 25 indicates that rutting on microsurfacing projects was well within the proposed warranty requirements. Tables 26 and 27 showed that bleeding on microsurfacing projects was minor. Out of the 89 segments tested, only 2 segments had bleeding in evidence that could be considered as exceeding warranty requirements.

An examination of the photo-logs from 31 microsurfacing archival projects (ages ranging from 2.62 yrs to 4.65 yrs) showed what appeared to be a few cases of delamination. But, these cases were rare and may have only been shadows in the photo-logs. It should be noted, though, that image resolution made it hard to discern the early stages of delamination.

Table 24
Summary of microsurfacing projects

DIST.	PROJECT NUMBER	LENGTH (mi.)	AGE (yrs)
4	010-05-0029	5.16	1.92
4	010-05-0029	5.16	3.33
4	010-05-0029	5.16	4.33
4	010-05-0029	5.16	5.25
8	015-03-0021	6.71	1.75
8	015-03-0021	6.71	3.17
8	015-03-0021	6.71	4.17
8	015-03-0021	6.71	5.08
2	018-01-0026	5.86	2.00
2	018-01-0026	5.86	3.00
2	018-01-0026	5.86	4.00
2	018-01-0026	5.86	5.75
58	022-06-0042	1.35	3.25
58	022-06-0042	1.35	4.25
58	022-06-0042	1.35	5.17
8	025-02-0031	5.26	3.75
8	025-02-0031	5.26	4.75
8	025-02-0031	5.26	5.67
58	026-03-0029	2.59	1.92
58	026-03-0029	2.59	3.33
5	051-04-0015	2.39	0.50
5	051-04-0015	2.39	1.92
5	051-04-0015	2.39	2.92
5	051-04-0015	2.39	3.83
61	060-02-0029	4.55	1.92
61	060-02-0029	4.55	3.33
61	060-02-0029	4.55	4.33
61	060-02-0029	4.55	5.25
5	069-02-0018	5.72	1.83
5	069-02-0018	5.72	2.83
5	069-02-0018	5.72	3.75
5	071-01-0022	7.12	2.00
5	071-01-0022	7.12	2.58
5	071-01-0022	7.12	4.42
5	071-01-0022	7.12	5.33
2	148-01-0023	1.45	2.00
2	148-01-0023	1.45	3.00
2	148-01-0023	1.45	4.00
7	193-31-0022	5.12	2.17
7	193-31-0022	5.12	3.25
7	193-31-0022	5.12	4.25
7	193-31-0022	5.12	5.17
5	451-07-0049	6.48	2.25
5	451-07-0049	6.48	3.25
5	451-07-0049	6.48	4.17
2	424-08-0023	3.6	0.83
2	424-08-0023	3.6	1.83
2	424-08-0023	3.6	2.83
2	424-08-0023	3.6	4.00
62	260-07-0016	4.94	2.25
62	260-07-0016	4.94	3.25
62	260-07-0016	4.94	4.25
62	260-07-0016	4.94	5.08
62	261-03-0015	5.12	2.25
62	261-03-0015	5.12	3.25
62	261-03-0015	5.12	4.25
62	261-03-0015	5.12	5.08
3	380-04-0012	2.2	1.42
3	380-04-0012	2.2	2.50
3	380-04-0012	2.2	3.50
3	380-04-0012	2.2	4.42
2	410-01-0026	1.11	2.17
2	410-01-0026	1.11	3.17
2	410-01-0026	1.11	4.17
2	410-01-0026	1.11	5.33
2	410-02-0014	1.85	2.17
2	410-02-0014	1.85	3.17
2	410-02-0014	1.85	4.17
2	410-02-0014	1.85	5.33
7	200-01-0007	4.7	0.83
7	200-01-0007	4.7	1.92
7	200-01-0007	4.7	2.92
7	200-01-0007	4.7	3.83
2	826-38-0007	1.62	0.83
2	826-38-0007	1.62	1.83
2	826-38-0007	1.62	2.83
2	826-38-0007	1.62	4.00
3	828-12-0011	2.57	0.42
3	828-12-0011	2.57	1.50
3	828-12-0011	2.57	2.50
3	828-12-0011	2.57	3.42
62	848-15-0005	2.11	2.00
62	848-15-0005	2.11	3.00
62	848-15-0005	2.11	4.00
62	848-15-0005	2.11	5.17
2	855-04-0051	2.71	2.00
2	855-04-0051	2.71	3.00
2	855-04-0051	2.71	4.00
2	855-04-0051	2.71	5.08

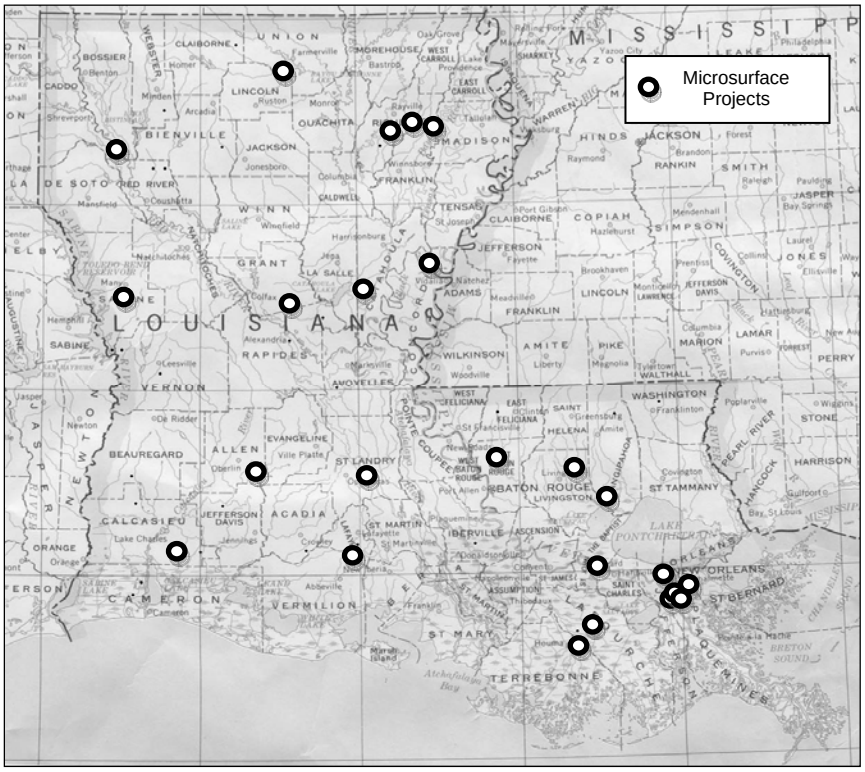


Figure 4
Distribution of microsurfacing projects used in warranties analysis

Table 25
Statistical summary of rutting on microsurfacing projects

	Rutting
Age Range	0.42 yrs – 5.76 yrs
Number of Projects	24
Total Mileage	93.2 miles
Mean Rutting	0.209 inches
Standard Error	0.00353 inches
Median	0.20 inches
Mode	0.20 inches
Standard Deviation	0.033 inches
Sample Variance	0.00111
Kurtosis	13.2
Skewness	3.78
Range	0.150 inches
Minimum	0.200 inches
Maximum	0.350 inches
Count	89
Mean + 2s	0.275 inches
Warranty Requirement	**≤ 0.5" Max; ≤ 0.5" Avg**

Table 26
Coding system used on microsurfacing projects for bleeding assessment

Severity	Extant	Threshold	Number of Segments Affected
none	none	0.1 - 3.6	**73**
slight	< 10% of surface	3.6 - 4.8	**14**
moderate	< 10% of surface	4.8 - 6.0	**0**
slight	10% to 30% of surface		
severe	< 10% of surface	6.0 - 6.4	**0**
slight	> 30% of surface		
moderate	10% to 30% of surface	6.4 - 8.0	**2**
severe	10% to 30% of surface	8.0 - 10.0	**0**
moderate	> 30% of surface		
severe	> 30% of surface	10	**0**

Note: 10% is about 63 ft^2 and 30% is about 190 ft^2

SUM: 89

Table 27
Statistical summary of bleeding on microsurfacing projects

	Bleeding
Age Range	0.42 yrs – 5.76 yrs
Number of Projects	24
Total Mileage	93.2 miles
Mean[1]	0.792
Standard Error[1]	0.163
Median[1]	0.10
Mode[1]	0.10
Standard Deviation[1]	1.538
Sample Variance	2.37
Kurtosis	3.12
Skewness	2.04
Range[1]	6.30
Minimum[1]	0.100
Maximum[1]	6.40
Count	89
95th Percentile[1] (approximate): Mean + 2s	3.87
Warranty Requirement	≤ $10ft^2$ (i.e. < 4.8_1) (2 of the 89 segments tested failed)[2]

1. Rating value defined in Table 26
2. Rating value defined in Table 26

Table 28 presents a summary of results from a series of friction tests carried out on a separate series of projects taken from archives. Items in both Tables 27 and 28 that are highlighted in grey indicate that a relevant percentage of the samples tested exceed the proposed warranty requirements to some extent. Figures in the "Mean" row of the table indicate the 50th percentile performance and figures in the "Mean-2s" row indicates the 5th percentile performance. If the testing and analysis techniques that underlie these estimates can be trusted, it means that the proposed warranty thresholds in the highlighted areas are either too restrictive or that construction and materials QA/QC are too lax.

Table 28
Summary of friction testing on
microsurfacing projects found in archives

21 projects tested: ages ranging from 2.50 years to 4.75 years	**Treaded Tire**	**Bald Tire**
Units	Friction Number	Friction Number
Number of Tests Conducted	21	21
Mean	50.6	32.9
Standard Error	2.89	3.49
Median	50.0	29.7
Standard Deviation	13.2	16.0
Sample Variance	175	255
Kurtosis	-1.52	-1.73
Skewness	-0.135	-0.0042
Minimum	29.5	11.9
Maximum	68.4	55.5
Mean - 2s	24.2	0.90
Warranty Requirement	≥ 30	≥ 30

Chipseal

A technical assistance study conducted between 1997 and 2002 that looked exclusively at the performance of microsurfacing and chipseal projects was used to analyze chipseal bleeding and aggregate loss *[5]*. The study examined 40 chipseal projects (70 total miles) that ranged in age from between 2.58 years to 5.25 years and consulted both visual inspections and ARAN surveys. As part of the study, each project was retested approximately four times as they aged (With retesting included, the total coverage equals some 775 miles worth of data.) A summary of the projects is found in Table 29. A map illustrating their distribution is provided in Figure 5.

Table 29

Summary of chipseal projects

DIST.	PROJECT NUMBER	LENGTH (mi.)	AGE (yrs)
62	260-09-0005	3.8	2.08
62	260-09-0005	3.8	3.08
62	260-09-0005	3.8	4.08
62	260-09-0005	3.8	4.92
62	278-05-0005	4.56	0.67
62	278-05-0005	4.56	1.67
62	278-05-0005	4.56	2.67
62	278-05-0005	4.56	3.50
8	365-01-0008	8.77	1.67
8	365-01-0008	8.77	2.67
8	365-01-0008	8.77	3.42
7	382-04-0033	5.66	2.25
7	382-04-0033	5.66	3.33
7	382-04-0033	5.66	4.33
3	385-04-0004	2.7	1.00
3	385-04-0004	2.7	2.08
3	385-04-0004	2.7	3.08
3	385-04-0004	2.7	3.92
3	393-03-0013	5.23	2.25
3	393-03-0013	5.23	3.33
3	393-03-0013	5.23	4.33
3	393-03-0013	5.23	5.25
4	043-06-0203	7.49	0.83
4	043-06-0203	7.49	2.25
4	043-06-0203	7.49	3.25
4	043-06-0203	7.49	4.17
61	804-20-0003	1.29	1.42
61	804-20-0003	1.29	2.42
61	804-20-0003	1.29	3.42
61	804-20-0003	1.29	4.58
61	804-28-0008	0.66	1.42
61	804-28-0008	0.66	2.42
61	804-28-0008	0.66	4.58
61	804-29-0009	0.76	1.42
61	804-29-0009	0.76	2.42
61	804-29-0009	0.76	3.42
61	804-29-0009	0.76	4.58
7	812-08-0003	2.33	2.17
7	812-08-0003	2.33	3.25
7	812-08-0003	2.33	4.25
7	812-08-0003	2.33	5.08
7	827-31-0003	1.89	2.17
7	827-31-0003	1.89	3.25
7	827-31-0003	1.89	4.25
7	827-31-0003	1.89	5.08
3	850-08-0008	2.64	2.25
3	850-08-0008	2.64	3.33
3	850-08-0008	2.64	4.33
3	850-08-0008	2.64	5.17
8	858-12-0001	2.8	1.67
8	858-12-0001	2.8	2.67
8	858-12-0001	2.8	3.58
62	859-09-0017	8.83	0.67
62	859-09-0017	8.83	1.67
62	859-09-0017	8.83	2.67
62	859-09-0017	8.83	3.50
61	863-02-0022	6.92	1.58
61	863-02-0022	6.92	2.58
61	863-02-0022	6.92	3.50
61	863-02-0022	6.92	4.42

Table 29

Summary of chipseal projects (continued)

DIST.	PROJECT NUMBER	LENGTH (mi.)	AGE (yrs)
7	031-08-0017	11.72	1.00
7	031-08-0017	11.72	2.08
7	031-08-0017	11.72	3.08
7	031-08-0017	11.72	3.92
58	036-04-0049	7.15	0.67
58	036-04-0049	7.15	2.08
58	036-04-0049	7.15	3.08
58	036-04-0049	7.15	4.00
5	037-02-0032	9	1.67
5	037-02-0032	9	3.08
5	037-02-0032	9	4.08
5	037-02-0032	9	5.00
58	039-04-0043	3.83	0.67
58	039-04-0043	3.83	2.08
58	039-04-0043	3.83	3.08
58	039-04-0043	3.83	4.00
58	051-03-0027	12.91	1.83
58	051-03-0027	12.91	3.25
58	051-03-0027	12.91	4.25
58	051-03-0027	12.91	5.17
8	057-08-0012	3.57	1.67
8	057-08-0012	3.57	3.08
8	057-08-0012	3.57	4.08
8	057-08-0012	3.57	5.00
4	082-05-0006	7.22	0.67
4	082-05-0006	7.22	2.08
4	082-05-0006	7.22	3.08
4	082-05-0006	7.22	4.00
4	085-03-0013	6.26	1.83
4	085-03-0013	6.26	3.25
4	085-03-0013	6.26	4.25
4	085-03-0013	6.26	5.17
4	111-01-0016	7.92	0.83
4	111-01-0016	7.92	2.25
4	111-01-0016	7.92	4.17
58	143-05-0021	5.48	1.58
58	143-05-0021	5.48	2.58
58	143-05-0021	5.48	3.50
58	143-06-0023	4.36	1.58
58	143-06-0023	4.36	2.58
58	143-06-0023	4.36	3.50
58	152-02-0008	2.29	3.25
58	152-02-0008	2.29	4.25
58	173-01-0025	4.65	1.58
58	173-01-0025	4.65	2.58
58	173-01-0025	4.65	3.50
5	166-05-0005	4.99	1.75
5	166-05-0005	4.99	3.17
5	166-05-0005	4.99	4.17
5	166-05-0005	4.99	5.08
7	193-02-0041	5.45	1.42
7	193-02-0041	5.45	2.50
7	193-02-0041	5.45	3.50
7	193-02-0041	5.45	4.33
7	193-03-0008	2.13	1.42
7	193-03-0008	2.13	2.50
7	193-03-0008	2.13	3.50
7	193-03-0008	2.13	4.33
7	193-04-0008	6.24	1.42
7	193-04-0008	6.24	2.50
7	193-04-0008	6.24	3.50
7	193-04-0008	6.24	4.33
7	193-05-0015	4.97	1.42
7	193-05-0015	4.97	2.50
7	193-05-0015	4.97	3.50
7	193-05-0015	4.97	4.33
7	196-01-0019	7.27	1.00
7	196-01-0019	7.27	2.08
7	196-01-0019	7.27	3.08
7	196-01-0019	7.27	3.92
7	199-01-0006	7.43	1.00
7	199-01-0006	7.43	2.08
7	199-01-0006	7.43	3.08
7	199-01-0006	7.43	3.92
3	203-01-0007	4.14	2.25
3	203-01-0007	4.14	3.33
3	203-01-0007	4.14	4.33
3	203-01-0007	4.14	5.17
3	235-01-0007	4.2	2.25
3	235-01-0007	4.2	3.33
3	235-01-0007	4.2	4.33
3	235-01-0007	4.2	5.25
62	260-06-0009	3.69	2.08
62	260-06-0009	3.69	3.08
62	260-06-0009	3.69	4.08
62	260-06-0009	3.69	4.92
62	260-09-0005	3.8	2.08
62	260-09-0005	3.8	3.08
62	260-09-0005	3.8	4.08
62	260-09-0005	3.8	4.92
61	804-38-0006	3.65	1.42
61	804-38-0006	3.65	2.42

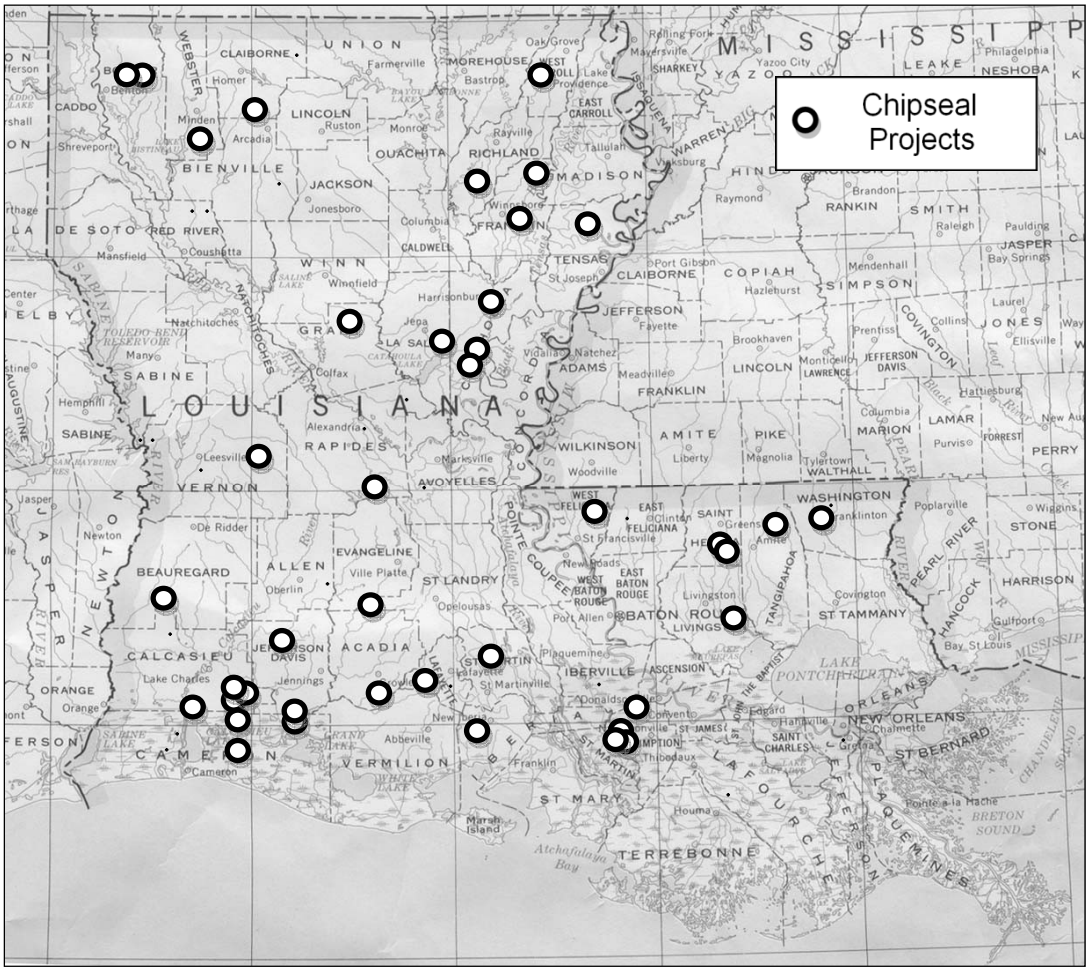


Figure 5
Distribution of chipseal projects used in warranties analysis

For the original study, both bleeding and aggregate loss on chipseal projects were evaluated using a specially developed coding system. This coding system classified segment distress in terms of severity and extant. Four severity levels were recognized (none, slight, moderate, and severe) and four extent levels were recognized (none, < 10% of surface, 10% to 30% of surface, and > 30% of surface). Each segment was graded in both areas and an index was assigned. A breakdown of the coding system accompanied by a summary of how the pavements scored is provided in Tables 30 and 31. Table 32 provides a statistical summary of the score breakdowns found in Tables 30 and 31. It shows, for example, that the "Mean+2s" estimate for aggregate loss has an index value equaling 7.6. This value falls into the 6.0 – 8.0 range of the aggregate loss coding system provided in Table 31, which indicates that over 95 percent of the pavement segments tested had distresses levels that could be characterized as

less than or equal to “moderate” severity and that the extant of these distresses occurred over no more than 30 percent of their surface. The SHRP Distress Manual describes the severity levels in greater detail.

A summary of results from a series of friction tests carried out on a separate series of projects taken from archives is provided in Table 33. As in previous sections, figures in these tables highlighted in grey indicate distresses in excess in proposed warranty requirements. If the testing and analysis techniques that underlie these estimates can be trusted, it means that the proposed warranty thresholds in the highlighted areas are either too restrictive or that construction and materials QA/QC are too lax.

Table 30

Coding system used on chipseal projects for bleeding

Severity	Extant	Threshold	No of Segments Affected
none	none	0.1 - 3.6	**63**
slight	< 10% of surface	3.6 - 4.8	**59**
moderate	< 10% of surface	4.8 - 6.0	**1**
slight	10% to 30% of surface		
severe	< 10% of surface	6.0 - 6.4	**0**
slight	> 30% of surface		
moderate	10% to 30% of surface	6.4 - 8.0	**20**
severe	10% to 30% of surface	8.0 - 10.0	**3**
moderate	> 30% of surface		
severe	> 30% of surface	10	**2**

Note: 10% is about 63 ft^2 and 30% is about 190 ft^2

SUM: 148

Table 31

Coding system used on chipseal projects for aggregate loss

Severity	Extant	Threshold	No of Segments Affected
none	none	0.1 – 1.5	**43**
slight	< 10% of surface	1.5 – 2.4	**77**
slight	10% to 30% of surface	2.4 - 3.0	**5**
moderate	< 10% of surface	3.0 – 4.8	
slight	> 30% of surface		**1**
moderate	10% to 30% of surface	4.8 – 5.0	
severe	< 10% of surface	5.0 – 6.0	**16**
moderate	> 30% of surface	6.0 – 8.0	**6**
severe	10% to 30% of surface	8.0 – 10.0	
severe	> 30% of surface	10	**0**

Note: 10% is about 63 ft^2 and 30% is about 190 ft^2

SUM: 154

Table 32
Statistical summary of bleeding and aggregate loss on chipseal projects

	Bleeding	Aggregate Loss
Age Range	2.58 yrs – 5.25 yrs	2.58 yrs – 5.25 yrs
Number of Projects	40	40
Total Mileage	70 miles	70 miles
Mean	2.64_1	1.68_2
Standard Error	0.205_1	0.134_2
Median	3.60_1	1.50_2
Mode	0.100_1	1.50_2
Standard Deviation	2.49_1	1.63_2
Sample Variance	6.22	2.66
Kurtosis	-0.406	1.08
Skewness	0.544	1.36
Range	9.90_1	5.90_2
Minimum	0.100_1	0.100_2
Maximum	10.0_1	6.0_2
Count	148	148
Mean + 2s	7.6_1	4.9_2
Warranty Requirement	$\leq 10 ft^2$ (i.e. $< 4.8_1$) (26 of 148 segments tested failed)	$\leq 10 ft^2$ (i.e. $< 2.4_2$) (28 of 154 segments tested failed)

1. Rating value defined in Table 30
2. Rating value defined in Table 31

Table 33
Summary of friction testing on chipseal projects found in archives

38 projects tested: ages ranging from 2.58 years to 4.33 years	Treaded Tire	Bald Tire
Units	Friction Number	Friction Number
Number of Tests Conducted	38	38
Mean	64.7	48.8
Standard Error	1.33	1.77
Median	68.1	52.1
Standard Deviation	8.22	10.9
Sample Variance	67.6	119
Kurtosis	0.64	0.047
Skewness	-1.23	-0.895
Minimum	43.2	21.5
Maximum	73.3	61.6
Mean - 2s	48.3	27.0
Warranty Requirement	≥ 30	≥ 30

Pavement Striping and Markings

The distress appraisal for the three areas of pavement markings that are listed in Table 1 (Raised Pavement Markings, Painted Traffic Striping, and Plastic Pavement Markings) was carried out during the photo-log analysis of the asphalt and PCCP pavements. As such, the project list given in Tables 12 and 20 can be taken to represent coverage. As was the case with edge cracking in earlier efforts, there were cases in which the ARAN camera aperture was not wide enough to consistently capture clear shots of the edge stripes and markings. Still, given the nature of stripe and marking distress, it was considered that image coverage was comprehensive enough to adequately produce usable results. Archival resources could not be used to assess improper application of paint or adhesive material in any area nor could it be used to determine if paint or pavement marking material thicknesses were adequate.

Figure 6 is provided to illustrate the rating scale used on both paint and on the raised appliqué markings during the analysis. Pavement reflectors were rated according to the percentage missing per 10th mile segment. A summary of findings is given in Table 34 and 35. As in previous sections, all items highlighted in grey indicate distresses in excess of proposed warranty requirements. If the testing and analysis techniques that underlie these estimates can be trusted, it means that the proposed warranty thresholds in the highlighted areas are either too restrictive or that construction and materials QA/QC are too lax. In terms of quality control, it should also be noted that there was evidence of a consistent mismatch in the registry between painted stripe and bead application of approximately 0.5 to 1.0 percent over most of the areas examined.

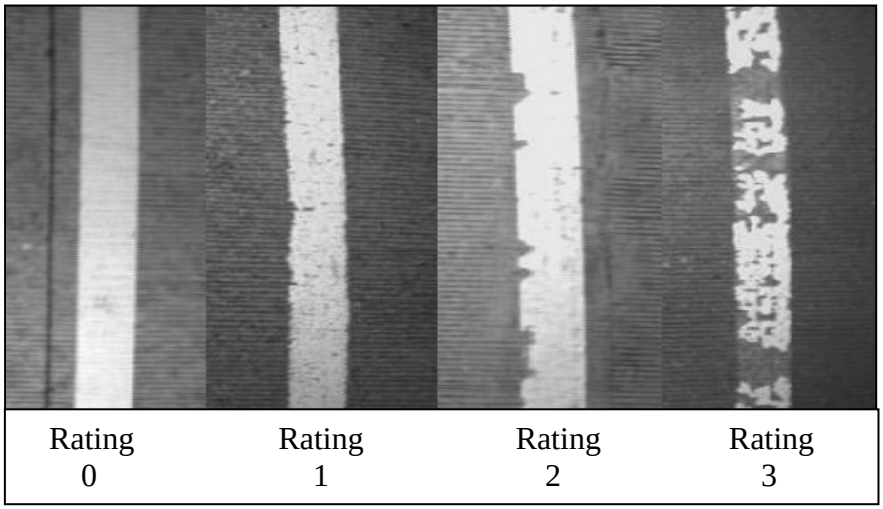


Figure 6

Rating scale used to assess pavement striping and markings

Table 34
Statistical summary of blistering, peeling, scaling, flaking, and loss for painted traffic striping and painted pavement markings

	Painted Traffic Striping	Plastic Pavement Markings
Number of Projects Examined	20	7
Total Mileage Examined	42.3 miles	2.7 miles
Age Range of Projects	2.33 yrs to 5.31 yrs	2.33 yrs to 5.05 yrs
Mean[1]	0.732	1.27
Standard Error[1]	0.0471	0.210
Median[1]	0	1
Mode[1]	0	1
Standard Deviation[1]	0.967	1.07
Sample Variance	0.935	1.14
Kurtosis	-0.392	-0.977
Skewness	0.981	0.500
Range[1]	3	3
Minimum[1]	0	0
Maximum[1]	3	3
Sum	309	33
Count	422	26
Mean + 2s[1]	2.7	3.4
Warranty Requirement[1]	0	0

1. Rating value defined in Figure 6

Table 35
Summary of loss of raised pavement markers

Project Age	Total Reflectors	Missing Reflectors	Percent Missing	Project Age	Total Reflectors	Missing Reflectors	Percent Missing
2.33	172	4	2.3	4.23	256	13	5.1
2.60	50	0	0.0	4.48	3	0	0.0
2.69	35	2	5.7	4.48	614	156	25.4
2.82	24	0	0.0	4.61	136	9	6.6
3.13	121	0	0.0	4.61	10	0	0.0
3.27	112	0	0.0	4.67	139	3	2.2
3.50	666	2	0.3	4.90	125	8	6.4
3.72	2	2	100	5.05	553	72	13.0
3.72	317	10	3.2	5.05	350	17	4.9
4.01	86	0	0.0	5.05	527	32	6.1
4.01	39	2	5.1	5.31	10	1	10.0
4.01	87	2	2.3	5.31	112	48	42.9
				SUM:	4546	383	8.4

WARRANTY REQUIREMENT: All lost reflectors must be replaced

An independent effort was carried out that compared various techniques for achieving reflectivity of pavement markings for the Department wherein a memorandum was released to the chief engineer in 2001 *[13]*. A copy of this memorandum is given in Appendix I and a summary of this investigation's findings is provided in Table 36. This effort compared five reflectivity treatments at five different test sections located on interstate and non-interstate routes. It compared standard thermoplastic and beads, standard thermoplastic with 40 percent intermix beads and 80 percent round bead top coat, standard thermoplastic with 48 percent intermix beads and AASHTO modified bead topcoat, standard thermoplastic double application of "Visibead," and the inverted profile stripe manufacturing process. Both yellow and white were examined.

Table 36
Three-year warranty thresholds for reflectivity of pavement markings

Treatment Type	Site	Reflectivity at three years (mcd/lux/m^2)
Std Thermoplastic and beads (yellow)	LA 40	50 (projected)
Std Thermoplastic and beads (white)	LA 40	37 (projected)
Std thermoplastic w/ 40% intermix & 80% round (yellow)	LA 422	25 (projected)
Std thermoplastic w/ 40% intermix & 80% round (white)	LA 422	125 (projected)
Std thermoplastic w/ 48% intermix and AASHTO modified bead topcoat (yellow)	LA 422	25 (projected)
Std thermoplastic w/ 48% intermix & AASHTO modified bead topcoat (white)	LA 422	215 (projected)
"Visibead" (yellow)	I-12	165
"Visibead" (white)	I-12	337
Inverted Profile Stripe Process (yellow)	I-55; I-10	475; 200
Inverted Profile Stripe Process (white)	I-55; I-10	580; 287

Warranty Requirement: ≥ 250 mcd/lux/m^2 for white; ≥ 175 mcd/lux/m^2 for yellow
(Problem areas highlighted in grey)

The findings from this investigation indicated that the standard thermoplastic/bead application had problems within the first year of installation for reasons relating to bead retention. The two bead blends performed well after the first year. But, by the close of year two, the centerline markings were below acceptable reflectivity standards (250 and 175 med/lux/m^2 for white and yellow, respectively). The inverted profile stripe process performed exceptionally well even after 4.6 years of service. And, the "Visibead" case showed the best performance in terms of rate of reflectivity loss. Only the inverted profile stripe process produced results that surpassed

the proposed warranty thresholds.

Summary Discussions

Pilot Project Summary

A summary of the testing regimen and subsequent findings associated with the two asphalt warranties pilot projects is provided in Tables 7, 8, and 10 with additional summaries and details being provided in Appendices C, D, E, F, G, and H (distresses like potholes and pop-outs that are not represented in the tables and appendices or are not mentioned in the discussion indicate that the distress did not appear). Specifically, Table 7 shows the schedule of testing that the two projects underwent and covers the high-speed profiler, friction, ARAN, and associated follow-up tests. Walking surveys of cracking were typically conducted concurrent with the laser profiler testing.

Tables 8 and 10 provide a brief summary of friction and profiler testing results collected by LTRC on the I-10 and LA422 projects, respectively. Appendices C and D provide detailed summaries of same. Appendix E and F provide detailed ARAN based profiler and rut summaries on the two projects. Appendix G provides a summary of cracking development seen on the two projects. Appendix H summarizes follow-up tests. Comprehensive summaries of the warranty requirements for the I-10 asphalt project (SP 450-03-0037), the LA 422 asphalt project (SP 819-02-0012), and the LA 946 PCC project (SP 817-08-0023) are provided in Table 37.

As was pointed out in the methodology section of this report, attempts made at filling out the project grid alluded to in Tables 1 and 4 proved to be problematic. Of the projects envisioned to be built as part of the pilot program, only three projects (LA 422, I-10, and LA 946) were eventually able to receive bids with warranty clauses. Of these three, only the first two (which were asphalt projects) were able to maintain their warranty status completely through their construction and subsequent warranties monitoring program, closing at the term of their full three-year bond period. The third project (which is a PCC project) is currently being monitored.

Comparison of the Table 37 requirements to the performance summaries provided in Tables 8 through 11 as well as in Appendices C thru H show that the pilot projects passed inspection in all cases with only one exception. Only in the case of LA 422 did a breach of warranty thresholds appear to be in evidence where there was the indication that longitudinal cracking was in excess of warranty requirements. Follow-up investigations indicated that the distresses (which had appeared to be fatigue cracking) were, in reality, determined to be reflection cracks associated with cement-stabilized base shrinkage. There was also some cracking that resulted

from slope failure in the embankment adjacent to culverts and bridges, but this was minimal. Both the soil-cement reflective cracking and cracking caused by slope failure were considered to be beyond contractor control and, as such, the contractor was released from liability.

Table 37
Warranty requirements on pilot projects

ID	Distress Type		Threshold limit (three year warranty requirement)
I-10 and LA 422 (Asphalt)	Bleeding		10 ft^2
	Raveling		10 ft^2
	Rutting		0.35 inch average in any 50 foot length in any wheel path Any area with rutting greater than 0.5 inch
	Shoving		Any occurrence
	Cracking	Fatigue	10 ft^2
		Longitudinal/Transverse	1) 50 linear feet total length with crack width greater than 0.25 inch 2) More than 200 linear feet total length
		Edge Cracking	1) 50 linear feet total length with crack width greater than 0.25 inch 2) More than 100 linear feet total length
	Potholes		Any occurrence
LA 946 (PCC)	Corner breaks, Longitudinal/Transverse, and Diagonal Cracking		Any occurrence
	Joint Deficiency	Joint Seal Damage: 1) Transverse Joint 2) Longitudinal Joint	 Any occurrence Any occurrence
		Spalling Damage: 1) Transverse Joint 2) Longitudinal Joint	 Spalls greater than 2 inch wide Spalls greater than 2 inch wide
	Tine Texture (Tire Gauge)		0.125 inch mean texture depth
	Macrotexture (Sand Patch)		20 percent maximum loss over warranty period
	Transverse Joint Faulting		0.25 inch maximum; 0.125 inch minimum
	Lane-to-AC Shoulder Separation		Any occurrence
	Popouts		Any occurrence
	Spalled Areas		Areas greater than 25 in^2 and/or with depth greater than 1 inch

The other asphalt project, I-10, performed exceptionally well on all accounts. Performance on I-10 was expected to be good even before construction. This was because the project was designated to be built as a high-performance Superpave job, a detail that implied the project

should not show significant distress development over the project's projected three-year bond period. Stakeholders, knowing this, made it much easier to get I-10 approved for warranties than the more conventional, and less robust, pavements placed under consideration.

The ease with which I-10 was approved for warranties is illustrative of a general pattern in warranty project negotiations that bears directly on the second objective of this report. Stakeholder perception acted as a natural filter, which screened out the higher risk projects in favor of their low-risk counterparts. Attempts to advance less robust pavements as warranty projects were deemed either cost prohibitive by stakeholders or else the effectiveness of the warranty clauses proposed for them were rendered less effective or binding.

An intrinsic difficulty associated with attempting to develop a performance-based warranties program is illustrated when considering the progress of the PCCP warranties project, LA 946, which is still being monitored as of the writing of this report in February 2012. The contractor on the project had logged a complaint with the Department's project engineer that soil tests were indicating there were problems with the site's subgrade that would compromise the pavement's performance and ultimately put him at risk in terms of the project's warranty clause. To compensate, he requested that the design be modified to alleviate the problem or else moved to have the warranty clause dropped. The Department took neither course of action, but did take note of his concerns.

Such a development may suggest that the warranty's effectiveness has been undermined in that the allegation calls into question the fairness of the warranty even before the project was constructed. If the project fails, then the contractor can claim that the warranty was unfair. If the Department had opted to make the modification, then the cost would have been driven up even beyond the already escalated level that came as a result of it being bid on as a warranty project at the onset. It is noteworthy that the LA 946 project, though still within its warranty period, has shown no warranty related problems as of this writing in February 2012.

Despite the difficulties and the limited number of projects made available in the pilot effort, it can be said that the warranties initiative succeeded, at least in principal, because the guarantee that the projects would be a superior product was met. The reluctance of stakeholders to participate in the more risky ventures suggests that warranties succeeds on another level because the participants clearly took the warranties initiative seriously. All parties examined the warranty specifications presented to them with greater than typical scrutiny and actively participated in discussions relating to them. Also, the contractors involved in the construction of

the warranties projects that were built confessed that more care and effort (product quality) was given to their construction because of their warranty status. The cost effectiveness of the warranties initiative could not be established because so few of the original prospective projects were built. Though inconclusive, the cost estimates given at the end of Appendix B can be used toward a preliminary assessment.

Based on the performance of the pilot projects that were analyzed, it can be surmised that the proposed warranty requirements, which are summarized in Table 38, are reasonable.

Archival Analysis Summary

Preliminary assessment of archival data showed that there were some systemic problems associated with data collection that had impacted coverage. For this reason, compliance in all areas listed in Table 1 could not be achieved. For example, edge cracking in many cases could not be assessed because the ARAN cameras often did not fully capture images to the edge of the pavement. Also, features like pothole depth could not be assessed because the ARAN device was not equipped with the means to gather such information. In most cases, though, enough data was available to carry out an analysis. Analysis summaries, covering the eight areas listed in Table 1, are provided in Tables 13 through 36 as well as in Appendix I. A recap of the central findings in these tables is provided in Table 39, which presents a summary of the performance means derived from the archival analysis.

Figures in Table 39 require some explanation. The table shows, for example, that 50 percent of the tenth mile segments examined (asphalt overlay) had more than 0.00238 potholes with an area of no less than 0.00444 square feet. This translates into one pothole every 42.02 miles (0.1 ÷ 0.00238 = 42.02) having an area equaling 0.64 square inches (0.00444 × 144 = 0.64). Some figures can be read directly. For example, 50 percent of the tenth mile segments examined (PCCP) had negative faults of at least 0.0230 inch and positive faults of at least 0.0242 inch. With the exception of microsurface rutting and bleeding estimates, all entries in Table 39 were developed from projects ranging in age from between around 2.29 years of age to around 5.33 years of age (see Tables 12 through 39). This is the reason the 50^{th} percentile estimates are presented in Table 39 instead of the 95^{th} percentile figures. All projects examined were either at the three-year warranty requirement age or older making the 50^{th} percentile estimate a good indicator of overall non-warranty performance. The only exception was microsurfacing rutting and bleeding estimates, which were derived from projects ranging in age from 0.42 years of age to 5.76 years of age.

Table 38
Proposed warranty thresholds

		Units/10th mi. seg.	New Asphalt	Asphalt Overlay	PCCP	Microsurfacing	Chipseal	Striping & Markings
Popouts, Joint Spalls, Joint Seal Damage	**Number**	Count	-	-	= 0	-	-	-
Transverse Joint Faulting	**Max negative**	in	-	-	≤ 0.125	-	-	-
	Max positive	in	-	-	≤ 0.125	-	-	-
	Average	in	-	-	-	-	-	-
	No of positive	Count	-	-	= 0	-	-	-
	No of negative	Count	-	-	= 0	-	-	-
Rutting	**Total avg**	in	≤ 0.35	≤ 0.35	-	≤ 0.5" max; ≤ 0.5" avg	-	-
	Total std dev	-	-	-	-	-	-	-
	Left average	In	≤ 0.35	≤ 0.35	-	-	-	-
	Left std dev	-	-	-	-	-	-	-
	Right average	In	≤ 0.35	≤ 0.35	-	-	-	-
	Right std dev	-	-	-	-	-	-	-
	5 Point total avg	In	-	-	-	-	-	-
	5 Point total std dev	-	-	-	-	-	-	-
IRI	**Left wheel path**	IRI	-	-	-	-	-	-
	Left std dev	-	-	-	-	-	-	-
	Right wheel path	IRI	-	-	-	-	-	-
	Right std dev	-	-	-	-	-	-	-
	Avg left and right	IRI	-	-	-	-	-	-
	Avg std dev	-	-	-	-	-	-	-
Lane-Shoulder Separation	**Number and Length**	Count & ft	-	-	= 0;undef	-	-	-
Spalls	**Number and Area**	Count & ft^2	-	-	0; ≤25 ft^2	-	-	-
Joint Seal Damage	**Count**	Count	-	-	0; ≤10%	-	-	-
Corner Breaks	**Count**	Count	-	-	= 0	-	-	-
Popouts								
Fatigue Cracking	**Low**	ft^2	≤ 10	≤ 10	-	-	-	-
	Medium	ft^2	≤ 10	≤ 10	-	-	-	-
	High	ft^2	= 0	= 0	-	-	-	-
Longitudinal Cracking	**Low**	Lin ft	≤ 50	≤ 50	= 0	-	-	-
	Medium	Lin ft	= 0	= 0	= 0	-	-	-
	High	Lin ft	= 0	= 0	= 0	-	-	-
Transverse Cracking	**Low**	Lin ft	≤ 50	≤ 50	= 0	-	-	-
	Medium	Lin ft	= 0	= 0	= 0	-	-	-
	High	Lin ft	= 0	= 0	= 0	-	-	-
Block Cracking	**Low**	Lin ft	≤ 10	≤ 10	-	-	-	-
	Medium	Lin ft	≤ 10	≤ 10	-	-	-	-
	High	Lin ft	= 0	= 0	-	-	-	-
Random Cracking	**Low**	Lin ft	-	-	-	-	-	-
	Medium	Lin ft	-	-	-	-	-	-
	High	Lin ft	-	-	-	-	-	-
Potholes	**Number**	Count	= 0	= 0	≤ 0.125	-	-	-
	Area	ft^2	= 0	= 0	≤ 0.125	-	-	-
Patches	**Area (low)**	ft^2	-	-	-	-	-	-
	Area (medium)	ft^2	-	-	-	-	-	-
	Area (high)	ft^2	-	-	-	-	-	-
	Number (low)	Count	-	-	-	-	-	-
	No (medium)	Count	-	-	-	-	-	-
	No (high)	Count	-	-	-	-	-	-
Shoving	**Number and Area**	Count & ft^2	0; ≤10	0; ≤10	-	-	-	-
Bleeding/Flushing	**Number and Area**	Count & ft^2	0; ≤10	0; ≤10	-	0; ≤10	0; ≤10	-
Raveling/Weathering	**Number and Area**	Count & ft^2	0; ≤10	0; ≤10	-	0; ≤10	-	-
Aggregate Loss	**Number and Area**	Count & ft^2	-	-	-	-	0; ≤10	-
Friction[1]	**Treaded tire**	FN	≥ 30	≥ 30	≥ 30	≥ 30	≥ 30	-
	Bald tire	FN	≥ 30	≥ 30	≥ 30	≥ 30	≥ 30	-
Delamination	**Number and Area**	Count & ft^2	-	-	-	0; ≤10	-	-
Painted Striping	**Code**	Index	-	-	-	-	-	= 0_2
Plastic Markings	**Code**	Index	-	-	-	-	-	= 0_2
Raised Markers	**Number**	Count	-	-	-	-	-	= 0
Marker Reflectivity	**Reflectivity**	Med/lux/m^2	-	-	-	-	-	White: ≥ 250 Yellow: ≥ 175

1. Warranty program not currently considering a friction requirement thus non-binding (thresholds reflects what is typical).

2. Index defined in Figure 6

Table 39

Archival analysis means

(breaches of warranty requirements highlighted in grey)

Estimates based on pavements between 2.29 and 5.81 years old		Units/10th mi. seg.	New Asphalt	Asphalt Overlay	PCCP	Micro-surfacing	Chipseal	Striping & Markings
Joint Spalls/Cracks, Corner Cracks, Popouts	**Number**	Count	-	-	***See Table 22***	-	-	-
Transverse Joint Faulting	**Max negative**	in	-	-	0.0230	-	-	-
	Max positive	in	-	-	0.0242	-	-	-
	Average	in	-	-	0.0347	-	-	-
	No of positive	Count	-	-	0.0882	-	-	-
	No of negative	Count	-	-	0.0956	-	-	-
Rutting	**Total avg**	in	0.113	0.114	-	0.209	-	-
	Total std dev		0.0309	0.0425	-	-	-	-
	Left average	in	0.0603	0.116	-	-	-	-
	Left std dev		0.0295	0.0286	-	-	-	-
	Right average	in	0.0212	0.108	-	-	-	-
	Right std dev		0.0127	0.0356	-	-	-	-
	5 Point total avg	in	0.0407	-	-	-	-	-
	5 Point total std dev		0.0474	-	-	-	-	-
IRI_7	**Left wheel path**	IRI	67.9	72.4	96.0	-	-	-
	Left std dev		17.1	19.3	22.2	-	-	-
	Right wheel path	IRI	79.4	85.5	113	-	-	-
	Right std dev		26.4	25.4	28.7	-	-	-
	Avg left and right	IRI	73.7	78.9	104	-	-	-
	Avg std dev		24.3	24.9	28.4	-	-	-
Lane-Shoulder Separ.	**Number and Length**	Count & ft	-	-	-	-	-	-
Spalls	**Number and Area**	Count & ft^2	-	-	-	-	-	-
Corner Breaks	**Count**	Count	-	-	-	-	-	-
Fatigue $Cracking_1$	**Low_1**	ft^2	237	50.4	0	-	-	-
	$Medium_1$	ft^2	66.2	5.75	0.176	-	-	-
	$High_1$	ft^2	0.115	0.143	0	-	-	-
Longitudinal Cracking	**Low**	Lin ft	23.0	10.7	0.897	-	-	-
	Medium	Lin ft	20.0	1.96	1.68	-	-	-
	High	Lin ft	0.331	0.0297	0.632	-	-	-
Transverse Cracking	**Low**	Lin ft	75.9	25.5	0.507	-	-	-
	Medium	Lin ft	22.9	2.50	0.669	-	-	-
	High	Lin ft	0.0105	0.0732	0.235	-	-	-
Block Cracking	**Low**	Lin ft	29.3	4.43	0	-	-	-
	Medium	Lin ft	3.77	8.14	0	-	-	-
	High	Lin ft	0	0.136	0	-	-	-
Random Cracking	**Low**	Lin ft	128	38.6	1.40	-	-	-
	Medium	Lin ft	46.7	12.5	2.35	-	-	-
	High	Lin ft	0.342	0.233	0.868	-	-	-
Potholes	**Number**	Count	0	0.00238	0	-	-	-
	Area	ft^2	0	0.00444	0	-	-	-
$Patches_7$	**Area (low)**	ft^2	7.73	1.48	11.7	-	-	-
	Area (medium)	ft^2	2.46	1.07	0.316	-	-	-
	Area (high)	ft^2	0.689	0.558	2.99	-	-	-
	Number (low)	Count	0.0422	0.0165	0.0735	-	-	-
	No (medium)	Count	0.0246	0.0223	0.0147	-	-	-
	No (high)	Count	0.0096	0.00814	0.118	-	-	-
Shoving	**Number and Area**	Count & ft^2	-		-	-	-	-
Bleeding/Flushing	**No, Area, or Code**	varied	0.0114	See Table 18	-	0.792_2	2.64_3	-
Raveling/Weathering	**Number**	Count	0.0038		-	-	-	-
Aggregate Loss	**Code**	Index	-	-	-	-	1.68_4	-
Friction	**Treaded tire**	FN	40.46	40.8; 42.5_6	45.79	50.6	67.4	-
	Bald tire	FN	30.08	25.8; 26.4_6	28.74	32.9	48.8	-
Delamination	**Number and Area**	Count & ft^2	-	-	-	-	-	-
Painted Striping	**Code**	Index	-	-	-	-	-	0.732_5
Plastic Markings	**Code**	Index	-	-	-	-	-	1.27_5
Raised Markers	**Number**	Count	-	-	-	-	-	See Table 35
Marker Reflectivity	**Reflectivity**	Med/lux/m^2	-	-	-	-	-	See Table 36

Note 1: Fatigue cracking may be overestimated by as much as a factor of three (see text for details)

Note 2: Score based on coding system described in Table 26

Note 3: Score based on coding system described in Table 30

Note 4: Score based on coding system described in Table 31

Note 5: Score based on coding system shown in Figure 6

Note 6: Two separate tests run - See Table 19
Note 7: No warranty requirement stipulated in this area – estimates tabulated solely for research purposes

All non-highlighted entries in Table 39 represent cases where there was no significant warranty problems, suggesting that the proposed warranty thresholds in those areas were either reasonable or else were possibly under-specified. (Note that some entries, such as patching, do not have a warranty threshold specified in Table 37.) Some highlighted distresses in Table 39, like high-level fatigue cracking, showed only marginal failure. These marginal failures imply that the warranty thresholds closely matched non-warranty project performance. In these cases, it is likely that the warranty would have been invoked and a few warranty related repairs mandated, provided it was shown that the contractor was proven to be liable.

A comparison of Table 39 figures to the specification thresholds set forth in Appendix A and Appendix B shows that, outside of cracking, most of the archival estimates fall well within the required limits set forth in the warranty program. There were some problems areas like the bald-tire friction estimates tabulated for asphalt overlay and PCCP, the PCCP joint and corner crack issues summarized in Table 22, as well as the striping and marking failures. But, these problem areas were typically only marginal failures both in the terms of the 50^{th} percentile estimates as well as the 95^{th} percentile estimates. Such a comparison indicates that the warranty thresholds being proposed are not unreasonable in these areas as over 95 percent of the projects previously constructed in Louisiana have met requirements even without a warranty clause being imposed.

Cracking estimates present a bigger problem. Both the 50^{th} and 95^{th} percentile estimates indicate that a significant number of segments in all three pavement areas (new asphalt, asphalt overlay, and PCCP) are in excess of proposed warranty requirements. The majority showed only marginal failure. For example, most of the high-severity cracking figures in Table 39, highlighted in grey, exceed warranty thresholds. However, these excesses are very small. The reason they show up is because the warranty policy is set to zero tolerance, a fact that causes the few high-severity cracks that are extant to show up in the statistical distributions as trace quantities. The implication is that high-severity cracking is not a significant problem and imposition of a warranty program requiring repair of the failed segments would not be considered as an excessive burden to contractors.

Outside of these trace problem areas, however, Table 39 does contain a few highly excessive distress estimates that would be in gross and widespread violation of the proposed warranty. For example, 50 percent of the tenth mile segments canvassed (new asphalt) were found to have more than 237 square feet, of low fatigue cracking. Since the limit set forth in the warranty program is 10 square feet, it can be assumed that more than 50 percent of the projects that have been built by the Department in the past would have failed under the proposed warranties

program. The problem with this reasoning is that the 237 square foot figure is in error. This error is the result of inadequacies in ARAN's distress analysis systems that render it incapable of distinguishing certain crack types. This is a particular problem when it comes to ARAN's ability to distinguish fatigue cracks from longitudinal cracks.

The problem arises because ARAN is not able to correlate cause (fatigue, reflective, slope, and failure) and effect (alligator, transverse, and longitudinal). To compensate for this, ARAN resorts to a zone-based analysis to render crack classification. All low-severity longitudinal style cracks *inside* the wheel-path are assumed by ARAN to be fatigue cracks. All low-severity longitudinal style cracks *outside* the wheel-path are considered by ARAN to be longitudinal cracks. The SHRP Distress Manual requires low-severity fatigue cracking to be measured in square feet and low-severity longitudinal cracking to be measured in linear feet. Thus, when ARAN encounters what are, in reality, low-severity linear-style longitudinal cracks (non-fatigue cracks in the wheel-path), it automatically assumes the cracks are longitudinal and imposes a square-foot unit. It accomplishes this by systemically applying a 3-ft. zone of distress around the crack. The result is that many low-severity fatigue cracks are misclassified and overestimated by a factor of three.

As such, the 237-square-foot figure in Table 39 would probably be, more correctly, estimated as somewhere between 237 square feet and 79 square feet (237 ÷ 3 = 79). The 79-square-foot figure also appears excessive given that the warranty threshold for such a distress is 10 square feet. But, as the LA 422 pilot project showed, there are instances where ARAN is known to misclassify reflection cracks as low-severity fatigue cracks. Thus, it is difficult to know what the actual distress is, both in terms of quantity or quality, without manual re-evaluation using ARAN photo-logs.

In support of the 237 figure and other seemingly elevated estimates in Table 39 that derive from ARAN testing, it must be mentioned that ARAN's distress analysis system is highly sensitive and is capable of capturing and quantifying distresses that might go unseen in a typical clipboard survey. Technologies like ARAN have not been long available to the engineering community and, as such, have not contributed greatly in helping to refine engineering judgment. This greater degree of sensitivity suggests that the current warranty thresholds may be too lax. But, given the great volume of data collected using ARAN and the fact that there is no way for it to be comprehensively analyzed in any automated fashion (manual assessment is cost prohibitive both in terms of manpower and fiscal resources), the suggestion is that there is no realistic way to utilize the resource.

CONCLUSIONS

The following conclusions can be arrived at based on the findings derived from the pilot study and the archival analysis:

- Implementation of the proposed warranty program would not be excessively burdensome to stakeholders. The evidence for this is that all three pilot projects [I-10 asphalt project (SP 450-03-0037); LA 422 asphalt project (SP 819-02-0012); and LA 946 PCC project (SP 817-08-0023)] were passed or are currently in full compliance with all warranty requirements as detailed in Table 38. Exceptions, such as the excessive longitudinal cracking observed on LA 422, which was caused by cement-stabilized base shrinkage, were determined to be beyond contractor control and, as such, did not invoke liability.

- The archival analysis, which examined the historic performance of Louisiana's existing pavement inventory, indicated that imposition of the proposed warranty program would not impose a quality standard beyond what is already in place in Louisiana. Archival projects performed on par with the pilot projects despite the fact that they were not constructed under a warranty requirement like the one being proposed. Archival projects did carry the standard regulatory materials and construction quality requirements that are placed on all Louisiana construction. The archival analysis indicated that this requirement is sufficient to obtain the same level of performance as the proposed warranty program would produce.

- It can be concluded that establishing a warranty program would provide the Department with an improved mechanism to pursue remediation in the event that a sub-standard product is discovered post-construction. As the archival analysis indicated that the pilot projects performed on par with the archival projects, indicating that implementation of the proposed warranty program would not impose an undue burden on stakeholders, it is reasonable to assert that implementation would serve only to better guarantee the Department's legal position in the event that remediation resulting from a sub-standard product becomes necessary post-construction.

- The current mechanism of mitigating conflict is sufficient to resolve disputes. The fact that the shrinkage cracking issue associated with LA 422 was resolved and the fact that contractor concerns relating to subgrade soil problems have been taken under advisement

by the Department indicate that the mechanism used to resolve conflict would not become more punitive as a result of the imposition of a warranty program. Once again, implementation of a warranty program would only serve to strengthen the Department's position in the event that a sub-standard product is discovered.

- Implementation of a warranty program, modeled on the one proposed, will likely improve product quality in some measure. It was clear that participants in the pilot phase of the study took the warranties initiative seriously. All parties examined the warranty specifications presented to them with greater than typical scrutiny and actively participated in discussions relating to them. Also, the contractors involved in the construction of the warranties projects that were built confessed that more care and effort (product quality) was given to their construction because of their warranty status.

- It is not clear what the cost impact would be if the proposed warranty program were implemented on a large scale. Stakeholder reluctance to participate in the pilot study is evidenced by the difficulty encountered in getting the project grid alluded to in Table 4 populated. Though inconclusive because of the limited scope of the analysis, the cost estimates given at the end of Appendix B can be used toward a preliminary assessment.

- There are problems extant with regards to the technologies associated with automated distress assessment as is evidenced by the misclassified and erroneous crack estimates examined in connection with the archival analysis. If these problems can be overcome, the coverage that they afford would make them vastly superior to what is possible by the use of traditional methods like manual crack mapping and so forth.

RECOMMENDATIONS

If the Department chooses to implement the proposed warranty program on a large scale, the following recommendations can be made based on the findings derived from the pilot study and the archival analysis:

- If the proposed warranty program is to be instituted in Louisiana, it must first be complemented with an increase in the manpower and resources needed to properly manage such an endeavor.

- This manpower expansion should include a full-time staff (employed with the Department's Planning Section) that is tasked with close examination of all pavement images, which are collected as part of the warranties program. This is necessary because automated distress analysis methods, under current technologies, cannot meet the level of accuracy that a warranty program requires.

- A departmentally owned ARAN fleet or other more advanced pavement monitoring resource should be kept and staffed by the Department so as to facilitate pavement monitoring of warranties projects on demand. The focus must be on manual evaluation either through examination of photo-logs or by on-site field inspections until such time as automated methods are not able to meet qualitative requirements.

- It is recommended that a widespread series of non-binding warranty contracts be let in order to gather enough performance data from them to establish a more comprehensive picture of what three-year distress development entails and to verify that the distress thresholds being proposed are sufficient and reasonable. A non-binding program is hoped will encourage greater contractor and bonding company participation and thereby establish an environment in which the project grid of Table 1 can be populated as originally envisioned.

- If a series of non-binding projects are instituted, then it is recommended that binding agreements be phased in, gradually, not to commence until after the non-binding contracts begin to retire. This will allow the performance of the retiring contracts to be assessed and the performance thresholds tweaked using reliable estimates. Binding contracts can then be issued utilizing the findings in a public manner so as to foster

confidence among stakeholders that future contractual requirements are fair and have been properly vetted.

ACRONYMS, ABBREVIATIONS, AND SYMBOLS

CRCP	continuously reinforced concrete pavement
DOTD	Department of Transportation and Development
FHWA	Federal Highway Administration
FWD	falling weight deflectometer
HPMS	Highway Performance Monitoring System
JCP	jointed concrete pavement
JTC	Joint Transportation Committee
LTRC	Louisiana Transportation Research Center
NHS	National Highway System
PCC	Portland cement concrete
PCCP	Portland cement concrete pavement
PRC	Project Review Committee
SHRP	Strategic Highway Research Program
SHRP-DIM	Strategic Highway Research Program's Distress Identification Manual
SN	structural number
TOPS	Tracking of Project

REFERENCES

1. Louisiana Department of Transportation and Development, "Warranties in State Contracts for Highway Construction, Louisiana Department of Transportation and Development Response to House Bill 1698," January 1998, pp. 13-14.

2. Hancher, D., "Use of Warranties in Road Construction," Prepared for the National Cooperative Highway Research Program, Transportation Research Board, National Research Council, *NCHRP Synthesis 195,* 1994.

3. Haddock, J. and Ward, D., "Performance of a Warranted Hot Mix Asphalt Pavement in Indiana." *Asphalt Paving Technology 1998*, Volume 67, March 1998, pp. 433-457.

4. Anderson, S. and Russell, J., "Guidelines for Warranty, Multi-Parameter, and Best Value Contracting," *NCHRP Report 451,* 2001.

5. Shah, S., "Evaluation of Louisiana's Maintenance Chipseal and Micro-Surfacing Program," *Research Report No. 363,* LADOTD, July 2002.

6. Hastak, M., Minkarah, I., Cui, Q., and Bavraktar, M., "The Evaluation of Warranty Provisions on ODOT Construction Projects," *Ohio Department of Transportation (ODOT) Final Report FHWA/OH-2003/019,* November 2003.

7. Carlson, P., Miles, J., Pratt, M., and Pike, A., "Evaluation of Wet-Weather Pavement Markings: First Year Report," *Texas Transportation Institute Technical Report 0-5008-1,* September 2005.

8. Shuler, S., Aschenbrener, T., DeDios, R., "Effect of Performance Warranties on Cost and Quality of Asphalt Pavements," *Transportation Research Record, No. 2040,* 2007.

9. NCHRP Topic Panel, "Automated Pavement Distress Collection Techniques," Prepared for the National Cooperative Highway Research Program, Transportation Research Board, National Research Council, *NCHRP Synthesis 334,* 2004, pp. 49-53.

10. Guralnick, S. A., Sun, E. S., and Smith, C. "Automating Inspection of Highway Pavement Surfaces," *Journal of Transportation Engineering*, Vol. 119, No 1, 1993.

11. Haas, C., and McNeil, S., “Criteria for Evaluating Pavement Imaging Systems,” *Transportation Research Record, No. 1260*, 1990.

12. Strategic Highway Research Program Executive Committee, “Distress Identification Manual for Long-Term Pavement Performance Studies,” *Strategic Highway Research Program, National Research Council Report SHRP-LTPP/FR-90-001*, October 1990.

13. LADOTD Striping Committee, “Memorandum: Thermoplastic Pavement Marking Material Comparison,” *Memorandum to Chief Engineer*, August 15, 2001.

APPENDIX A

Preliminary Draft Specifications

Louisiana
Department of Transportation and Development

SPECIAL PROVISION
FOR
CONSTRUCTION OF ASPHALT PAVEMENT WARRANTY

1.0 General

Part V of the Standard Specifications and the specifications for asphalt pavement are amended to include this Special Provision.

The term "pavement surface" in this Special Provision includes the asphalt driving lanes, asphalt paved shoulders, asphalt acceleration/deceleration lanes, and asphalt ramps.

The current edition of the *Louisiana Standard Specifications for Roads and Bridges*, as amended, is the minimum standards to be followed.

For the purpose of evaluating the performance of warranted asphalt pavement, the project will be divided into segments; each segment will be 500-ft. for the lane width.

2.0 Warranty Bond

The contractor shall warrant the workmanship, materials, quality, and performance of asphalt pavement for a period of three years following the date of project acceptance.

The contractor shall furnish a warranty bond in an amount equal to the contract amount for the warranted items or 50% of the full contract amount, whichever is greater. The warranty period shall be renewable annually for a period of three years. The bond will ensure the proper and prompt completion of remedial actions required to correct defective warranted work, including payments for all labor, materials, equipment, traffic control, and other incidental work.

3.0 Warranty Requirements

During the three-year warranty period, the contractor shall warrant the workmanship, materials, quality, and performance of asphalt pavement. The following pavement distresses will be

monitored by the Department to determine whether warranty action may be required:

- surface defects
- surface deformation
- cracking
- potholes

3.1 Surface Defects

Surface defects shall include bleeding and raveling. The pavement surface shall also be evaluated for friction resistance. Surface defects will be determined by a visual pavement condition survey, while friction resistance will be evaluated using ASTM standard test procedures E-501 and E-525. The warranted asphalt pavement shall be free of surface defects and shall pass the minimum required friction number; otherwise, the contractor shall execute remedial action.

3.1.1 Surface Friction

Surface friction characteristics will be evaluated following the American Society for Testing and Materials standard test method for friction resistance of paved surfaces using a full-scale tire (ASTM E-274 - 90). Friction resistance tests will be conducted at a speed of 40 miles per hour for two tire types, the Standard Rib Tire for Pavement Skid-Resistance Tests (ASTM E-501 - 94), and the Standard Smooth Tire for Pavement Skid-Resistance Tests (ASTM E-525 - 88). One friction test will be conducted in each segment with each tire type. The friction number (FN), which reflects the surface friction characteristics of the paved surface, will be obtained from these tests. For each segment, the FN shall be greater than or equal to 30 ($FN \geq 30$) with each tire (rib and smooth). If the friction number for a segment is measured less than thirty, then the contractor shall execute remedial action. Remedy shall be selected based on evaluation of traffic volume and loading on the pavement and shall be in accordance with Engineering Directive and Standards Manual (EDSM) 1.1.1.5-Departments Surface Characteristics Program. Remedial action shall include resurfacing with microsurfacing, chip seal, or overlays.

3.1.2 Bleeding

Bleeding is the existence of excess bituminous binder occurring on the pavement surface. Bleeding will be determined by a visual pavement condition survey. Bleeding will be reported in terms of the number of occurrences within each segment and will be measured in square feet of affected area. All bleeding areas greater than 10 square feet ($A > 10\ ft^2$) for any individual area of bleeding shall be corrected. The minimum replacement area shall be 100 square feet per

occurrence. The entire segment shall be resurfaced if there are three or more bleeding occurrences within one segment.

3.1.3 Raveling

Raveling is wearing away of the pavement surface in a high-quality hot mix asphalt concrete. Raveling will be determined by a visual pavement condition survey. Raveling will be reported by the number of occurrences within each segment and will be measured in square feet of affected area. Raveling occurrence with area greater than 25 square feet shall be corrected. If raveling occurrence is reported in one segment, the contractor shall remove and resurface 200 percent of the distressed area. The entire segment shall be resurfaced if there are three or more raveling occurrences within one segment.

3.2 Surface Deformation

Surface deformation shall include rutting and shoving. Surface deformation will be determined by standard measurement methods and/or a visual pavement condition survey, as applicable. The warranted asphalt pavement shall be free of surface deformation; otherwise, the contractor shall execute remedial action.

3.2.1 Rutting

Rutting is longitudinal surface depression in the wheel path. Rutting will be measured in linear feet along each wheel path. Rutting severity is determined by the mean depth of rut. The mean rut depth will be determined every segment (500 ft.). The mean rut depth along the segment shall not exceed 1/2 in. (mean rut depth < 0.5 in.). Mean rut depth greater than 1/2 in. shall require remedy based on the severity of rutting. Remedy shall be partial or full depth patch or mill and overlay.

3.2.2 Shoving

Shoving is a longitudinal displacement of a localized area of the pavement surface. Shoving will be determined by a visual pavement condition survey. Shoving will be measured by number of occurrences and square feet of affected surface area. Shoving occurrences with areas greater than 25 square feet shall be corrected. If shoving occurrence is reported in one segment, the contractor shall remove and resurface 200 percent of the distressed area. Any shoving occurrence in a segment shall be corrected by milling and replacement. The entire segment shall be milled and replaced if there are three or more shoving occurrences within one segment.

3.3 Cracking

Cracking includes fatigue cracking, block cracking, longitudinal cracking, and transverse cracking. A description of cracking, cracking severity levels, and cracking measurements can be found in the *Distress Identification Manual for the Long-Term Pavement Performance Project, SHRP-P-338*. Cracking will be determined by a visual pavement condition survey. Fatigue or block cracking of low to moderate severity levels shall not exceed 10 square feet of the area in a segment. No fatigue or block cracking of high severity level shall be allowed in a segment in the warranted asphalt pavement. Fatigue and block cracking shall be treated by removal and resurfacing of 150 percent of the area of the distressed surface.

The total length of each of longitudinal or transverse cracking of low severity level shall not exceed (15 ft.) in a segment. No longitudinal or transverse cracking of moderate to high severity levels shall be allowed in a segment in the warranted asphalt pavement. Remedial action shall be determined by the type and severity of the crack and shall include cutting and sealing, removing spalled block cracks, and resurfacing.

3.4 Potholes

Potholes are bowl-shaped holes of various sizes in the pavement surface. Potholes will be determined by a visual pavement condition survey. Potholes will be reported by number of occurrences and will be measured by the area of each pothole. The depth of the pothole will also be measured. Potholes with areas greater than 25 square inches and/or with depth greater than 1 inch shall be corrected. Remedial action for potholes shall include removal and replacement of 150 percent of the potholes area.

4.0 Rights and Responsibilities of the Department

The Department:

(a) Shall monitor the items described in Section 3.0 of this Special Provision for a period of three years. The Department will conduct condition surveys to evaluate the warranted items at no cost to the contractor. The initial survey will be conducted within one month following the initial acceptance of the project.

(b) Reserve the right to perform routine maintenance at any time on the warranted pavement. This will not relieve the contractor from meeting the warranty requirement of this Special

Provision.

(c) Shall advise the contractor of the survey schedule and the results will be made available within 14 days after completion of the survey.

(d) Shall notify the contractor, in writing, of any remedial action required to meet the warranty requirements.

(e) Reserve the right to approve the date(s) requested by the contractor to perform the remedial action.

(f) Reserve the right to approve all materials and methods used the contractor to perform the remedial action

(g) Reserves the right, if the contractor is unable, to make immediate emergency repairs to the pavement to prevent an unsafe road condition as determined by the Department. The Department will attempt to notify the contractor that action is required to address an unsafe condition. However, should the contractor be unable to comply with this requirement, to the Department's satisfaction and within the time frame required by the Department, the Department will perform, or have performed any emergency repairs deemed necessary. Any such emergency repairs undertaken will not relieve the contractor from meeting the warranty requirements of this Special Provision. Any costs associated with the emergency repairs will be paid by the contractor if it is determined the cause was from defective materials and/or workmanship.

(h) Shall document the condition of the pavement prior to emergency repairs.

5.0 Rights and Responsibilities of the Contractor

The contractor:

(a) Shall unconditionally warrant to the Department that the pavement shall be free of defects in materials and workmanship, as defined by the contract plans and specifications, for a three-year period. This warranty and the warranty bond shall be on forms furnished by the Department. These completed forms shall be submitted to the Department prior to award of contract.

(b) Shall perform remedial action once any of the warranted items exceeds the acceptable limits described in this Special Provision. The warranty will remain in a good standing as long as each distress (item) remains within the defined acceptable limits.

(c) Is responsible for cost of remedial action, including but not limited to payments for all labor, materials, equipment, traffic control, and restoring all associated pavement features, such as pavement marking, shoulders, adjacent lanes, and other incidental work, at no additional cost to the Department.

(d) Is responsible for replacing all temporary repairs resulting from the pavement being in noncompliance with the warranty requirements.

(e) Shall notify the Department and shall submit a written course of action proposing appropriate remedial action for five calendar days prior to commencement of any remedial action, unless this work requires immediate emergency repairs as determined by the Department.

(f) Shall perform the remedial action within three months of its approval by the Department, unless the Department notifies the contractor that immediate emergency repairs are necessary to prevent an unsafe road condition; in this event, the contractor shall make said emergency repairs within a time frame required by the Department.

(g) Shall furnish to the Department, in addition to the regular performance and lien bond for the contract, supplemental performance and lien bonds covering any corrective action being performed. These supplemental bonds shall be furnished to the Department, using Department approved forms, prior to beginning any remedial action in the amount required by the Department to cover said remedial action and be in all respects satisfactory and acceptable to the Department.

(h) Is responsible for all costs of all emergency repairs to the pavement deemed necessary by the Department to prevent an unsafe road condition.

(i) Shall submit a Traffic Control Plan to the Department for approval before the remedial action is undertaken. Traffic control and traffic control devices will be required to safeguard the public and contractor personnel during remedial action. All traffic control and traffic control devices shall be in accordance with the current *Louisiana Standard Specifications for Roads and Bridges*, as amended, appropriate Louisiana DOTD Standard Plans, and the *Manual of Uniform Traffic Control Devices* (MUTCD).

(j) Shall not be held responsible for distresses which are caused by factors beyond the control of the contractor.

6.0 Conflict Resolution

If the contractor disputes the survey findings, written notification of the dispute shall be provided to the chief engineer within 30 days.

Upon receipt of the contractor's written dispute, a Conflict Resolution Team, hereinafter "team", will determine the validity of the dispute. The team will consist of two contractor representatives, two Department representatives, and a fifth person mutually agreed upon by both the Department and the contractor. Any costs for the fifth person will be equally shared between the Department and the contractor. The team members will be identified in writing at the preconstruction meeting and will be knowledgeable in the terms and conditions of this warranty and the methods used in the determination of warranted item distresses. The team will submit its recommendation to the chief engineer. If it is determined that remedial action is required to correct any warranted item, the contractor shall perform the required actions as directed, including payments for all labor, materials, equipment, traffic control, and other incidental work. Remedial action shall be performed within three months.

7.0 Measurement and Payment

All contractor costs associated with the performance of this Special Provision, including but not limited to, maintaining traffic, remedial action with associated work, materials, and engineering will not be paid for separately. All costs associated with providing the required warranty bond, documentation, and conflict resolution team members will be considered as included in the items of work covered by the warranty as detailed in Section 4.0 of this Special Provision. All costs will be considered as included in the contractor's prices included in the contract.

Louisiana
Department of Transportation and Development

SPECIAL PROVISION
FOR
ASPHALTIC SURFACE TREATMENT (AST)-
CHIP SEAL WARRANTY

1.0 General

The specifications for AST-Chip Seal are amended to include this Special Provision.

The current edition of the *Louisiana Standard Specifications for Roads and Bridges*, as amended, is the minimum standards to be followed, with the exception of aggregate friction rating requirement.

For the purpose of evaluating the performance of warranted AST-Chip Seal, the project will be divided into segments; each segment will be 500 ft. for the lane width.

2.0 Warranty Bond

The contractor shall warrant the workmanship, materials, quality, and performance of AST-Chip Seal for a period of three (3) years following the date of project acceptance.

The contractor shall furnish a warranty bond in an amount equal to the contract amount for the warranted items or 50 percent of the full contract amount, whichever is greater. The warranty period shall be renewable annually for a period of three years. The bond will ensure the proper and prompt completion of remedial actions required to correct defective warranted work, including payments for all labor, materials, equipment, traffic control, and other incidental work.

3.0 Warranty Requirements

During the three-year warranty period, the contractor shall warrant the workmanship, materials, quality, and performance of AST-Chip Seal. The following AST-Chip Seal distresses will be monitored by the Department to determine whether warranty action may be required:

- surface friction
- bleeding
- loss of cover aggregate

3.1 Surface Friction

Surface friction characteristics will be evaluated following the American Society for Testing and Materials standard test method for friction resistance of paved surfaces using a full-scale tire (ASTM E-274 - 90). Friction resistance tests will be conducted at a speed of 40 miles per hour for two tire types, the Standard Rib Tire for Pavement Friction-Resistance Tests (ASTM E-501 - 94), and the Standard Smooth Tire for Pavement Friction-Resistance Tests (ASTM E-525 - 88). One friction test will be conducted in each segment with each tire type. The friction number (FN), which reflects the surface friction characteristics of the paved surface, will be obtained from these tests. For each segment, the FN shall be greater than or equal to 30 ($FN \geq 30$) with each tire (rib and smooth). If the friction number for a segment is measured less than 30, then the contractor shall execute a remedial action. Remedy shall include resurfacing with AST-Chip Seal.

3.2 Bleeding

Bleeding is the existence of excess bituminous binder occurring on the pavement surface. Bleeding will be determined by a visual pavement condition survey. Bleeding will be reported in terms of the number of occurrences within each segment and will be measured in square feet of affected area. All bleeding occurrences of area greater than 10 square feet (> 10 ft^2) shall be corrected; the minimum replacement area shall be 100 square feet per occurrence or 200 percent of the affected area, whichever is greater. The entire segment shall be resurfaced if there are three or more bleeding occurrences within one segment.

3.3 Loss of Cover Aggregate

Aggregate loss is the wearing away of the pavement surface in the AST-Chip Seal caused by the dislodging of aggregate particles. Aggregate loss will be determined by a visual pavement condition survey. Aggregate loss will be reported in terms of number of occurrences in a segment and will be measured in square feet of affected area. All aggregate loss occurrences of areas greater than 10 square feet ($A > 10$ ft^2) shall be corrected; the minimum replacement area

shall be 100 square feet per occurrence or 200 percent of the affected area, whichever is greater. The entire segment shall be resurfaced if there are three or more occurrences within one segment.

4.0 Rights and Responsibilities of the Department

The Department:

(a) Shall monitor the items described in Section 3.0 of this Special Provision for a period of three years. The Department will conduct condition surveys to evaluate the warranted items at no cost to the contractor. The initial survey will be conducted within one month following the initial acceptance of the project.

(b) Reserves the right to perform routine maintenance at any time on the warranted pavement. This will not relieve the contractor from meeting the warranty requirement of this Special Provision.

(c) Shall advise the contractor of the survey schedule and the results will be made available within 14 days after completion of the survey.

(d) Shall notify the contractor, in writing, of any remedial action required to meet the warranty requirements.

(e) Reserves the right to approve the date(s) requested by the contractor to perform the remedial action.

(f) Reserves the right to approve all materials and methods used the contractor to perform the remedial action.

(g) Reserves the right, if the contractor is unable, to make immediate emergency repairs to the pavement to prevent an unsafe road condition as determined by the Department. The Department will attempt to notify the contractor that action is required to address an unsafe condition. However, should the contractor be unable to comply with this requirement, to the Department's satisfaction and within the time frame required by the Department, the Department will perform, or have performed any emergency repairs deemed necessary. Any such emergency repairs undertaken will not relieve the contractor from meeting the warranty requirements of this Special Provision. Any costs associated with the emergency repairs will be paid by the contractor if it is determined the cause was from defective materials and/or workmanship.

(h) Shall document the condition of the pavement prior to emergency repairs.

5.0 Rights and Responsibilities of the Contractor

The contractor:

(a) Shall unconditionally warrant to the Department that the AST-Chip Seal shall be free of defects in materials and workmanship, as defined by the contract plans and specifications, for the three-year period. This warranty and the warranty bond shall be on forms furnished by the Department. These completed forms shall be submitted to the Department prior to award of contract.

(b) Shall perform remedial action once any of the warranted items exceeds the acceptable limits described in this Special Provision. The warranty will remain in a good standing as long as each distress (item) remains within the defined acceptable limits.

(c) Is responsible for cost of remedial action, including but not limited to payments for all labor, materials, equipment, traffic control, and restoring all associated pavement features, such as pavement marking, shoulders, and adjacent lanes, and other incidental work, at no additional cost to the Department.

(d) Is responsible for replacing all temporary repairs resulting from the AST-Chip Seal being in noncompliance with the warranty requirements.

(e) Shall notify the Department and shall submit a written course of action proposing appropriate remedial action for five calendar days prior to commencement of any remedial action, unless this work requires immediate emergency repairs as determined by the Department.

(f) Shall perform the remedial action within three months of its approval by the Department, unless the Department notifies the contractor that immediate emergency repairs are necessary to prevent an unsafe road condition; in this event, the contractor shall make said emergency repairs within a time frame required by the Department.

(g) Shall furnish to the Department, in addition to the regular performance and lien bond for the contract, supplemental performance and lien bonds covering any corrective action being performed. These supplemental bonds shall be furnished to the Department, using Department approved forms, prior to beginning any remedial action in the amount required by the Department to cover said remedial action and be in all respects satisfactory and acceptable to the Department.

(h) Is responsible for all costs of all emergency repairs to the pavement deemed necessary by the Department to prevent an unsafe road condition.

(i) Shall submit a Traffic Control Plan to the Department for approval before the remedial action is undertaken. Traffic control and traffic control devices will be required to

safeguard the public and contractor personnel during remedial action. All traffic control and traffic control devices shall be in accordance with the current *Louisiana Standard Specifications for Roads and Bridges*, as amended, appropriate Louisiana DOTD Standard Plans, and the *Manual of Uniform Traffic Control Devices* (MUTCD).

(j) Shall not be held responsible for distresses that are caused by factors beyond the control of the contractor.

6.0 Conflict Resolution

If the contractor disputes the survey findings, written notification of the dispute shall be provided to the chief engineer within 30 days.

Upon receipt of the contractor's written dispute, a Conflict Resolution Team, hereinafter "team," will determine the validity of the dispute. The team will consist of two contractor representatives, two Department representatives, and a fifth person mutually agreed upon by both the Department and the contractor. Any costs for the fifth person will be equally shared between the Department and the contractor. The team members will be identified in writing at the preconstruction meeting and will be knowledgeable in the terms and conditions of this warranty and the methods used in the determination of warranted item distresses. The team will submit its recommendation to the chief engineer. If it is determined that remedial action is required to correct any warranted item, the contractor shall perform the required actions as directed, including payments for all labor, materials, equipment, traffic control, and other incidental work. Remedial action shall be performed within three months.

7.0 Measurement and Payment

All contractor costs associated with the performance of this Special Provision, including but not limited to, maintaining traffic, remedial action with associated work, materials, and engineering will not be paid for separately. All costs will be considered as included in the contractor's prices included in the contract.

Louisiana
Department of Transportation and Development

SPECIAL PROVISION
FOR
MICROSURFACING WARRANTY

1.0 General

The specifications for microsurfacing are amended to include this Special Provision.

The current edition of the *Louisiana Standard Specifications for Roads and Bridges*, as amended, is the minimum standards to be followed, with the exception of the aggregate friction rating requirement.

For the purpose of evaluating the performance of warranted microsurfacing, the project will be divided into segments; each segment will be 550 ft. for the lane width.

2.0 Warranty Bond

The contractor shall warrant the workmanship, materials, quality, and performance of microsurfacing for a period of three years following the date of project acceptance.

The contractor shall furnish a warranty bond in an amount equal to the contract amount for the warranted items or 50 percent of the full contract amount, whichever is greater. The warranty period shall be renewable annually for a period of three years. The bond will ensure the proper and prompt completion of remedial actions required to correct defective warranted work, including payments for all labor, materials, equipment, traffic control, and other incidental work.

3.0 Warranty Requirements

During the three-year warranty period, the contractor shall warrant the workmanship, materials, quality, and performance of microsurfacing. The following microsurfacing distresses will be monitored by the Department to determine whether warranty action may be required:

- surface friction
- bleeding and flushing
- delamination
- rutting
- raveling and weathering

3.1 Surface Friction

Surface friction characteristics will be evaluated following the American Society for Testing and Materials standard test method for friction resistance of paved surfaces using a full-scale tire (ASTM E-274 - 90). Friction resistance tests will be conducted at a speed of 40 miles per hour for two tire types, the Standard Rib Tire for Pavement Friction-Resistance Tests (ASTM E-501 - 94), and the Standard Smooth Tire for Pavement Friction-Resistance Tests (ASTM E-525 - 88). One Friction resistance test will be conducted in each segment with each tire type. The friction number (FN), which reflects the surface friction characteristics of the paved surface, will be obtained from these tests. For each segment, the FN shall be greater than or equal to thirty ($FN \geq 30$) with each tire (rib and smooth). If the friction number for a segment is measured less than 30, then the contractor shall execute remedial action. Remedy shall include resurfacing with microsurfacing, chipseal, or overlays.

3.2 Bleeding and Flushing

Bleeding and flushing is the existence of excess bituminous binder occurring on the pavement surface. Bleeding and flushing will be determined by a visual pavement condition survey. Bleeding and flushing will be reported in terms of the number of occurrences within each segment and will be measured in square feet of affected area. All bleeding and flushing occurrences of area greater than ten square feet ($A > 10\ ft^2$) shall be corrected; the minimum replacement area shall be 100 square feet per occurrence or 200 percent of the affected area, whichever is greater. The entire segment shall be resurfaced if there are two or more bleeding and flushing occurrences within one segment.

3.3 Delamination

Delamination is the loss of microsurfacing material from the pavement surface. Delamination

will be determined by a visual pavement condition survey. Delamination will be reported in terms of the number of occurrences within each segment and will be measured in square feet of affected area. Any occurrence of delamination with area of more than one square foot (> 1 ft^2) shall be corrected. Any segment with delaminated area(s) of more than four percent (> 4%) of the area of the segment shall be milled and replaced.

3.4 Rutting

Rutting is longitudinal surface depression in the wheel path. Rutting will be measured in linear foot along each wheel path. Rutting severity is determined by the mean depth of rut. The mean rut depth will be determined every segment 500 ft. The mean rut depth along the segment shall not exceed 1/2 in. (mean rut depth < 0.5 in.). Mean rut depth greater than 1/2 in. shall require remedy based on the severity of rutting. Remedy shall be by rut filling by microsurfacing followed by full width microsurfacing at a minimum of 18 pounds per square yard (18 lbs/yd^2).

3.5 Raveling and Weathering

Raveling and weathering is wearing away of the microsurfacing, from the previous pavement surface course, caused by the dislodging of aggregate particles (raveling) and loss of asphalt binder (weathering). Raveling and weathering will be reported by the number of occurrences within each segment and will be measured in square feet of affected area. Raveling and weathering of area greater than 10 square feet (A > 10 ft^2) shall be corrected; the minimum replacement area shall be 100 square feet per occurrence or 200 percent of the affected area, whichever is greater. The entire segment shall be resurfaced if there are two or more raveling and weathering occurrences within one segment.

4.0 Rights and Responsibilities of the Department

The Department:

(a) Shall monitor the items described in Section 3.0 of this Special Provision for a period of three years. The Department will conduct condition surveys to evaluate the warranted items at no cost to the contractor. The initial survey will be conducted within one month following the initial acceptance of the project.

(b) Reserves the right to perform routine maintenance at any time on the warranted pavement. This will not relieve the contractor from meeting the warranty requirement of this Special Provision.

(c) Shall advise the contractor of the survey schedule and the results will be made available within 14 days after completion of the survey.

(d) Shall notify the contractor, in writing, of any remedial action required to meet the warranty requirements.

(e) Reserves the right to approve the date(s) requested by the contractor to perform the remedial action.

(f) Reserves the right to approve all materials and methods used the contractor to perform the remedial action.

(g) Reserves the right, if the contractor is unable, to make immediate emergency repairs to the pavement to prevent an unsafe road condition as determined by the Department. The Department will attempt to notify the contractor that action is required to address an unsafe condition. However, should the contractor be unable to comply with this requirement, to the Department's satisfaction and within the time frame required by the Department, the Department will perform, or have performed any emergency repairs deemed necessary. Any such emergency repairs undertaken will not relieve the contractor from meeting the warranty requirements of this Special Provision. Any costs associated with the emergency repairs will be paid by the contractor if it is determined the cause was from defective materials and/or workmanship.

(h) Shall document the condition of the pavement prior to emergency repairs.

5.0 Rights and Responsibilities of the Contractor

The contractor:

(a) Shall unconditionally warrant to the Department that the microsurfacing shall be free of defects in materials and workmanship, as defined by the contract plans and specifications, for the three-year period. This warranty and the warranty bond shall be on forms furnished by the Department. These completed forms shall be submitted to the Department prior to award of contract.

(b) Shall perform remedial action once any of the warranted items exceeds the acceptable limits described in this Special Provision. The warranty will remain in a good standing as long as each distress (item) remains within the defined acceptable limits.

(c) Is responsible for cost of remedial action, including but not limited to payments for all labor, materials, equipment, traffic control, and restoring all associated pavement features, such as pavement marking, shoulders, and adjacent lanes, and other incidental work, at no additional cost to the Department.

(d) Is responsible for replacing all temporary repairs resulting from the microsurfacing being

in noncompliance with the warranty requirements.

(e) Shall notify the Department and shall submit a written course of action proposing appropriate remedial action for five calendar days prior to commencement of any remedial action, unless this work requires immediate emergency repairs as determined by the Department.

(f) Shall perform the remedial action within three months of its approval by the Department, unless the Department notifies the contractor that immediate emergency repairs are necessary to prevent an unsafe road condition; in this event, the contractor shall make said emergency repairs within a time frame required by the Department.

(g) Shall furnish to the Department, in addition to the regular performance and lien bond for the contract, supplemental performance and lien bonds covering any corrective action being performed. These supplemental bonds shall be furnished to the Department, using Department approved forms, prior to beginning any remedial action in the amount required by the Department to cover said remedial action and be in all respects satisfactory and acceptable to the Department.

(h) Is responsible for all costs of all emergency repairs to the pavement deemed necessary by the Department to prevent an unsafe road condition.

(i) Shall submit a Traffic Control Plan to the Department for approval before the remedial action is undertaken. Traffic control and traffic control devices will be required to safeguard the public and contractor personnel during remedial action. All traffic control and traffic control devices shall be in accordance with the current *Louisiana Standard Specifications for Roads and Bridges,* as amended, appropriate LADOTD Standard Plans, and the *Manual of Uniform Traffic Control Devices* (MUTCD).

(j) Shall not be held responsible for distresses that are caused by factors beyond the control of the contractor.

6.0 Conflict Resolution

If the contractor disputes the survey findings, written notification of the dispute shall be provided to the chief engineer within 30 days.

Upon receipt of the contractor's written dispute, a Conflict Resolution Team, hereinafter "team," will determine the validity of the dispute. The team will consist of two contractor representatives, two Department representatives, and a fifth person mutually agreed upon by both the Department and the contractor. Any costs for the fifth person will be equally shared between the Department and the contractor. The team members will be identified in writing at the preconstruction

meeting and will be knowledgeable in the terms and conditions of this warranty and the methods used in the determination of warranted item distresses. The team will submit its recommendation to the chief engineer. If it is determined that remedial action is required to correct any warranted item, the contractor shall perform the required actions as directed, including payments for all labor, materials, equipment, traffic control and other incidental work. Remedial action shall be performed within three months.

7.0 Measurement and Payment

All contractor costs associated with the performance of this Special Provision, including but not limited to, maintaining traffic, remedial action with associated work, materials, and engineering will not be paid for separately. All costs will be considered as included in the contractor's prices included in the contract.

Louisiana
Department of Transportation and Development

SPECIAL PROVISION
FOR
RAISED PAVEMENT MARKINGS WARRANTY

1.0 General

Part VII of the Standard Specifications and Section 731 specifications for Raised Pavement Markings are amended to include this Special Provision.

The current edition of the *Louisiana Standard Specifications for Roads and Bridges*, as amended, is the minimum standards to be followed.

2.0 Warranty Bond

The contractor shall unconditionally warrant the workmanship, materials, quality, and performance of the Raised Pavement Markings to be free of defects a period of three years following the date of project acceptance.

The contractor shall furnish a warranty bond in an amount equal to the contract amount for the warranted items or 50 percent of the full contract amount, whichever is greater. The warranty period shall be renewable annually for a period of three years. The bond will ensure the proper and prompt completion of remedial actions required to correct defective warranted work, including payments for all labor, materials, equipment, traffic control, and other incidental work.

3.0 Warranty Requirements

During the three-year warranty period, the contractor shall warrant the workmanship, materials, quality, and performance of the Raised Pavement Markings to be free of defects, as hereinafter defined and determined by visual inspection. The warranty called for shall be on a warranty form furnished by LADOTD. This warranty shall be submitted to LADOTD prior to the award of the contract.

The Raised Pavement Markings will be considered defective if any of the following conditions are discovered within the three-year warranty period:

(a) The occurrence of visible loss or damage of Raised Pavement Markings
(b) Incomplete and improper application of adhesive material as specified in the specifications.
(c) Loss of color of Raised Pavement Markings.
(d) Loss of luminescence as determined by ASTM D-6359 (Standard Specification for Minimum Retroreflectance of Newly Applied Pavement Marking Using Portable Hand-Operated Instrument).
(e) Damage to the Raised Pavement Markings caused by the contractor while performing other work.

4.0 Rights and Responsibilities of the Department

The Department:

(a) Shall inspect the Raised Pavement Markings thoroughly for the defects listed for a period of three years. The Department will conduct the inspection to evaluate the warranted items at no cost to the contractor.
(b) Shall determine if there are any defective areas present in the warranted Raised Pavement Markings.
(c) Reserve the right to perform routine maintenance at any time on the warranted Raised Pavement Markings. This will not relieve the contractor from meeting the warranty requirement of this Special Provision.
(d) Shall advise the contractor of the inspection schedule and the results will be made available within 14 days after completion of the inspection.
(e) Shall notify the contractor, in writing, of any remedial action required to meet the warranty requirements.
(f) Reserves the right to approve the date(s) requested by the contractor to perform the remedial action.
(g) Reserves the right to approve all materials and methods used the contractor to perform the remedial action

5.0 Rights and Responsibilities of the Contractor

The contractor:

(a) Shall unconditionally warrant to the Department that the Raised Pavement Markings shall be free of defects in materials and workmanship, as defined by the contract plans and specifications, for the three-year period. This warranty and the warranty bond shall be on forms furnished by the Department. These completed forms shall be submitted to the Department prior to award of contract.

(b) Shall repair defective areas, identified by the Department, in accordance with the Raised Pavement Markings specifications.

(c) Is responsible for cost of repair, including but not limited to payments for all labor, materials, equipment, and traffic control.

(d) Shall notify the Department, in writing, and shall submit a course of action proposing the repair procedures and progress schedule two weeks prior to commencement of any remedial action.

(e) Shall perform the remedial action within three months of its approval by the Department, unless the Department notifies the contractor that immediate emergency repairs are necessary to prevent an unsafe road condition; in this event, the contractor shall make said emergency repairs within a time frame required by the Department.

(f) Shall supply verification to the Department that the required liability insurance is in effect during the period the corrective work is being done.

(g) Shall submit a Traffic Control Plan to the Department for approval before the remedial action is undertaken. Traffic control and traffic control devices will be required to safeguard the public and contractor personnel during remedial action. All traffic control and traffic control devices shall be in accordance with the current *Louisiana Standard Specifications for Roads and Bridges*, as amended, appropriate LADOTD Standard Plans, and the *Manual of Uniform Traffic Control Devices* (MUTCD).

(h) Shall not be held responsible for distresses that are caused by factors beyond the control of the contractor.

6.0 Conflict Resolution

If the contractor disputes the inspection findings, written notification of the dispute shall be provided to the chief engineer within 30 days.

Upon receipt of the contractor's written dispute, a Conflict Resolution Team, hereinafter "team," will determine the validity of the dispute. The team will consist of two contractor representatives, two Department representatives, and a fifth person mutually agreed upon by both the Department and the contractor. Any costs for the fifth person will be equally shared between the Department and the contractor. The team members will be identified in writing at the preconstruction meeting and will be knowledgeable in the terms and conditions of this warranty and the methods used in the determination of warranted item defects. The team will submit its recommendation to the chief engineer. If it is determined that remedial action is required to correct any warranted item, the contractor shall perform the required actions as directed, including payments for all labor, materials, equipment, traffic control, and other incidental work. Remedial action shall be performed within three months.

7.0 Measurement and Payment

All costs associated with performance of the work, the required maintaining traffic, the required supplemental performance and lien bonds, and the required permit insurance will not be paid for separately but will be considered to be included in the contractor's overhead and administrative costs.

Louisiana
Department of Transportation and Development

SPECIAL PROVISION
FOR
PLASTIC PAVEMENT MARKINGS WARRANTY

1.0 General

Part VII of the Standard Specifications and Section 732 specifications for Plastic Pavement Markings are amended to include this Special Provision.

The current edition of the *Louisiana Standard Specifications for Roads and Bridges*, as amended, is the minimum standards to be followed.

2.0 Warranty Bond

The contractor shall unconditionally warrant the workmanship, materials, quality, and performance of the Plastic Pavement Markings to be free of defects a period of three years following the date of project acceptance.

The contractor shall furnish a warranty bond in an amount equal to the contract amount for the warranted items or 50 percent of the full contract amount, whichever is greater. The warranty period shall be renewable annually for a period of three years. The bond will ensure the proper and prompt completion of remedial actions required to correct defective warranted work, including payments for all labor, materials, equipment, traffic control, and other incidental work.

3.0 Warranty Requirements

During the three-year warranty period, the contractor shall warrant the workmanship, materials, quality, and performance of the Plastic Pavement Markings to be free of defects, as hereinafter defined and determined by visual inspection and paint thickness measurements. The warranty called for shall be on a warranty form furnished by LADOTD. This warranty shall be submitted to LADOTD prior to the award of the contract.

The Plastic Pavement Markings will be considered defective if any of the following conditions are discovered within the three-year warranty period:

(a) The occurrence of visible loss, peeling, or flaking of Plastic Pavement Markings
(b) Application of Plastic Pavement Markings over dirt, debris, or products not removed during cleaning.
(c) Incomplete application of Plastic Pavement Markings or material thicknesses less than the minimums specified in the specifications.
(d) Loss of luminescence as determined by ASTM D-6359 (Standard Specification for Minimum Retroreflectance of Newly Applied Pavement Marking Using Portable Hand-Operated Instrument).
(e) Damage to the Plastic Pavement Markings caused by the contractor while performing other work.

4.0 Rights and Responsibilities of the Department

The Department:

(a) Shall inspect the Plastic Pavement Markings thoroughly for the defects listed for a period of three years. The Department will conduct the inspection to evaluate the warranted items at no cost to the contractor.
(b) Shall determine if there are any defective areas present in the warranted Plastic Pavement Markings.
(c) Reserves the right to perform routine maintenance at any time on the warranted Plastic Pavement Markings. This will not relieve the contractor from meeting the warranty requirement of this Special Provision.
(d) Shall advise the contractor of the inspection schedule and the results will be made available within 14 days after completion of the inspection.
(e) Shall notify the contractor, in writing, of any remedial action required to meet the warranty requirements.
(f) Reserves the right to approve the date(s) requested by the contractor to perform the remedial action.
(g) Reserves the right to approve all materials and methods used the contractor to perform the remedial action

5.0 Rights and Responsibilities of the Contractor

The contractor:

(a) Shall unconditionally warrant to the Department that the Plastic Pavement Markings shall be free of defects in materials and workmanship, as defined by the contract plans and specifications, for the three-years period. This warranty and the warranty bond shall be on forms furnished by the Department. These completed forms shall be submitted to the Department prior to award of contract.

(b) Shall repair defective areas, identified by the Department, in accordance with the Plastic Pavement Markings specifications.

(c) Is responsible for cost of repair, including but not limited to payments for all labor, materials, equipment, and traffic control.

(d) Shall notify the Department, in writing, and shall submit a course of action proposing the repair procedures and progress schedule two weeks prior to commencement of any remedial action.

(e) Shall perform the remedial action within three months of its approval by the Department, unless the Department notifies the contractor that immediate emergency repairs are necessary to prevent an unsafe road condition; in this event, the contractor shall make said emergency repairs within a time frame required by the Department.

(f) The contractor shall supply verification to the Department that the required liability insurance is in effect during the period the corrective work is being done.

(g) Shall submit a Traffic Control Plan to the Department for approval before the remedial action is undertaken. Traffic control and traffic control devices will be required to safeguard the public and contractor personnel during remedial action. All traffic control and traffic control devices shall be in accordance with the current *Louisiana Standard Specifications for Roads and Bridges*, as amended, appropriate LADOTD Standard Plans, and the *Manual of Uniform Traffic Control Devices* (MUTCD).

(h) Shall not be held responsible for distresses that are caused by factors beyond the control of the contractor.

6.0 Conflict Resolution

If the contractor disputes the inspection findings, written notification of the dispute shall be provided to the chief engineer within 30 days.

Upon receipt of the contractor's written dispute, a Conflict Resolution Team, hereinafter "team," will determine the validity of the dispute. The team will consist of two contractor representatives, two Department representatives, and a fifth person mutually agreed upon by both the Department and the contractor. Any costs for the fifth person will be equally shared between the Department and the contractor. The team members will be identified in writing at the preconstruction meeting and will be knowledgeable in the terms and conditions of this warranty and the methods used in the determination of warranted item defects. The team will submit its recommendation to the chief engineer. If it is determined that remedial action is required to correct any warranted item, the contractor shall perform the required actions as directed, including payments for all labor, materials, equipment, traffic control, and other incidental work. Remedial action shall be performed within three months.

7.0 Measurement and Payment

All costs associated with performance of the work, the required maintaining traffic, the required supplemental performance and lien bonds, and the required permit insurance will not be paid for separately but will be considered to be included in the contractor's overhead and administrative costs.

Louisiana
Department of Transportation and Development

SPECIAL PROVISION
FOR
PAINTED TRAFFIC STRIPING WARRANTY

1.0 General

Part VII of the Standard Specifications and Section 737 specifications for Painted Traffic Striping are amended to include this Special Provision.

The current edition of the *Louisiana Standard Specifications for Roads and Bridges*, as amended, is the minimum standards to be followed.

2.0 Warranty Bond

The contractor shall unconditionally warrant the workmanship, materials, quality, and performance of the Painted Traffic Striping to be free of defects a period of three years following the date of project acceptance.

The contractor shall furnish a warranty bond in an amount equal to the contract amount for the warranted items or 50 percent of the full contract amount, whichever is greater. The warranty period shall be renewable annually for a period of three years. The bond will ensure the proper and prompt completion of remedial actions required to correct defective warranted work, including payments for all labor, materials, equipment, traffic control, and other incidental work.

3.0 Warranty Requirements

During the three-year warranty period, the contractor shall warrant the workmanship, materials, quality, and performance of the Painted Traffic Striping to be free of defects, as hereinafter defined and determined by visual inspection and paint thickness measurements. The warranty called for shall be on a warranty form furnished by LADOTD. This warranty shall be submitted to LADOTD prior to the award of the contract.

The Painted Traffic Striping will be considered defective if any of the following conditions are discovered within the three-year warranty period:

(a) The occurrence of visible paint blistering, peeling, or scaling.
(b) Paint applied over dirt, debris, or products not removed during cleaning.
(c) Incomplete painting or painting thicknesses less than the minimums specified in the specifications.
(d) Loss of luminescence as determined by ASTM D-6359 (Standard Specification for Minimum Retroreflectance of Newly Applied Pavement Marking Using Portable Hand-Operated Instrument).
(e) Damage to the Painted Traffic Striping caused by the contractor while performing other work.

4.0 Rights and Responsibilities of the Department

The Department:

(a) Shall inspect the Painted Traffic Striping thoroughly for the paint defects listed for a period of three years. The Department will conduct the inspection to evaluate the warranted items at no cost to the contractor.
(b) Shall determine if there are any defective areas present in the warranted Painted Traffic Striping.
(c) Reserves the right to perform routine maintenance at any time on the warranted Painted Traffic Striping. This will not relieve the contractor from meeting the warranty requirement of this Special Provision.
(d) Shall advise the contractor of the inspection schedule and the results will be made available within 14 days after completion of the inspection.
(e) Shall notify the contractor, in writing, of any remedial action required to meet the warranty requirements.
(f) Reserves the right to approve the date(s) requested by the contractor to perform the remedial action.
(g) Reserves the right to approve all materials and methods used the contractor to perform the remedial action

5.0 Rights and Responsibilities of the Contractor

The contractor:

(a) Shall unconditionally warrant to the Department that the Painted Traffic Striping shall be free of defects in materials and workmanship, as defined by the contract plans and specifications, for the three-year period. This warranty and the warranty bond shall be on forms furnished by the Department. These completed forms shall be submitted to the Department prior to award of contract.

(b) Shall repair defective areas, identified by the Department, in accordance with the Painted Traffic Striping specifications.

(c) Is responsible for cost of repair, including but not limited to payments for all labor, materials, equipment, and traffic control.

(d) Shall notify the Department, in writing, and shall submit a course of action proposing the repair procedures and progress schedule two weeks prior to commencement of any remedial action.

(e) Shall perform the remedial action within three months of its approval by the Department, unless the Department notifies the contractor that immediate emergency repairs are necessary to prevent an unsafe road condition; in this event, the contractor shall make said emergency repairs within a time frame required by the Department.

(f) The contractor shall supply verification to the Department that the required liability insurance is in effect during the period the corrective work is being done.

(g) Shall submit a Traffic Control Plan to the Department for approval before the remedial action is undertaken. Traffic control and traffic control devices will be required to safeguard the public and contractor personnel during remedial action. All traffic control and traffic control devices shall be in accordance with the current *Louisiana Standard Specifications for Roads and Bridges*, as amended, appropriate LADOTD Standard Plans, and the *Manual of Uniform Traffic Control Devices* (MUTCD).

(h) Shall not be held responsible for distresses that are caused by factors beyond the control of the contractor.

6.0 Conflict Resolution

If the contractor disputes the inspection findings, written notification of the dispute shall be provided to the chief engineer within 30 days.

Upon receipt of the contractor's written dispute, a Conflict Resolution Team, hereinafter "team," will determine the validity of the dispute. The team will consist of two contractor representatives, two Department representatives, and a fifth person mutually agreed upon by both the Department and the contractor. Any costs for the fifth person will be equally shared between the Department and the contractor. The team members will be identified in writing at the preconstruction meeting and will be knowledgeable in the terms and conditions of this warranty and the methods used in the determination of warranted item defects. The team will submit its recommendation to the chief engineer. If it is determined that remedial action is required to correct any warranted item, the contractor shall perform the required actions as directed, including payments for all labor, materials, equipment, traffic control and other incidental work. Remedial action shall be performed within three months.

7.0 Measurement and Payment

All costs associated with performance of the work, the required maintaining traffic, the required supplemental performance and lien bonds, and the required permit insurance will not be paid for separately but will be considered to be included in the contractor's overhead and administrative costs.

Louisiana
Department of Transportation and Development

SPECIAL PROVISION
FOR
PERFORMANCE WARRANTY ON BRIDGE PAINTING

1.0 General

Part VIII of the Standard Specifications and Section 811 specifications for painting and protective coatings are amended to include this Special Provision.

The current edition of the *Louisiana Standard Specifications for Roads and Bridges*, as amended, is the minimum standards to be followed.

2.0 Warranty Bond

The contractor shall unconditionally warrant the workmanship, materials, quality, and performance of the paint system applied to the bridge to be free of defects a period of three years following the date of project acceptance.

The contractor shall furnish a warranty bond in an amount equal to the contract amount for the warranted items or 50 percent of the full contract amount, whichever is greater. The warranty period shall be renewable annually for a period of three years. The bond will ensure the proper and prompt completion of remedial actions required to correct defective warranted work, including payments for all labor, materials, equipment, traffic control, and other incidental work.

3.0 Warranty Requirements

During the three-year warranty period, the contractor shall warrant the workmanship, materials, quality, and performance of the paint system applied to the bridge to be free of defects, as hereinafter defined and determined by visual inspection and paint thickness measurements. The warranty called for shall be on a warranty form furnished by LADOTD, a copy of which is attached. This warranty shall be submitted to LADOTD prior to the award of the contract.

The paint system will be considered defective if any of the following conditions are discovered within the three-year warranty period:

(a) The occurrence of visible rust or rust breakthrough, paint blistering, peeling, scaling, or unremoved slivers.

(b) Paint applied over dirt, debris, blasting debris, or rust products not removed during blast cleaning.

(c) Incomplete coating or coating thicknesses less than the minimums specified in the painting specifications.

(d) Damage to the coating system caused by the contractor while removing scaffolding or performing other work.

4.0 Rights and Responsibilities of the Department

The Department:

(a) Shall inspect the bridge thoroughly for the paint system defects listed for a period of three years. The Department will conduct the inspection to evaluate the warranted items at no cost to the contractor.

(b) Shall determine if there are any defective areas present in the warranted bridge paint.

(c) Reserves the right to perform routine maintenance at any time on the warranted bridge painting. This will not relieve the contractor from meeting the warranty requirement of this Special Provision.

(d) Shall advise the contractor of the inspection schedule and the results will be made available within 14 days after completion of the inspection.

(e) Shall notify the contractor, in writing, of any remedial action required to meet the warranty requirements.

(f) Reserves the right to approve the date(s) requested by the contractor to perform the remedial action.

(g) Reserves the right to approve all materials and methods used the contractor to perform the remedial action

5.0 Rights and Responsibilities of the Contractor

The contractor:

(a) Shall unconditionally warrant to the Department that the bridge paint shall be free of defects in materials and workmanship, as defined by the contract plans and specifications,

for the three year period. This warranty and the warranty bond shall be on forms furnished by the Department. These completed forms shall be submitted to the Department prior to award of contract.

(b) Shall repair defective areas, identified by the Department, in accordance with the painting specifications.

(c) Is responsible for cost of repair, including but not limited to payments for all labor, materials, equipment, and traffic control.

(d) Shall notify the Department, in writing, and shall submit a course of action proposing the repair procedures and progress schedule two weeks prior to commencement of any remedial action.

(e) Shall perform the paint repair work in the same season as the inspection, unless the seasonal limitations stated in the painting specifications prevents the completion that season. In this case, the corrective work will be completed the following season.

(f) Shall perform the remedial action within three months of its approval by the Department, unless the Department notifies the contractor that immediate emergency repairs are necessary to prevent an unsafe road condition; in this event, the contractor shall make said emergency repairs within a time frame required by the Department.

(g) The contractor shall supply verification to the Department that the required liability insurance is in effect during the period the corrective work is being done.

(h) Shall submit a Traffic Control Plan to the Department for approval before the remedial action is undertaken. Traffic control and traffic control devices will be required to safeguard the public and contractor personnel during remedial action. All traffic control and traffic control devices shall be in accordance with the current *Louisiana Standard Specifications for Roads and Bridges*, as amended, appropriate LADOTD Standard Plans, and the *Manual of Uniform Traffic Control Devices* (MUTCD).

(i) Shall not be held responsible for distresses that are caused by factors beyond the control of the contractor.

6.0 Special Supplemental Performance and Lien Bonds

Contractor shall furnish, in addition to the regular performance and lien bonds for the contract, a supplemental performance bond to the Department. The bond shall be in the sum of 20 percent of the original total contract amount. The bond is to secure the performance by the contractor of correction work on any paint system defects that he is directed by Department to perform and shall be in force for the period covering the three-year warranty and the time required to perform any corrective work covered by the warranty. The contractor shall use the form provided by the

Department, a copy of which is attached, and executed in accordance with the requirements of this special provision. If corrective work is required the contractor shall provide a supplemental lien bond (form provided by the Department) that is in effect for the duration of the corrective work. The supplemental performance and lien bonds must be in all respects satisfactory and acceptable to Department, executed by a surety company authorized to do business in state of Louisiana.

Upon completion of the work and final inspection of the project, the supplemental performance bond shall become effective and shall continue in full force and effect until such time as the Department will, in accordance with the Paint Quality Warranty, advise the contractor that there are either no paint system defects, or, if the contractor has been notified that there are paint system defects, said paint system defects have been repaired by the contractor to the satisfaction of the Department as specified under the Paint Quality Warranty. The Department shall withhold in reserve an amount equal to 20 percent of the total contract amount for "Cleaning Existing Steel Structure" and "Coating Existing Steel Structure" until the Supplemental Performance Bond has been received.

7.0 Conflict Resolution

If the contractor disputes the inspection findings, written notification of the dispute shall be provided to the chief engineer within 30 days.

Upon receipt of the contractor's written dispute, a Conflict Resolution Team, hereinafter "team," will determine the validity of the dispute. The team will consist of two contractor representatives, two Department representatives, and a fifth person mutually agreed upon by both the Department and the contractor. Any costs for the fifth person will be equally shared between the Department and the contractor. The team members will be identified in writing at the preconstruction meeting and will be knowledgeable in the terms and conditions of this warranty and the methods used in the determination of warranted item defects. The team will submit its recommendation to the chief engineer. If it is determined that remedial action is required to correct any warranted item, the contractor shall perform the required actions as directed, including payments for all labor, materials, equipment, traffic control, and other incidental work. Remedial action shall be performed within three months.

8.0 Measurement and Payment

All costs associated with performance of the work, the required maintaining traffic, the required supplemental performance and lien bonds, and the required permit insurance will not be paid for separately but will be considered to be included in the contractor's overhead and administrative costs.

LOUISIANA
DEPARTMENT OF TRANSPORTATION AND DEVELOPMENT

Date: Friday, May 26, 2000

WARRANTY

PAINT QUALITY

THIS WARRANTY, made by _____
(Contractor)

of _____

hereinafter called "Warrantor," in favor of the Louisiana Department of Transportation and Development, hereinafter called "Department";

W I T N E S S E T H:

RECITALS:

1. The Department has contracted for the cleaning and painting structural steel on the _____ Bridge on the _____ Highway in _____ Parish, Louisiana.

2. Under the provision of Contract No. _____ , pertaining in part to painting of structural steel, entered into by _____, and LADOTD,
(Contractor)
the _____ is
(Contractor)
required to furnish LA DOT a written warranty for the paint system warranting against defect as stated in said contract for a period(s) of three years from the date(s) of final inspection by the Engineer, of _____
_____ work under said contract.
(Contractor)

WARRANTY

PAINT QUALITY

NOW, THEREFORE, is consideration of the foregoing, Warrantor hereby agrees and warrants that in every case in which any defect, as described in Contract No. _____ , occurs within said three year period(s), Warrantor shall, forthwith upon receipt of written notice of such defect, repair said defective area.

It is expressly understood and agreed that the warranty and obligations herein set forth are made and undertaken by Warrantor to and for the benefit of the Department.

IN WITNESS WHEREOF, Warrantor have set his/her hands as of this

_____ day of _____ , 20_____ .

_____
(Contractor)

ATTEST: By:

_____ Title:

LOUISIANA
DEPARTMENT OF TRANSPORTATION AND DEVELOPMENT

Date: Friday, May 26, 2000

SUPPLEMENTAL PERFORMANCE BOND

KNOW ALL MEN BY THESE PRESENTS, That we _____ as principal, and _____ as surety, a corporation duly organized and existing under and by virtue of the laws of the State of _____ and duly authorized to transact the business of surety in the State of Louisiana, are jointly and severally held and bound unto the Louisiana Department of Transportation and Development in the sum of _____ Dollars, for the payment of which we jointly and severally bind ourselves, our heirs and executors, administrators, successors and assigns firmly by these presents.

Whereas, the principal herein has, on the _____ day of _____ , 20____, made and entered into a certain agreement with the State of Louisiana, by and through the Louisiana Department of Transportation and Development , which agreement is more fully described as _____ , Contract No. _____ , under which agreement the principal agrees to furnish certain materials and to perform certain work which he agrees to do in accordance with the terms, conditions, and requirements as set out in said agreement, and whereas, in connection with said contract, the principal has executed a written warranty, a copy of which warranty is attached hereto and by this reference made a part hereof;

SUPPLEMENTAL PERFORMANCE BOND

And, whereas, the principal has therein undertaken to warrant the work of cleaning and painting structural steel against any defects, as therein defined, for a period(s) of at least three years from the date(s) of final inspection of the project by the Engineer.

NOW, THEREFORE, THE CONDITION OF THIS BOND IS SUCH THAT if the principal herein shall faithfully and truly observe and comply with the terms of such warranty and shall well and truly perform all matters and things by him/her undertaken to be performed under said warranty upon the terms proposed therein and shall do all things required of said principal by the laws of this state and shall indemnify and save the harmless the State of Louisiana and Louisiana Department of Transportation and Development against any direct or indirect damages of every kind and description that shall be suffered or claimed to be suffered in connection with or arising out of the performance of the said warranty by the Contractor or subcontractors, then this obligation is to be void, otherwise to remain in full force and effect.

In no event shall the obligations under this bond be terminated without written consent of Louisiana and Louisiana Department of Transportation and Development.

Signed and sealed this _____ day of _____ , 19 _____.

SURETY_____ PRINCIPAL_____ BY

_____ BY _____
(Attorney-in-fact) (Official Capacity)

Countersigned:

_____ Attest: _____
Resident Agent Secretary

Louisiana
Department of Transportation and Development

SPECIAL PROVISION
FOR
CONSTRUCTION OF PORTLAND CEMENT
CONCRETE PAVEMENT WARRANTY

1.0 General

Part VI of the Standard Specifications and the specifications for Portland cement concrete pavement are amended to include this Special Provision.

The term "pavement surface" in this Special Provision includes the concrete driving lanes, concrete paved shoulders, concrete acceleration/deceleration lanes, and concrete ramps.

The current edition of the *Louisiana Standard Specifications for Roads and Bridges*, as amended, is the minimum standard to be followed.

For the purpose of evaluating the performance of warranted Portland cement concrete pavement, the project will be divided into segments; each segment will be 500 ft. for the lane width.

2.0 Warranty Bond

The contractor shall warrant the workmanship, materials, quality, and performance of Portland cement concrete pavement for a period of three years following the date of project acceptance.

The contractor shall furnish a warranty bond in an amount equal to the contract amount for the warranted items or 50 percent of the full contract amount, whichever is greater. The warranty period shall be renewable annually for a period of three years. The bond will ensure the proper and prompt completion of remedial actions required to correct defective warranted work, including payments for all labor, materials, equipment, traffic control, and other incidental work.

3.0 Warranty Requirements

During the three-year warranty period, the contractor shall warrant the workmanship, materials, quality, and performance of Portland cement concrete pavement. The Portland cement concrete

pavement shall include the jointed concrete pavement (JPC) and continuous reinforced concrete pavement (CRCP). The following pavement distresses will be monitored by the Department to determine whether warranty action may be required:

- cracking
- joint deficiencies
- surface defects
- miscellaneous distress

Warranty requirement for jointed concrete pavement shall include the following subsections of this Special Provision: (a) 3.1 Cracking *(3.1.1 Corner Breaks, 3.1.2 Longitudinal Cracking, 3.1.3 Transverse Cracking*), (b) 3.2 Joint Deficiencies (*3.2.1 Joint Seal Damage (Transverse and Longitudinal), 3.2.2 Spalling of Transverse and Longitudinal Joints*), (c) 3.3 Surface Defects (*3.3.1 Surface Friction, 3.3.2 Popouts*), and (d) 3.4 Miscellaneous Distresses (*3.4.1 Faulting of Transverse Joints and Cracks, 3.4.2 Lane-To-Shoulder Separation*).

Warranty requirement for continuous reinforced concrete pavement shall include the following subsections of this Special Provision: (a) 3.1 Cracking *(3.1.2 Longitudinal Cracking, 3.1.3 Transverse Cracking*), and (b) 3.3 Surface Defects (*3.3.1 Surface Friction, 3.3.2 Popouts*) and (c) 3.4 Miscellaneous Distresses (3.4.3 *Spalled Areas*).

3.1 Cracking

Cracking shall include corner breaks, longitudinal cracking, and transverse cracking. Cracking will be determined by a visual pavement condition survey. The warranted Portland cement concrete pavement shall be free of cracking; otherwise, the contractor shall execute remedial actions in accordance with Table 1.

3.1.1 Corner Breaks

In corner breaks, a portion of the slab separated by a crack that intersects the adjacent transverse and longitudinal joints, describing approximately a 45° angle with the direction of traffic. The length of the insides is from 1 foot to one-half the width of the slab, on each side of the corner. Corner breaks are measured by number of occurrences at each severity level. Description of corner breaks severity levels and their remedial action are presented in Table 1.

3.1.2 Longitudinal Cracking

Longitudinal cracks are predominantly parallel to the pavement centerline. Description of longitudinal cracking severity levels and their remedial action are presented in Table 1. Longitudinal cracks are measured by length at each severity level.

3.1.3 Transverse Cracking

Transverse cracks are predominantly perpendicular to the pavement centerline. Description of transverse cracking severity levels and their remedial action are presented in Table 1. Transverse cracks are measured by length at each severity level. The highest severity level will be assigned for the entire crack if at least 10 percent of the total length of the crack is rated at that level. The warranted Portland cement concrete pavement shall be free of transverse cracking; otherwise, the contractor shall execute remedial actions in accordance with Table 1.

TABLE 1: Severity levels and suggested remedial action for cracking

Distress	Severity Levels	Description	Remedial Action
Corner Breaks	Low	Crack is not spalled; there is no measurable faulting; and the corner piece is not broken into two or more pieces	Seal the crack
	Moderate to High	Crack is spalled; or faulting of crack or joint is greater than 0.25 inch; or the corner piece is broken into two or more pieces	Removal of the corner piece and patch (proper bonding with the slab shall be made).If more than one corner is broken, removal and replacement of the slab
Longitudinal Cracking	Low	Crack widths are less than 0.125 inch, no spalling, and no measurable faulting	Seal the crack. If more than three cracks per slab, remove and replace slab.
	Moderate to High	Crack widths are equal to or greater than 0.125; or with spalling; or faulting greater than 0.25 inch	Seal the crack. If more than two cracks per slab, remove and replace slab.
Transverse Cracking	Low	Crack widths are less than 0.125 inch, no spalling, and no measurable faulting	Full or partial slab removal and replacement. If more than two cracks per slab, remove and replace slab
	Moderate to High	Crack widths are equal to or greater than 0.125 inch; or with spalling; or faulting greater than to 0.25 inch	Full or partial slab removal and replacement. If more than two cracks per slab, remove and replace slab

3.2 Joint Deficiencies

Joint deficiencies shall include transverse joint seal damage, longitudinal joint seal damage, spalling of longitudinal joints, and spalling of transverse joints. Joint deficiencies will be

determined by a visual pavement condition survey. The warranted Portland cement concrete pavement shall be free of joint deficiencies; otherwise, the contractor shall execute remedial actions in accordance with Table 2.

3.2.1 Joint Seal Damage (Transverse and Longitudinal)

Joint seal damage is any condition which enables incompressible materials or a significant amount of water to infiltrate the joint from the surface. Typical types of joint seal damages include loss of sealant integrity caused by adhesive failure (debonding) and/or cohesive failure (material splitting), a completely missing seal, hardening, and intrusion of foreign material in the joint. Transverse joint seal damage will measured by number of at each severity level. Longitudinal seal damage will be measured length of damaged joint seal per occurrence.

3.2.2 Spalling of Transverse and Longitudinal Joints

Cracking, breaking, chipping, or fraying of slab edges within 2 feet of the transverse or longitudinal joint. Spalling of transverse joints will be measured by number of affected joints; the joint will be rated at the highest severity level if at least 10 percent of the total spalled length is rated at that level. Spalling of longitudinal joints will measured by the length in feet at each severity level.

TABLE 2: Severity levels and suggested remedial action for joint deficiencies.

Distress	Severity Levels	Description	Remedial Action
Transverse Joint Seal Damage	Low	Joint seal damage exists over less than 10 percent of the joint	Remove completely and replace seal materials across the lane regardless of the length of failed material
	Moderate	Joint seal damage exists over 10 to 50 percent of the joint	
	High	Joint seal damage exists over more than 50 percent of the joint	
Longitudinal Joint Seal Damage	None	Joint seal damaged as described in Subsection 3.2.1 of this Special Provision	Remove and replace seal materials
Spalling of Longitudinal Joints	Low	Spalls less than 3 inch wide, with loss of material	Repair affected area
	Moderate	Spalls 3 inch to 6 inch wide, with loss of material	
	High	Spalls greater than 6 inch wide, with loss of material	
Spalling of Transverse Joints	Low	Spalls less than 3 inch wide, with loss of material, or spalls with no loss of material	Repair affected area
	Moderate	Spalls 3 inch to 6 inch wide, with loss of material.	
	High	Spalls greater than 6 inch wide, with loss of material.	

3.3 Surface Defects

Surface defects shall include popouts. The pavement surface shall also be evaluated for friction resistance. Surface defects will be determined by a visual pavement condition survey, while friction resistance will be evaluated using ASTM standard test procedures E-501 and E-525. The warranted Portland cement concrete pavement shall be free of surface defects and shall pass the minimum required friction number; otherwise, the contractor shall execute remedial actions in accordance with Section 3.3 of this Special Provision.

3.3.1 Surface Friction

Surface friction characteristics will be evaluated following the American Society for Testing and Materials standard test method for friction resistance of paved surfaces using a full-scale tire (ASTM E-274 - 90). Friction resistance tests will be conducted at a speed of 40 miles per hour for two tire types, the Standard Rib Tire for Pavement Friction-Resistance Tests (ASTM E-501 - 94), and the Standard Smooth Tire for Pavement Friction-Resistance Tests (ASTM E-525 - 88). One friction resistance test will be conducted in each segment with each tire type. The friction number (FN), which reflects the surface friction characteristics of the paved surface, will be obtained from these tests. For each segment, the FN shall be greater than or equal to thirty ($FN \geq 30$) with each tire (rib and smooth). If the friction number for a segment is measured less than 30, then the contractor shall execute a remedial action. Remedy shall include grooving or shot blasting.

3.3.2 Popouts

Cavity left behind when small pieces of pavement broken loose from the surface, normally ranging in diameter from 1 in. to 4 in. and depth from 0.5 in. to 2 in. Popouts are measured by the number of occurrences and square feet of the affected area. Remedial action shall include patching with high early strength mortar.

3.4 Miscellaneous Distresses

This section shall include faulting of transverse joints and cracks, lane-to-shoulder separation, and spalled areas. Miscellaneous distresses will be determined by a visual pavement condition survey. The warranted Portland cement concrete pavement shall be free of miscellaneous distresses; otherwise, the contractor shall execute remedial actions in accordance with Section 3.4 of this Special Provision.

3.4.1 Faulting of Transverse Joints and Cracks

Faulting is the difference in elevation across a joint or crack. Faulting of transverse joints and cracks is measured in inches of difference in elevation. Faulting equal to or larger than 0.125 in. shall be corrected. Remedial action includes jacking the slab by approved methods or grinding the joint to eliminate faulting.

3.4.2 Lane-To-Shoulder Separation

Lane-to-shoulder separation is widening of the joint between the edge of slab and the shoulder. Lane-to-shoulder separation is measured in inches. Lane-to-shoulder separation shall be corrected by sealing.

3.4.3 Spalled Areas

Spalled areas will be measured by square inches of an affected area. The severity of spalled areas will be identified by the depth in inches. Spalled areas larger than 25 square inches with a depth larger than 1 in. shall be corrected. Remedial action shall include patching.

4.0 Rights and Responsibilities of the Department

The Department:

(a) Shall monitor the items described in Section 3.0 of this Special Provision for a period of three years. The Department will conduct condition surveys **annually** to evaluate the warranted items at no cost to the contractor. The initial survey will be conducted within one month following the initial acceptance of the project.

(b) Reserves the right to perform routine maintenance at any time on the warranted pavement. This will not relieve the contractor from meeting the warranty requirement of this Special Provision.

(c) Shall advise the contractor of the survey schedule and the results will be made available within 14 days after completion of the survey.

(d) Shall notify the contractor, in writing, of any remedial action required to meet the warranty requirements.

(e) Reserves the right to approve the date(s) requested by the contractor to perform the remedial action.

(f) Reserves the right to approve all materials and methods used the contractor to perform the remedial action.

(g) Reserves the right, if the contractor is unable, to make immediate emergency repairs to the pavement to prevent an unsafe road condition as determined by the Department. The Department will attempt to notify the contractor that action is required to address an unsafe condition. However, should the contractor be unable to comply with this requirement, to the Department's satisfaction and within the time frame required by the Department, the Department will perform, or have performed any emergency repairs deemed necessary. Any such emergency repairs undertaken will not relieve the contractor from meeting the warranty requirements of this Special Provision. Any costs associated with the emergency repairs will be paid by the contractor if it is determined the cause was from defective materials and/or workmanship.

(h) Shall document the condition of the pavement prior to emergency repairs.

5.0 Rights and Responsibilities of the Contractor

The contractor:

(a) Shall unconditionally warrant to the Department that the pavement shall be free of defects in materials and workmanship, as defined by the contract plans and specifications, for a three-year period. This warranty and the warranty bond shall be on forms furnished by the Department. These completed forms shall be submitted to the Department prior to award of contract.

(b) Shall perform remedial action once any of the warranted items exceeds the acceptable limits described in this Special Provision. The warranty will remain in a good standing as long as each distress (item) remains within the defined acceptable limits.

(c) Is responsible for cost of remedial action; including but not limited to payments for all labor, materials, equipment, traffic control, and restoring all associated pavement features, such as pavement marking, shoulders, and adjacent lanes, and other incidental work, at no additional cost to the Department.

(d) Is responsible for replacing all temporary repairs resulting from the pavement being in noncompliance with the warranty requirements.

(e) Shall notify the Department and shall submit a written course of action proposing appropriate remedial action for five calendar days prior to commencement of any remedial action, unless this work requires immediate emergency repairs as determined by the Department.

(f) Shall perform the remedial action within three months of its approval by the Department, unless the Department notifies the contractor that immediate emergency repairs are necessary to prevent an unsafe road condition, in this event the contractor shall make said emergency repairs within a time frame required by the Department.

(g) Shall furnish to the Department, in addition to the regular performance and lien bond for the contract, supplemental performance and lien bonds covering any corrective action being performed. These supplemental bonds shall be furnished to the Department, using Department approved forms, prior to beginning any remedial action in the amount required by the Department to cover said remedial action and be in all respects satisfactory and acceptable to the Department.

(h) Is responsible for all costs of all emergency repairs to the pavement deemed necessary by the Department to prevent an unsafe road condition.

(i) Shall submit a Traffic Control Plan to the Department for approval before the remedial action is undertaken. Traffic control and traffic control devices will be required to safeguard the public and contractor personnel during remedial action. All traffic control and traffic control devices shall be in accordance with the current *Louisiana Standard Specifications for Roads and Bridges*, as amended, appropriate Louisiana DOTD Standard Plans, and the *Manual of Uniform Traffic Control Devices* (MUTCD).

(j) Shall not be held responsible for distresses which are caused by factors beyond the control of the contractor.

6.0 Conflict Resolution

If the contractor disputes the survey findings, written notification of the dispute shall be provided to the chief engineer within 30 days.

Upon receipt of the contractor's written dispute, a Conflict Resolution Team, hereinafter "team," will determine the validity of the dispute. The team will consist of two contractor representatives, two Department representatives, and a fifth person mutually agreed upon by both the Department and the contractor. Any costs for the fifth person will be equally shared between the Department and the contractor. The team members will be identified in writing at the preconstruction meeting and will be knowledgeable in the terms and conditions of this warranty and the methods used in the determination of warranted item distresses. The team will submit its recommendation to the chief engineer. If it is determined that remedial action is required to correct any warranted item, the contractor shall perform the required actions as directed, including payments for all

labor, materials, equipment, traffic control, and other incidental work. Remedial action shall be performed within three months.

7.0 Measurement and Payment

All contractor costs associated with the performance of this Special Provision, including but not limited to, maintaining traffic, remedial action with associated work, materials, and engineering will not be paid for separately. All costs associated with providing the required warranty bond, documentation, and conflict resolution team members will be considered as included in the items of work covered by the warranty as detailed in Section 4.0 of this Special Provision. All costs will be considered as included in the contractor's prices included in the contract.

Louisiana
Department of Transportation and Development

SPECIAL PROVISION
FOR
STRUCTURAL CONCRETE WARRANTY

1.0 General

Part VIII of the Standard Specifications and Section 805 of the specifications for structural concrete are amended to include this Special Provision.

The current edition of the *Louisiana Standard Specifications for Roads and Bridges*, as amended, is the minimum standards to be followed.

2.0 Warranty Bond

The contractor shall warrant the workmanship, materials, quality, and performance of Structural Concrete for a period of three years following the date of project acceptance.

The contractor shall furnish a warranty bond in an amount equal to the contract amount for the warranted items or 50 percent of the full contract amount, whichever is greater. The warranty period shall be renewable annually for a period of three years. The bond will ensure the proper and prompt completion of remedial actions required to correct defective warranted work, including payments for all labor, materials, equipment, traffic control, and other incidental work.

3.0 Warranty Requirements

During the three-year warranty period, the contractor shall warrant the workmanship, materials, quality, and performance of structural concrete. The following distresses will be monitored by the Department to determine whether warranty action may be required:

- cracking
- surface defects

3.1 Cracking

Cracking will be determined by a visual condition survey of structural concrete. The warranted structural concrete shall be free of cracking; otherwise, the contractor shall execute remedial actions.

3.3 Surface Defects

Surface defects shall include scaling and peeling/flaking (such as concrete barriers). Surface defects will be determined by a visual condition survey. The warranted structural concrete shall be free of surface defects; otherwise, the contractor shall execute remedial actions.

4.0 Rights and Responsibilities of the Department

The Department:

(a) Shall monitor the items described in Section 3.0 of this Special Provision for a period of three years. The Department will conduct condition surveys to evaluate the warranted items at no cost to the contractor. The initial survey will be conducted within one month following the initial acceptance of the project.

(b) Reserves the right to perform routine maintenance at any time on the warranted structural concrete. This will not relieve the contractor from meeting the warranty requirement of this Special Provision.

(c) Shall advise the contractor of the survey schedule and the results will be made available within 14 days after completion of the survey.

(d) Shall notify the contractor, in writing, of any remedial action required to meet the warranty requirements.

(e) Reserves the right to approve the date(s) requested by the contractor to perform the remedial action.

(f) Reserves the right to approve all materials and methods used the contractor to perform the remedial action

(g) Reserves the right, if the contractor is unable, to make immediate emergency repairs to the structural concrete to prevent an unsafe road condition as determined by the Department. The Department will attempt to notify the contractor that action is required to address an unsafe condition. However, should the contractor be unable to comply with this requirement, to the Department's satisfaction and within the time frame required by the Department, the Department will perform, or have performed any emergency repairs

deemed necessary. Any such emergency repairs undertaken will not relieve the contractor from meeting the warranty requirements of this Special Provision. Any costs associated with the emergency repairs will be paid by the contractor if it is determined the cause was from defective materials and/or workmanship.

(h) Shall document the condition of the structural concrete prior to emergency repairs.

5.0 Rights and Responsibilities of the Contractor

The contractor:

(a) Shall unconditionally warrant to the Department that the structural concrete shall be free of defects in materials and workmanship, as defined by the contract plans and specifications, for the three-year period. This warranty and the warranty bond shall be on forms furnished by the Department. These completed forms shall be submitted to the Department prior to award of contract.

(b) Shall perform remedial action once any of the warranted items exceeds the acceptable limits described in this Special Provision. The warranty will remain in a good standing as long as each distress (item) remains within the defined acceptable limits.

(c) Is responsible for cost of remedial action; including but not limited to payments for all labor, materials, equipment, traffic control, and restoring all associated pavement features, such as pavement marking, shoulders, and adjacent lanes, and other incidental work, at no additional cost to the Department.

(d) Is responsible for replacing all temporary repairs resulting from the pavement being in noncompliance with the warranty requirements.

(e) Shall notify the Department and shall submit a written course of action proposing appropriate remedial action for five calendar days prior to commencement of any remedial action, unless this work requires immediate emergency repairs as determined by the Department.

(f) Shall perform the remedial action within three months of its approval by the Department, unless the Department notifies the contractor that immediate emergency repairs are necessary to prevent an unsafe road condition, in this event the contractor shall make said emergency repairs within a time frame required by the Department.

(g) Shall furnish to the Department, in addition to the regular performance and lien bond for the contract, supplemental performance and lien bonds covering any corrective action being performed. These supplemental bonds shall be furnished to the Department, using Department approved forms, prior to beginning any remedial action in the amount

required by the Department to cover said remedial action and be in all respects satisfactory and acceptable to the Department.

(h) Is responsible for all costs of all emergency repairs to the structural concrete deemed necessary by the Department to prevent an unsafe road condition.

(i) Shall submit a Traffic Control Plan to the Department for approval before the remedial action is undertaken. Traffic control and traffic control devices will be required to safeguard the public and contractor personnel during remedial action. All traffic control and traffic control devices shall be in accordance with the current *Louisiana Standard Specifications for Roads and Bridges*, as amended, appropriate LADOTD Standard Plans, and the *Manual of Uniform Traffic Control Devices* (MUTCD).

(j) Shall not be held responsible for distresses which are caused by factors beyond the control of the contractor.

6.0 Conflict Resolution

If the contractor disputes the survey findings, written notification of the dispute shall be provided to the chief engineer within 30 days.

Upon receipt of the contractor's written dispute, a Conflict Resolution Team, hereinafter "team," will determine the validity of the dispute. The team will consist of two contractor representatives, two Department representatives, and a fifth person mutually agreed upon by both the Department and the contractor. Any costs for the fifth person will be equally shared between the Department and the contractor. The team members will be identified in writing at the preconstruction meeting and will be knowledgeable in the terms and conditions of this warranty and the methods used in the determination of warranted item distresses. The team will submit its recommendation to the chief engineer. If it is determined that remedial action is required to correct any warranted item, the contractor shall perform the required actions as directed, including payments for all labor, materials, equipment, traffic control, and other incidental work. Remedial action shall be performed within three months.

7.0 Measurement and Payment

All contractor costs associated with the performance of this Special Provision, including but not limited to, maintaining traffic, remedial action with associated work, materials, and engineering will not be paid for separately. All costs will be considered as included in the contractor's prices included in the contract.

APPENDIX B

Pilot Project Summary

Asphalt:

1. SP 819-02-0012:
   LA 422 in East Feliciana Parish (District 61)
   From Junction LA 19 to Junction LA 67 (logmile 0.00 to 12.25)
   Bids received March 28, 2001 (Contractor: Diamond B)
   Construction accepted May 6, 2002

2. SP 450-03-0037:
   I-10 in Jefferson Davis Parish (District 07) – Superpave construction
   From the Calcasieu Parish Line to Junction LA 99 (logmile 0.00 – 10.68)
   Bids received June 27, 2001 (Contractor: Diamond B)
   Construction accepted June 6, 2002

PCC:

3. SP 817-08-0023:
   LA 946 in East Baton Rouge Parish (District 61)
   From Junction with Jones Bayou to Intersection LA408 (logmile 1.91 – 5.05)
   Bids received August 30, 2006 (Contractor: Denton-James LLC)
   Construction accepted Sept 1, 2009

Warranty Specification used on LA 422

WARRANTY OF ASPHALTIC CONCRETE PAVEMENT CONSTRUCTION (02/01): Section 501/502 of the Standard Specifications is amended to include the following:

General: The term "pavement surface width" includes the asphaltic concrete paved travel lanes, shoulders, acceleration/deceleration lanes, and ramps as applicable.

For the purpose of evaluating the performance of warranted asphaltic concrete pavement, the project will be divided into segments; each segment will be 500 feet (150 m) in length for the full pavement surface width described above.

Warranty Bond: The contractor shall warrant the workmanship, materials, quality, and performance of asphaltic concrete pavement for a period of three (3) years following the date of final acceptance of the project.

The contractor shall furnish a warranty bond in an amount equal to fifty percent (50%) of the full contract amount. The bond will provide for the proper and prompt completion of remedial actions required to correct defective warranted work discovered after final acceptance, including payments for all labor, materials, equipment, traffic control, and other incidental work. Although claims against the warranty bond shall be for defects found during the first three (3) years following acceptance, the bond shall have a prescription period of five (5) years.

Warranty Requirements: The contractor shall unconditionally warrant to the Department that the pavement shall be free of defects in materials and workmanship, as defined by the contract plans and specifications, for the three (3) years period. This warranty and the warranty bond shall be in addition to the payment/performance/retainage bond and shall be on forms furnished by the Department. These completed forms shall be submitted to the Department upon award of contract.

The Department will conduct a distress and condition survey within six (6) months prior to the end of the three (3) year warranty period at no cost to the contractor. The Department will advise the contractor of the survey schedule and will notify the contractor in writing when distresses are found requiring remedial action. Within fourteen (14) calendar days after receipt of written notification, the contractor shall develop a remedial action plan including date(s) to perform the remedial actions, and submit it to the Department for approval. The Department will approve all materials and methods used by the contractor, including traffic control, to perform the remedial action. If a segment exceeds the threshold limits established in Table 1 prior to the survey as determined by either the Department or the contractor, the contractor shall submit a plan for remedial action to be approved by the Department.

All remedial actions within a distressed lane width shall be constructed such that the average pavement smoothness within the repaired segment is similar to the average pavement smoothness of the non-distressed segments. When multiple areas are distressed within a segment, the contractor may elect to submit a plan that exceeds the minimum remedial actions provided in Table 1 such that the entire segment is treated. These plans will be negotiated and approved by the Department.

The contractor shall be responsible for all costs of remedial actions; including but not limited to payments for all labor, materials, equipment, traffic control and restoring all associated pavement features, such as pavement marking, shoulders, and adjacent lanes, and other incidental work, at no additional cost.

STATE PROJECT NO(S). 819-02-0012
SPECIAL PROVISIONS

The contractor shall submit a Traffic Control Plan to the Department for approval before the remedial action is undertaken. Traffic control and traffic control devices will be required to safeguard the public and contractor personnel during remedial action. All traffic control and traffic control devices shall be in accordance with the current *Louisiana Standard Specifications for Roads and Bridges*, as amended, appropriate Louisiana DOTD Standard Plans, and the *Manual of Uniform Traffic Control Devices* (MUTCD).

The Department may perform routine maintenance at any time on the warranted pavement. This will not relieve the contractor from meeting the warranty requirements herein.

The Department may make immediate emergency repairs to the pavement to correct an unsafe road condition as determined by the Department. The Department will notify the contractor that action is required to address an unsafe condition. However, should the contractor be unable to comply with this requirement to the Department's satisfaction and within the time frame required by the Department, the Department will perform, or have performed any emergency repairs deemed necessary. Any such emergency repairs undertaken will not relieve the contractor from meeting the warranty requirements herein. Any costs associated with the emergency repairs shall be paid by the contractor if it is determined the cause was from defective materials and/or workmanship.

The contractor will not be held responsible for distresses which are caused by factors beyond the control of the contractor.

Pavement Distress Indicators, Thresholds and Remedial Actions: The following pavement distresses will be monitored by the Department to determine whether warranty action may be required:

1) Surface Defects
2) Surface Deformation
3) Cracking
4) Potholes

For each pavement distress threshold limit, the minimum remedial treatments will be as prescribed in Table 1.

Surface Defects: Surface defects include bleeding and raveling. Surface defects will be determined by a visual pavement condition survey.

(a) *Bleeding:* Bleeding is the existence of excess bituminous binder on the pavement surface. Bleeding will be reported in terms of the number of occurrences within each pavement segment and each occurrence will be measured in square feet (sq m) of affected area.

(b) *Raveling:* Raveling is the wearing away of the pavement surface in a hot mix asphaltic concrete. It is caused by the dislodging of aggregate particles and loss of asphalt binder. Raveling will be reported by the number of occurrences within each pavement segment and each occurrence will be measured in square feet (sq m) of affected area.

Surface Deformation: Surface deformation is caused by rutting or shoving. Surface deformation will be measured with a high speed profiler. Surface deformations will be measured in tenths (0.1) of an inch (3 mm).

(a) *Rutting:* Rutting is a longitudinal surface depression in the wheel path. It may have associated transverse displacement.

(b) *Shoving:* Shoving is the longitudinal displacement of a localized area of the pavement surface. It may be caused by braking or accelerating vehicles, and is usually located on hills or

Warranty Specification used on LA 422

curves, or at intersections. It may also have associated vertical displacement and be determined with a visual evaluation. Cracking: Cracking includes fatigue cracking, longitudinal cracking, transverse cracking, and edge cracking. Cracking will be determined by a visual pavement condition survey. Fatigue cracking will be measured in areas of square feet (sq m). Longitudinal, transverse and edge cracking will be measured in linear feet (m) and severity (width of crack). Reflective cracking will not be included.

(a) *Fatigue cracking*: Occurs in areas subjected to repeated traffic loadings (wheel paths). It can be a series of interconnected cracks in early stages, developing into many sided, sharp-angled pieces, characteristically with a chicken wire or alligator pattern.

(b) *Longitudinal cracking*: Cracks predominantly parallel to the pavement centerline.

(c) *Transverse cracking*: Cracks that are predominantly perpendicular to the pavement centerline and that are not located over Portland cement concrete joints.

(d) *Edge cracking*: Crescent shaped cracks or fairly continuous cracks which intersect the pavement edge and are located within 2 feet (0.6 m) of the pavement edge, adjacent to the shoulder. Includes longitudinal cracks outside the wheel path within this 2 foot (0.6 m) area. Applies only to pavements with unpaved shoulders.

Potholes: Potholes are bowl-shaped holes of various sizes in the pavement surface. Potholes will be determined by a visual pavement condition survey. Potholes will be reported by number of occurrences and will be measured by the square feet (sq m) area of each pothole within each pavement segment.

Conflict Resolution: If the contractor disputes the distress and condition survey findings, written notification of the dispute shall be provided to the Chief Engineer within thirty (30) days.

Upon receipt of the contractor's written dispute, a Conflict Resolution Team, hereinafter "Team," will determine the validity of the dispute. The Team will consist of two contractor representatives, two Department representatives, and a fifth person mutually agreed upon by both the Department and the contractor. Any costs for the fifth person will be equally shared between the Department and the contractor. The Team members will be identified in writing at the preconstruction meeting and will be knowledgeable in the terms and conditions of this warranty and the methods used in the determination of warranted item distresses. The Team will determine the validity of the dispute and submit its recommendation to the Chief Engineer. If it is determined that remedial action is required to correct any warranted item, the contractor shall perform the required actions as directed, including payments for all labor, materials, equipment, traffic control and other incidental work. Remedial action shall be performed within three (3) months.

Measurement and Payment: All contractor costs associated with the performance of this warranty, including but not limited to, maintaining traffic, traffic control devices, remedial action with associated work, materials, and engineering will not be paid for separately. All costs associated with providing the required warranty bond, documentation and conflict resolution team members will be considered as included in the contract prices for the items of work covered by the warranty.

STATE PROJECT NO(S). 819-02-0012
SPECIAL PROVISIONS

Table 1

Pavement Distress Indicator	Threshold Limit	Remedial Action (Minimal-within lane width)
Bleeding	10 square feet (1 sq m)	Remove and replace 200 percent of defective area
Raveling	10 square feet (1 sq m)	Remove and replace 200 percent of defective area
Rutting (500 foot (150 m) segment subdivided into 50 foot (15 m) lengths)	0.35 inch (10 mm) average in any 50 foot length (15 m) in any wheel path Any area with rutting greater than 0.50 inch (13 mm)	Fine tooth milling and overlay or remove and replace defective area
Shoving	Any occurrence	Remove and replace 200 percent of defective area
Fatigue Cracking	10 square feet (1 sq m)	Remove and replace 200 percent of defective area
Longitudinal Cracking	50 linear feet (15 m) total length with crack width greater than 0.25 inch (6 mm) More than 200 linear feet (60 m) total length	Route and seal cracks with rubberized crack filler Remove and replace entire segment
Transverse Cracking	50 linear feet (15 mm) total length with crack width greater than 0.25 inch (6 mm) More than 200 linear feet (60 m) total length.	Route and seal cracks with rubberized crack filler Remove and replace entire segment
Edge Cracking	50 linear feet (15 m) total length with crack width greater than 0.25 inch (6 mm) More than 100 linear feet (30 m) total length	Route and seal cracks with rubberized crack filler Remove and replace entire segment
Potholes	Any occurrence	Remove and replace 200 percent of defective area

Coversheet for LA 422

TOTAL SHEETS =

STANDARD PLANS TO BE USED ON THIS PROJECT

STD. PLAN	REV. DATE
BM-01	2-19-86
CB-01	6-25-82
DO-01(M)	2-4-97
HS-01	9-14-94
MB-01	01-14-92
PC-01	4-16-90
PM-01	1-21-98
RS-31	6-1-83
GR 200(M)	5-10-99

TRAFFIC DATA
2000 A.D.T. = 250
2008 A.D.T. = 275
D = 55%
K = 10%
T = 8%

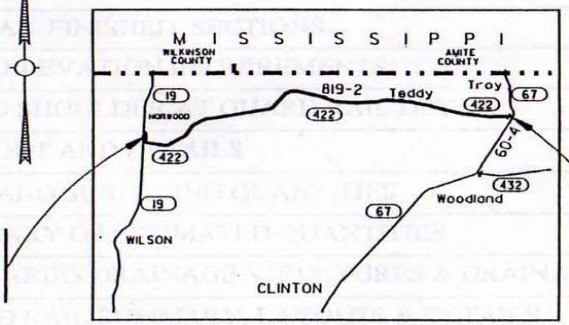
C.S.L.M. 0.000
STATION 10+00.00
BEGIN S.P. 819-02-0012

J-1

STATE OF LOUISIANA
DEPARTMENT OF TRANSPORTATION & DEVELOPMENT

PLANS OF PROPOSED
STATE HIGHWAY

STATE PROJECT NO. 819-02-0012
FEDERAL NO. STP-410-1(001)
LA 19 - LA 67
EAST FELICIANA PARISH
ROUTE LA 422



F.A.P.	STATE PROJECT	PARISH	SHEET NO.
STP-410-1(001)	819-02-0012	E. FELICIANA	1

STRUCTURES IN PLACE

C.S.L.M.	STA.	STR. NO.	DIMENSIONS
1.91	110+84.80	819020191I	(24' CLR. RDWY) X 59'
2.11	121+40.80	819020211I	(28' CLR. RDWY) X 380'
3.81	211+16.80	819020381I	(28' CLR. RDWY) X 418'
6.54	355+31.20	819020654I	(24' CLR. RDWY) X 78'

STATE OF LOUISIANA
ROBIN ROWELL ROMEO
REG. No. 24200
REGISTERED
PROFESSIONAL ENGINEER
IN
CIVIL ENGINEERING

12-00

C.S.L.M. 12.250
STATION 656+80.00
END S.P. 819-02-0012

RECOMMENDED FOR APPROVAL

DISTRICT DESIGN, WATER RESOURCES & DEVELOPMENT ENGINEER

DISTRICT ADMINISTRATOR

APPROVED

CHIEF ENGINEER

DATE 10-8-00

SCHEDULE OF REVISIONS

DATE	REVISION	DATE	RECOMMENDED	DATE	APPROVED

THE 1992 EDITION OF THE LOUISIANA D.O.T.D. STANDARD SPECIFICATIONS FOR ROADS AND BRIDGES AS AMENDED BY THE PROJECT SPECIFICATIONS SHALL GOVERN ON THIS PROJECT.

Warranty Specification used on I-10

STATE PROJECT NO(S). 450-03-0037, 450-03-0055, 450-03-0056, 450-03-0057 and 450-03-0060
SPECIAL PROVISIONS

WARRANTY OF SUPERPAVE ASPHALTIC CONCRETE OVERLAY ON RUBBLIZED CONCRETE (05/01): Section 502 of the Standard Specifications is amended to include the following:

General: The term "pavement surface width" includes the asphaltic concrete paved travel lanes, shoulders, acceleration/deceleration lanes, and ramps as applicable.

For the purpose of evaluating the performance of warranted asphaltic concrete pavement, the project will be divided into segments; each segment will be 500 feet (150 m) in length for the full pavement surface width described above.

Warranty Bond: The contractor shall warrant the workmanship, materials, quality, and performance of asphaltic concrete pavement for a period of three (3) years following the date of final acceptance of the project.

The contractor shall furnish a warranty bond in an amount equal to fifteen percent (15%) of the full contract amount. The bond will provide for the proper and prompt completion of remedial actions required to correct defective warranted work discovered after final acceptance, including payments for all labor, materials, equipment, traffic control, and other incidental work.

Warranty Requirements: The contractor shall unconditionally warrant to the Department that the pavement shall be free of defects in materials and workmanship, as defined by the contract plans and specifications, for a three (3) year period. This warranty and the warranty bond shall be in addition to the payment/performance/retainage bond and shall be on forms furnished by the Department. These completed forms shall be submitted to the Department upon award of contract.

As a minimum the Department will conduct a distress and condition survey within six (6) months prior to the end of the three (3) year warranty period at no cost to the contractor. The Department will advise the contractor of the survey schedule and will notify the contractor in writing when distresses are found requiring remedial action. Within fourteen (14) calendar days after receipt of written notification, the contractor shall develop a remedial action plan including date(s) to perform the remedial actions, and submit it to the Department for approval. The Department will approve all materials and methods used by the contractor, including traffic control, to perform the remedial action. If a segment exceeds the threshold limits established in Table 1 prior to the survey as determined by either the Department or the contractor, the contractor shall submit a plan for remedial action to be approved by the Department.

All remedial actions within a distressed lane width shall be constructed such that the average pavement smoothness within the repaired segment is similar to the average pavement smoothness of the non-distressed segments. When multiple areas are distressed within a segment, the contractor may elect to submit a plan that exceeds the minimum remedial actions provided in Table 1 such that the entire segment is treated. These plans will be negotiated and approved by the Department.

The contractor shall be responsible for all costs of remedial actions; including but not limited to payments for all labor, materials, equipment, traffic control and restoring all associated pavement features, such as pavement marking, shoulders, and adjacent lanes, and other incidental work, at no additional cost.

The contractor shall submit a Traffic Control Plan to the Department for approval before the remedial action is undertaken. Traffic control and traffic control devices will be required to safeguard the public and contractor personnel during remedial action. All traffic control and

STATE PROJECT NO(S). 450-03-0037, 450-03-0055, 450-03-0056, 450-03-0057 and 450-03-0060
SPECIAL PROVISIONS

traffic control devices shall be in accordance with the current *Louisiana Standard Specifications for Roads and Bridges*, as amended, appropriate Louisiana DOTD Standard Plans, and the *Manual of Uniform Traffic Control Devices* (MUTCD).

The Department may perform routine maintenance at any time on the warranted pavement. This will not relieve the contractor from meeting the warranty requirements herein.

The Department may make immediate emergency repairs to the pavement to correct an unsafe road condition as determined by the Department. The Department will notify the contractor that action is required to address an unsafe condition. However, should the contractor be unable to comply with this requirement to the Department's satisfaction and within the time frame required by the Department, the Department will perform, or have performed any emergency repairs deemed necessary. Any such emergency repairs undertaken will not relieve the contractor from meeting the warranty requirements herein. Any costs associated with the emergency repairs shall be paid by the contractor if it is determined the cause was from defective materials and/or workmanship.

The contractor will not be held responsible for distresses which are caused by factors beyond the control of the contractor.

Pavement Distress Indicators, Thresholds and Remedial Actions: The following pavement distresses will be monitored by the Department to determine whether warranty action may be required:

1) Surface Defects
2) Surface Deformation
3) Cracking
4) Potholes

For each pavement distress threshold limit, the minimum remedial treatments will be as prescribed in Table 1.

Surface Defects: Surface defects include bleeding and raveling. Surface defects will be determined by a visual pavement condition survey.

(a) *Bleeding:* Bleeding is the existence of excess bituminous binder on the pavement surface. Bleeding will be reported in terms of the number of occurrences within each pavement segment and each occurrence will be measured in square feet (sq m) of affected area.

(b) *Raveling:* Raveling is the wearing away of the pavement surface in a hot mix asphaltic concrete. It is caused by the dislodging of aggregate particles and loss of asphalt binder. Raveling will be reported by the number of occurrences within each pavement segment and each occurrence will be measured in square feet (sq m) of affected area.

Surface Deformation: Surface deformation is caused by rutting or shoving. Surface deformation will be measured with a high speed profiler. Surface deformations will be measured in tenths (0.1) of an inch (3 mm).

(a) *Rutting:* Rutting is a longitudinal surface depression in the wheel path. It may have associated transverse displacement.

(b) *Shoving:* Shoving is the longitudinal displacement of a localized area of the pavement surface. It may be caused by braking or accelerating vehicles, and is usually located on hills or curves, or at intersections. It may also have associated vertical displacement and be determined with a visual evaluation. Cracking: Cracking includes fatigue cracking, longitudinal cracking,

Warranty Specification used on I-10

transverse cracking, and edge cracking. Cracking will be determined by a visual pavement condition survey. Fatigue cracking will be measured in areas of square feet (sq m). Longitudinal, transverse and edge cracking will be measured in linear feet (m) and severity (width of crack).

(a) *Fatigue cracking*: Occurs in areas subjected to repeated traffic loadings (wheel paths). It can be a series of interconnected cracks in early stages, developing into many sided, sharp-angled pieces, characteristically with a chicken wire or alligator pattern.

(b) *Longitudinal cracking*: Cracks predominantly parallel to the pavement centerline.

(c) *Transverse cracking*: Cracks that are predominantly perpendicular to the pavement centerline and that are not located over Portland cement concrete joints.

(d) *Edge cracking*: Crescent shaped cracks or fairly continuous cracks which intersect the pavement edge and are located within 2 feet (0.6 m) of the pavement edge, adjacent to the shoulder. Includes longitudinal cracks outside the wheel path within this 2 foot (0.6 m) area. Applies only to pavements with unpaved shoulders.

Potholes: Potholes are bowl-shaped holes of various sizes in the pavement surface. Potholes will be determined by a visual pavement condition survey. Potholes will be reported by number of occurrences and will be measured by the square feet (sq m) area of each pothole within each pavement segment.

Conflict Resolution: If the contractor disputes the distress and condition survey findings, written notification of the dispute shall be provided to the Chief Engineer within thirty (30) days.

Upon receipt of the contractor's written dispute, a Conflict Resolution Team, hereinafter "Team," will determine the validity of the dispute. The Team will consist of two contractor representatives, two Department representatives, and a fifth person mutually agreed upon by both the Department and the contractor. Any costs for the fifth person will be equally shared between the Department and the contractor. The Team members will be identified in writing at the preconstruction meeting and will be knowledgeable in the terms and conditions of this warranty and the methods used in the determination of warranted item distresses. The Team will determine the validity of the dispute and submit its recommendation to the Chief Engineer. If it is determined that remedial action is required to correct any warranted item, the contractor shall perform the required actions as directed, including payments for all labor, materials, equipment, traffic control and other incidental work. Remedial action shall be performed within three (3) months.

Measurement and Payment: All contractor costs associated with the performance of this warranty, including but not limited to, maintaining traffic, traffic control devices, remedial action with associated work, materials, and engineering will not be paid for separately. All costs associated with providing the required warranty bond, documentation and conflict resolution team members will be considered as included in the contract prices for the items of work covered by the warranty.

STATE PROJECT NO(S). 450-03-0037, 450-03-0055, 450-03-0056,
450-03-0057 and 450-03-0060
SPECIAL PROVISIONS

Table 1

Pavement Distress Indicator	Threshold Limit	Remedial Action (Minimal-within lane width)
Bleeding	10 square feet (1 sq m)	Remove and replace 200 percent of defective area
Raveling	10 square feet (1 sq m)	Remove and replace 200 percent of defective area
Rutting (500 foot (150 m) segment subdivided into 50 foot (15 m) lengths)	0.35 inch (10 mm) average in any 50 foot length (15 m) in any wheel path Any area with rutting greater than 0.50 inch (13 mm)	Fine tooth milling and overlay or remove and replace defective area
Shoving	Any occurrence	Remove and replace 200 percent of defective area
Fatigue Cracking	10 square feet (1 sq m)	Remove and replace 200 percent of defective area
Longitudinal Cracking	50 linear feet (15 m) total length with crack width greater than 0.25 inch (6 mm) More than 200 linear feet (60 m) total length	Route and seal cracks with rubberized crack filler Remove and replace entire segment
Transverse Cracking	50 linear feet (15 m) total length with crack width greater than 0.25 inch (6 mm) More than 200 linear feet (60 m) total length.	Route and seal cracks with rubberized crack filler Remove and replace entire segment
Edge Cracking	50 linear feet (15 m) total length with crack width greater than 0.25 inch (6 mm) More than 100 linear feet (30 m) total length	Route and seal cracks with rubberized crack filler Remove and replace entire segment
Potholes	Any occurrence	Remove and replace 200 percent of defective area

Warranty Specification used on LA 946

WARRANTY OF PORTLAND CEMENT CONCRETE PAVEMENT CONSTRUCTION

Section 601 of the 2000 Standard Specifications is amended to include the following:

General: The term "pavement surface width" includes the concrete paved travel lanes, shoulders, acceleration/deceleration lanes, and ramps as applicable.

The current edition of the *Louisiana Standard Specifications for Roads and Bridges*, as amended, is the minimum standard to be followed.

For the purpose of evaluating the performance of warranted portland cement concrete pavement, the project will be divided into segments; each segment will be 500 feet (150 m) in length for the full pavement surface width described above.

Warranty Bond: The contractor shall warrant the workmanship, materials, quality, and performance of portland cement concrete pavement for a period of three (3) years following the date of project acceptance.

The contractor shall furnish a warranty bond in an amount equal to five percent (5%) of the total cost of all portland cement concrete paving items including travel lanes, crossovers, turnouts, and shoulders. The bond will provide for the proper and prompt completion of remedial actions required to correct defective warranted work discovered after final acceptance, including payments for all labor, materials, equipment, traffic control, and other incidental work. Although claims against the warranty bond shall be for defects found during the first three (3) years following final acceptance, the bond shall have a prescription period of five (5) years. This warranty and the warranty bond shall be in addition to the payment, performance, and retainage bond and shall be on forms furnished by the Department. These completed forms shall be submitted to the Department upon award of contract.

As a minimum the Department will conduct a distress and condition survey within six (6) months prior to the end of the three (3) year warranty period at no cost to the contractor. The Department will advise the contractor of the survey schedule and will notify the contractor in writing when distresses are found requiring remedial action. Within fourteen (14) calendar days after the receipt of written notification, the contractor shall develop a remedial action plan including date(s) to perform the remedial actions, and submit it to the Department for approval. The Department will approve all materials and methods used by the contractor, including traffic control, to perform the remedial action. If a segment exceeds the threshold limits prior to the survey as determined by either the Department or the contractor, the contractor shall submit a plan for remedial action to be approved by the Department.

Warranty Requirements: The contractor will unconditionally warrant to the Department that the pavement shall be free of defects in materials and workmanship, as defined by the contract plans and specifications and this special provision, for the three-year (3) period.

All remedial actions within a distressed lane width shall be constructed such that the average pavement smoothness within the repaired area is similar to the average pavement smoothness of the non-distressed area.

When multiple areas are distressed within a segment, the contractor may elect to submit a plan that exceeds the minimum remedial actions such that the entire segment is treated. These plans will be negotiated and approved by the Department.

The portland cement concrete pavement shall include jointed concrete pavement (JCP) and continuously reinforced concrete pavement (CRCP). Transverse cracking that naturally occurs in CRCP is excluded from these provisions. The following pavement distresses will be monitored by the Department to determine whether warranty action may be required wherein all forms of distress are to be defined and tabulated in accordance to the descriptions given in FHWA's Distress Identification Manual for the Long-Term Pavement Performance Program (FHWA-RD-03-031):

1) Cracking (corner breaks, longitudinal cracking, transverse cracking, and diagonal cracking)

2) Joint deficiencies (joint seal damage, transverse and longitudinal, spalling of transverse and longitudinal joints)

3) Pavement texture loss [loss of the macrotexture (transverse or longitudinal grooves) constructed to remove the surface water]

4) Miscellaneous distress (faulting of transverses joints, lane-to-AC shoulder separation, popouts, and spalled areas)

Cracking: Cracking shall include corner breaks, longitudinal cracking, transverse cracking, and diagonal cracking. Cracking will be determined by a visual pavement condition survey. The warranted portland cement concrete pavement shall be free of cracking; otherwise, the contractor shall execute remedial actions indicated below:

(a) Corner Breaks: In corner breaks, a portion of the slab is separated by a crack, which intersects the adjacent transverse and longitudinal joints, describing approximately a 45° angle with the direction of traffic. The length of corner crack is defined to be less than 2 feet (0.6 m) on each side of the corner.

The corner breaks defined above shall be removed and replaced by full depth patching with a proper tie-in.

(b) Longitudinal, Transverse, and Diagonal Cracking: Longitudinal cracks are predominantly parallel to the pavement centerline. Transverse or diagonal cracks are either perpendicular or diagonal to the pavement centerline.

The longitudinal, transverse and diagonal cracking shall be repaired in accordance with Subsection 601.09(k) of the Standard Specifications.

Joint Deficiencies: Joint deficiencies shall include transverse joint seal damage, longitudinal joint seal damage, spalling of longitudinal joints, and spalling of transverse joints. Joint deficiencies will be determined by a visual pavement condition survey. The warranted portland cement concrete pavement shall be free of joint deficiencies, otherwise, the contractor shall execute remedial actions in accordance with Table 1.

(a) Joint Seal Damage (Transverse and Longitudinal): Joint seal damage is any condition, which enables incompressible materials or a significant amount of water to infiltrate the joint from the surface. Typical types of joint seal damages include loss of sealant integrity caused by adhesive failure (debonding) and/or cohesive failure (material splitting), a completely missing seal, hardening, and intrusion of foreign material in the joint.

(b) Spalling of Transverse and Longitudinal Joints: This is defined as cracking, breaking, chipping, or fraying of slab edges within 2 feet (0.6 m) of the transverse or longitudinal joint.

Warranty Specification used on LA 946

TABLE 1
Suggested Remedial Actions for Joint Deficiencies

Distress	Description	Remedial Action*
Transverse Joint Seal Damage	Joint seal damage exists over travel lane or shoulder	Remove completely and replace seal materials across the travel lane or shoulder regardless of the length of failed material
Longitudinal Joint Seal Damage	Joint seal damaged as described above	Remove and replace damaged or missing seal materials in accordance with Subsection 601.13
Spalling of Longitudinal Joints	Spalls greater than 2 inches (50 mm) wide	Repair of affected area in accordance with a Department approved action plan
Spalling of Transverse Joints	Spalls greater than 2 inches (50 mm) wide	Full depth repair of affected area in accordance with a Department approved action plan

Pavement Texture Loss: Pavement surface texture shall retain its shape and texture depth for adequate surface water removal from the travel lanes for the duration of the warranty period as determined by the methodologies indicated below.

(a) Tine Texturing Measurement by Tire Gauge: The depth of the tining shall be originally determined and recorded in accordance with DOTD TR 229, prior to the opening to traffic as required, for meeting the construction specification requirements.

In no time during the warranty period shall a mean texture depth of less than 1/8 inch (3 mm) be obtained in any of the pavement grooved areas.

(b) Macrotexture Depth Measurements (Sand Patch): In accordance with ASTM E 965, Standard Test Method for Measuring Pavement Macrotexture Depth Using a Volumetric Technique, the pavement macrotexture depth shall be determined and recorded prior to opening to traffic at the locations where texture depth measurements were determined using the section (a) procedures. During the warranty period, the average macrotexture depth in any subsequent measurements, as determined by this method, shall not show a loss greater than 20 percent of the original mean (prior to the opening to traffic measurements) texture depth.

(c) Visual Inspection: The pavement surface texture shall be visually inspected by the Department during the warranty period. If at any time after completion it appears that the surface areas between the grooves show signs of crushing or excessive wear, the Department will conduct the tests described above. If any measured mean value of the texture depth is less than 1/8 inch (3 mm) as determined by the tire gauge method, or losses of more than 20 percent of the mean values originally determined by the sand patch method are indicated, the contractor shall repair the entire lot where inadequate texture depth readings were taken. Diamond grinding or other methods approved by the Department shall be used to restore the pavement texture within 30 days of the contractor's notification.

Additionally, within three months prior to the expiration of the warranty period, the Department will take texture depths measurements. If the mean texture depth loss is greater than 20 percent as compared to the original values as determined by the sand patch method, or a mean reading of less than 1/8 inch (3 mm) is obtained by the tire gauge method, the contractor shall restore the texture as described above prior to expiration of the warranty period.

Miscellaneous Distresses: This section shall include faulting of transverse joints and cracks, lane-to-shoulder separation, popouts, and spalled areas. Miscellaneous distresses will be determined by a visual pavement condition survey. The warranted portland cement concrete pavement shall be free of miscellaneous distresses, otherwise, the contractor shall execute remedial actions as specified in this section.

(a) Faulting of Transverse Joints: Faulting is the difference in elevation across a joint. Faulting of transverse joints and cracks is measured in inches (millimeters) of difference in elevation. Faulting greater than 1/8 inch (3 mm), but less than 1/4 inch (6 mm) shall be corrected. Minimum remedial action includes jacking the slab by approved methods. Joints with faults greater than 1/4 inch (3 mm) shall be removed and replaced.

(b) Lane-To-AC Shoulder Separation: Lane-to-shoulder separation is widening of the joint between the edge of slab and the asphaltic concrete (AC) shoulder. Lane-to-shoulder separation shall be corrected by sealing when there is any visible separation.

(c) Popouts: Popouts are small pieces of pavement broken loose from the surface, ranging in diameter from 1 inch (25 mm) to 4 inches (100 mm) and depth from 1/2 inch (15 mm) to 2 inches (50 mm). All of the popouts shall be repaired. Remedial action shall include patching with low shrinkage high early strength mortar from LADOTD Qualified Product List 24.

(d) Spalled Areas: Spalled areas will be measured by square inch (square meter) of affected area. Spalled areas larger than 25 square inches (0.016 sq m) and/or with depth larger than 1 inch (25 mm) shall be corrected. Remedial action will depend upon the type of spalling that occurs and shall be in accordance with a Department approved action plan submitted by the contractor. Patching materials shall be conventional concrete components or patching materials listed in QPL 24.

Rights and Responsibilities of the Department:
The Department will:

(1) Monitor the items described in the warranty requirements for a period of three (3) years. The Department will conduct condition surveys annually to evaluate the warranted items at no cost to the contractor. The initial survey will be conducted within one (1) month following the initial acceptance of the project.

(2) Reserve the right to perform routine maintenance at any time on the warranted pavement. This will not relieve the contractor from meeting the warranty requirement of this Special Provision.

(3) Advise the contractor of the survey schedule and make the results available within fourteen (14) calendar days after completion of the survey.

(4) Notify the contractor, in writing, of any remedial action required to meet the warranty requirements.

(5) Reserve the right to approve the date(s) requested by the contractor to perform the remedial action.

(6) Reserve the right to approve all materials and methods used by the contractor to perform the remedial action.

remedial action.

(6) Reserve the right to approve all materials and methods used by the contractor to perform the remedial action.

Warranty Specification used on LA 946

(7) Reserve the right, if the contractor is unable, to make immediate emergency repairs to the pavement to prevent an unsafe road condition as determined by the Department. The Department will notify the contractor that action is required to address an unsafe condition.

However, if the contractor is unable to comply with this requirement, to the Department's satisfaction and within the time frame required by the Department, the Department will perform, or have performed any emergency repairs deemed necessary. Any such emergency repairs undertaken will not relieve the contractor from meeting the warranty requirements of this Special Provision. Any costs associated with the emergency repairs will be paid by the contractor if it is determined the cause was from defective materials and/or workmanship.

(8) Document the condition of the pavement prior to emergency repairs.

Rights and Responsibilities of the Contractor:

The contractor shall:

(1) Unconditionally warrant to the Department that the pavement shall be free of defects in materials and workmanship, as defined by the contract plans and specifications, for a period of three (3) years. This warranty and the Warranty Bond, shall be on forms furnished by the Department. These completed forms shall be submitted to the Department prior to award of contract.

(2) Perform remedial action once any of the warranted items exceeds the acceptable limits described in this Special Provision. The warranty will remain in a good standing as long as each distress (item) remains within the defined acceptable limits.

(3) Be responsible for all costs of remedial action; including but not limited to payments for all labor, materials, equipment, traffic control and restoring all associated pavement features, such as pavement marking, shoulders, and adjacent lanes, and other incidental work, at no additional cost to the Department.

(4) Be responsible for replacing all temporary repairs resulting from the pavement being in noncompliance with the warranty requirements.

(5) Notify the Department and submit a written course of action proposing appropriate remedial action at least five (5) calendar days prior to commencement of such remedial action, unless this work requires immediate emergency repairs as determined by the Department.

(6) Perform the remedial action within three (3) months of its approval by the Department, unless the Department notifies the contractor that immediate emergency repairs are necessary to prevent an unsafe road condition. In this event, the contractor shall make said emergency repairs within a time frame required by the Department.

(7) Be responsible for all costs of all emergency repairs to the pavement deemed necessary by the Department to prevent an unsafe road condition.

(8) Submit a Traffic Control Plan to the Department for approval before the remedial action is undertaken. Traffic control and traffic control devices will be required to safeguard the public and contractor personnel during remedial action. All traffic control and traffic control devices shall be in accordance with the current *Louisiana Standard Specifications for Roads and Bridges*, as amended, appropriate Louisiana DOTD Standard Plans, and the *Manual of Uniform Traffic Control Devices* (MUTCD).

(9) Not be held responsible for distresses which are caused by factors beyond the control of the contractor.

Conflict Resolution: If the contractor disputes the distress and condition survey findings, written notification of the dispute shall be provided to the Chief Engineer within thirty (30) calendar days.

Upon receipt of the contractor's written dispute, a Conflict Resolution Team, hereinafter "Team", will determine the validity of the dispute. The Team will consist of two contractor representatives, two Department representatives, and a fifth person mutually agreed upon by both the Department and the contractor. Any costs for the fifth person will be equally shared between the Department and the contractor. The Team members will be identified in writing at the preconstruction meeting and will be knowledgeable in the terms and conditions of this warranty and the methods used in the determination of warranted item distresses. The Team will submit its recommendation to the Chief Engineer. If it is determined that remedial action is required to correct any warranted item, the contractor shall perform the required actions as directed, including payments for all labor, materials, equipment, traffic control and other incidental work. Remedial action shall be performed within three (3) months.

Measurement and Payment: All contractor costs associated with the performance of this warranty, including but not limited to, maintaining traffic, traffic control devices, remedial action with associated work, materials, and engineering will not be paid for separately. All costs associated with providing the required warranty bond, documentation and conflict resolution team members will be considered as included in the contract prices for items of work covered by the warranty.

Summary of Bid Estimates on I-10 and LA 422

Project 450-03-0037 (I-10) Departmental Estimate: $19,319,598.61

Project/Contractor	Bid Amount	Over the Estimate	Bid date
Diamond B Construction Co., L.L.C.	$21,862,438.14	13%	6/27/2001
Gilchrist Construction Co.	$22,229,067.35	15%	6/27/2001
Prairie Construction Co., Inc.	$22,376,206.48	16%	6/27/2001
D & J Construction Co., Inc.	$24,685,358.85	28%	6/27/2001

Project 819-02-0012 (LA 422) Departmental Estimate: $2,954,251.51

Project/Contractor	Bid Amount	Over the Estimate	Bid date
Diamond B Construction Co., L.L.C.	$2,685,980.82	-9%	3/28/2001
F.G. Sullivan, Jr. Contractor	$2,924,299.52	-1%	3/28/2001
Barber Bros. Contracting Co., L.L.C.	$2,985,716.36	1%	3/28/2001
Construction Specialists, L.L.C.	$2,994,389.85	1%	3/28/2001
Soil Stabilizers, Inc.	$3,020,348.82	2%	3/28/2001

Looking at the I-10 job, it can be seen that all bidders were above the Department's estimate from 13 percent to 28 percent. The low bidder who was awarded the contract was 13 percent over the estimate. The Department requires written justification from the project engineer/manager when a low bid price is more than 5 percent of the low bid price for contract award construction. The written justification that was received from the manager in charge indicated "much higher than AC prices." The unit price of estimate was $37.00 per ton while the low bid contractor bid it at $46.00 or about 24 percent higher. Note that this was a level 3 Superpave job. It is also worthy to note that other contractors, who bid higher, bid less on the asphalt item. For example, the second lowest bidder was only 8 percent over the Department's estimate of the asphalt cost. It must be taken into consideration, though, that the Department's estimate might have not reflected a true cost of AC materials, particularly for new mixes such as Superpave.

On the second job, LA-422, the low bid cost was 9 percent less than the Department's estimate. Unlike the I-10 job, this did not have Superpave asphalt and the low bidder cost came at $31.00 per ton for the AC. It cannot be concluded that any overall price increase resulted because this job was made into a warranty job.

In conclusion, since there were only two warranty jobs, and based on the above considerations, it can be concluded that the impact of the cost of a construction project due to

requirement of warranty is inconclusive. Also, note that Louisiana had only a three-year warranty period. Had the Department required a five- or ten- year warranty period, it can be expected that the increases in the cost of construction would have been much higher.

APPENDIX C

I-10: Detailed Summary of Profiler and Friction Testing Conducted by LTRC

Table C-0
Summary of Profiler and Friction Testing Conducted by LTRC on I-10

	Age (yrs)	Mean	Standard Error	Median	Mode	Standard Deviation	Sample Variance	Kurtosis	Skewness	Range	Min	Max	Segment Count	95th Percentile	Mean + 95%
Avg IRI (in/mile)	-0.022	45.2	0.617	43	42	8.77	76.9	11.1	2.82	60	33	93	202	1.22	46.4
	0.490	44.7	0.616	43	44	8.75	76.5	10.4	2.67	63	32	95	202	1.21	45.9
	0.953	44.2	0.594	42	41	8.44	71.3	11.3	2.70	63	32	95	202	1.17	45.4
	1.42	44.2	0.622	42	41	8.84	78.1	16.9	3.28	72	31	103	202	1.23	45.4
	2.05	45.2	0.627	43	42	8.91	79.5	8.78	2.50	60	32	92	202	1.24	46.4
	2.59	44.2	0.549	42.8	38.1	7.80	60.8	10.1	2.34	63.9	31.8	95.7	202	1.08	45.3
	3.48	45.1	1.14	41	38	16.2	264	32.3	5.17	144	32	176	202	2.25	47.3
	3.95	47.3	0.729	45.4	45.9	10.4	107	35.6	4.54	108.9	33.1	142	202	1.44	48.7
IRI 1 (in/mile)	-0.022	49.3	0.713	47.5	44	10.1	103	8.85	2.31	77	34	111	202	1.41	50.7
	0.490	48.4	0.684	47	45	9.73	94.6	6.51	2.01	65	33	98	202	1.35	49.8
	0.953	47.4	0.696	46	45	9.90	97.9	10.5	2.48	79	32	111	202	1.37	48.8
	1.42	46.9	0.704	45	43	10.0	100	15.4	2.96	87	32	119	202	1.39	48.3
	2.05	48.8	0.698	47	45	9.92	98.5	8.04	2.16	74	33	107	202	1.38	50.2
	2.59	47.7	0.639	46.7	57.6	9.08	82.5	8.16	1.93	74	31.7	105.7	202	1.26	48.9
	3.48	48.0	1.17	45	47	16.6	277	26.3	4.56	140	32	172	202	2.31	50.4
	3.95	52.8	0.842	50.5	56.8	12.0	143	19.1	3.22	109.9	34.1	144	202	1.66	54.5
IRI 2 (in/mile)	-0.022	41.0	0.607	40	40	8.62	74.4	15.9	3.16	71	28	99	202	1.20	42.2
	0.490	41.0	0.620	40	38	8.81	77.7	13.5	2.95	67	28	95	202	1.22	42.2
	0.953	41.1	0.574	39	38	8.16	66.6	12.6	2.61	69	29	98	202	1.13	42.2
	1.42	41.4	0.628	40	40	8.92	79.6	29.2	4.03	91	28	119	202	1.24	42.7
	2.05	41.5	0.638	39	38	9.06	82.1	14.6	3.04	76	29	105	202	1.26	42.8
	2.59	40.7	0.526	39.2	36.7	7.48	55.9	7.81	2.18	56.6	29.1	85.7	202	1.04	41.7
	3.48	42.1	1.16	38.5	36	16.5	273	34.5	5.29	152	29	181	202	2.29	44.4
	3.95	41.7	0.681	40	36.3	9.68	93.7	52.8	5.69	111.3	28.7	140	202	1.34	43.1
Rut Standard Deviation	-0.022	0.008	0.000242	0.007	0.008	0.00344	0.0000118	0.437	0.554	0.018	0.000	0.018	202	0.000477	0.0083
	0.490	0.017	0.000315	0.017	0.015	0.00447	0.0000200	3.50	1.27	0.032	0.009	0.041	202	0.000621	0.0181
	0.953	0.019	0.000339	0.018	0.016	0.00482	0.0000232	2.97	1.43	0.031	0.008	0.039	202	0.000668	0.0195
	1.42	0.022	0.000435	0.020	0.019	0.00618	0.0000382	1.85	1.29	0.033	0.014	0.047	202	0.000857	0.0232
	2.05	0.023	0.000486	0.021	0.019	0.00691	0.0000477	2.27	1.47	0.037	0.010	0.047	202	0.000959	0.0235
	2.59	0.022	0.000462	0.020	0.019	0.00657	0.0000431	1.86	1.34	0.037	0.014	0.051	202	0.000911	0.0232
	3.48	0.024	0.000551	0.021	0.017	0.00783	0.0000613	3.10	1.62	0.047	0.014	0.061	202	0.00109	0.0248
	3.95	0.022	0.000466	0.021	0.020	0.00663	0.0000439	3.02	1.59	0.039	0.014	0.053	202	0.000920	0.0233
Rut Avg (inches)	-0.022	0.010	0.000371	0.01	0.01	0.0053	0.000028	1.48	0.182	0.03	0.00	0.03	202	0.000732	0.0105
	0.490	0.039	0.00111	0.04	0.03	0.0158	0.000249	0.44	0.698	0.08	0.01	0.09	202	0.00219	0.0410
	0.953	0.046	0.00137	0.04	0.04	0.0194	0.000378	1.24	1.05	0.11	0.01	0.12	202	0.00270	0.0487
	1.42	0.097	0.00173	0.10	0.10	0.0246	0.000607	0.271	0.073	0.13	0.03	0.16	202	0.00342	0.100
	2.05	0.103	0.00204	0.10	0.09	0.0291	0.000844	0.870	-0.172	0.17	0.01	0.18	202	0.00403	0.107
	2.59	0.069	0.00166	0.07	0.07	0.0235	0.000554	-0.104	0.469	0.12	0.02	0.14	202	0.00327	0.0723
	3.48	0.074	0.00199	0.07	0.06	0.0283	0.000798	0.116	0.231	0.15	0.01	0.16	202	0.00392	0.0779
	3.95	0.078	0.00197	0.07	0.07	0.0280	0.000781	0.489	0.680	0.16	0.02	0.18	202	0.00388	0.0823
Friction Number – Ribbed Tire	-0.038	43.8	0.199	44.1	44.3	1.32	1.75	0.175	-0.399	5.8	40.7	46.5	44	0.402	44.2
	0.499	39.1	0.240	39	38.0	1.59	2.52	1.05	0.864	7.5	36.5	44.0	44	0.483	39.6
	0.953	30.5	0.185	30.5	29.4	1.21	1.47	0.383	0.448	5.9	28.1	34.0	43	0.373	30.9
	1.42	31.0	0.247	30.6	30.2	1.64	2.69	-1.13	0.394	5.5	28.6	34.1	44	0.498	31.5
	1.84	30.5	0.157	30.3	29.6	1.02	1.03	-0.637	0.067	4	28.4	32.4	42	0.317	30.9
	1.84	33.0	0.216	33	33.5	1.40	1.96	0.161	0.062	6.4	30.0	36.4	42	0.436	33.4
	2.60	32.8	0.162	32.7	32.6	1.06	1.12	0.775	0.266	5.3	30.1	35.4	43	0.326	33.2
	3.95	31.3	0.217	31.1	32.5	1.41	1.98	0.022	0.258	6.5	28.2	34.7	42	0.438	31.7
Friction Number – Smooth Tire	-0.038	33.3	0.328	33.1	33.1	2.17	4.72	-0.552	0.067	9.3	28.2	37.5	44	0.661	33.9
	0.499	34.1	0.491	33.5	33.9	3.30	10.9	0.105	0.662	15.2	28.0	43.2	45	0.990	35.1
	0.953	23.5	0.285	23.4	22.4	1.87	3.49	-0.864	0.121	6.9	20.0	26.9	43	0.575	24.1
	1.42	23.0	0.289	23.2	24.9	1.92	3.67	-0.133	-0.098	9.3	18.3	27.6	44	0.583	23.6
	1.84	23.4	0.334	23.8	21.0	2.16	4.69	-0.679	0.167	8.9	19.6	28.5	42	0.675	24.1
	1.84	26.9	0.437	26.5	24.8	2.83	8.03	0.550	0.602	13.1	21.0	34.1	42	0.883	27.8
	2.60	29.1	0.428	28.9	27.3	2.80	7.86	0.645	0.388	13.2	23.2	36.4	43	0.863	30.0
	3.95	25.7	0.324	26	25.1	2.10	4.40	0.464	-0.787	8.9	20.3	29.2	42	0.654	26.4

3-Year Projected Distress (derived by linear regression of above data)		Mean	Standard Error	Median	Mode	Standard Deviation	Sample Variance	Kurtosis	Skewness	95th Percentile	Mean + 95%
Average IRI (in/mile)	Projected Distress	45.4	0.773	43.0	41.3	11.0	131	23.8	3.83	1.52	47.0
	R^2 Error	0.2904	0.3137	0.0556	0.0092	0.3137	0.2970	0.6026	0.4760	0.3137	0.4163
IRI 1 (in/mile)	Projected Distress	49.3	0.851	47.2	51.2	12.1	154	16.7	3.1	1.68	51.0
	R^2 Error	0.1946	0.3523	0.0740	0.4731	0.3523	0.3377	0.4915	0.3628	0.3523	0.2771
IRI 2 (in/mile)	Projected Distress	41.6	0.761	39.3	36.9	10.8	129	30.8	4.30	1.50	43.06
	R^2 Error	0.4077	0.2569	0.1474	0.6665	0.2569	0.2516	0.4564	0.4436	0.2569	0.3655
Rut Standard Dev.	Projected Distress	0.0228	0.00048	0.0211	0.0189	0.0069	0.00005	2.69	1.52	0.001	0.024
	R^2 Error	0.5833	0.7744	0.5365	0.5212	0.7744	0.7692	0.1608	0.5707	0.7744	0.5942
Rut Avg. (inches)	Projected Distress	0.0805	0.0018	0.0766	0.0725	0.027	0.0008	0.329	0.386	0.0039	0.0841
	R^2 Error	0.3991	0.6826	0.3190	0.3156	0.6826	0.7329	0.3755	0.0024	0.6826	0.4099
Friction Number – Ribbed Tire	Projected Distress	30.6	0.197	30.4	30.8	1.28	1.68	0.001	0.268	0.398	31.0
	R^2 Error	0.4164	0.0260	0.4177	0.2811	0.0415	0.0418	0.0164	0.0032	0.0252	0.4167
Friction Number – Smooth Tire	Projected Distress	25.3	0.360	25.4	24.0	2.34	5.60	0.328	-0.136	0.727	26.0
	R^2 Error	0.1943	0.0029	0.1808	0.2428	0.0094	0.0159	0.3559	0.3039	0.0026	0.1871

Table C-1

Project: 450-03-0037
ICC Profiler Survey: 5/29/2002
Direction: East

FROM miles	TO miles	Rut Avg inches	Rut STD	IRI 1 in/mile	IRI 2 in/mile	Avg IRI in/mile
0.0	0.1	0.01	0.008	77	67	72
0.1	0.2	0.00	0.003	69	46	57
0.2	0.3	0.00	0.000	58	43	51
0.3	0.4	0.01	0.005	71	55	63
0.4	0.5	0.01	0.005	55	43	49
0.5	0.6	0.01	0.005	69	63	66
0.6	0.7	0.02	0.018	84	65	74
0.7	0.8	0.02	0.015	76	99	88
Bridge						
0.9	1.0	0.01	0.009	56	45	51
1.0	1.1	0.01	0.010	44	42	43
1.1	1.2	0.01	0.009	43	45	44
1.2	1.3	0.01	0.005	40	40	40
1.3	1.4	0.01	0.005	44	41	43
1.4	1.5	0.01	0.006	52	45	49
1.5	1.6	0.01	0.008	49	43	46
1.6	1.7	0.01	0.009	58	43	50
1.7	1.8	0.02	0.012	43	41	42
1.8	1.9	0.01	0.009	34	32	33
1.9	2.0	0.01	0.008	38	34	36
2.0	2.1	0.01	0.007	38	36	37
2.1	2.2	0.01	0.006	41	37	39
2.2	2.3	0.01	0.006	38	40	39
2.3	2.4	0.01	0.006	39	37	38
2.4	2.5	0.01	0.008	36	39	38
2.5	2.6	0.01	0.007	36	39	37
2.6	2.7	0.01	0.009	43	44	43
2.7	2.8	0.01	0.013	40	41	41
2.8	2.9	0.01	0.008	39	40	40
2.9	3.0	0.01	0.011	43	36	40
3.0	3.1	0.01	0.008	44	35	40
3.1	3.2	0.01	0.008	45	37	41
3.2	3.3	0.01	0.018	44	46	45
3.3	3.4	0.01	0.008	38	35	36
3.4	3.5	0.01	0.010	39	35	37
3.5	3.6	0.01	0.009	45	45	45
3.6	3.7	0.01	0.009	48	43	46
3.7	3.8	0.01	0.010	49	41	45
3.8	3.9	0.01	0.009	49	41	45
3.9	4.0	0.01	0.008	49	44	46
4.0	4.1	0.01	0.014	48	41	44
4.1	4.2	0.01	0.009	50	40	45
4.2	4.3	0.01	0.007	42	40	41
4.3	4.4	0.00	0.000	42	43	42
4.4	4.5	0.01	0.007	48	43	46
4.5	4.6	0.00	0.001	36	39	38
4.6	4.7	0.01	0.007	39	41	40
4.7	4.8	0.01	0.007	42	39	40
4.8	4.9	0.01	0.005	50	46	48
4.9	5.0	0.01	0.006	48	48	48
5.0	5.1	0.00	0.006	46	50	48
Bridge						
5.2	5.3	0.02	0.013	51	43	47
5.3	5.4	0.02	0.012	45	43	44
5.4	5.5	0.02	0.012	49	40	44
5.5	5.6	0.01	0.010	42	41	42
5.6	5.7	0.02	0.011	48	41	44
5.7	5.8	0.02	0.013	44	40	42
5.8	5.9	0.02	0.014	52	44	48
5.9	6.0	0.02	0.012	48	40	44
6.0	6.1	0.01	0.008	42	36	39
6.1	6.2	0.01	0.009	39	32	36
6.2	6.3	0.01	0.009	41	34	37
6.3	6.4	0.01	0.008	36	33	34
6.4	6.5	0.01	0.006	39	33	36
6.5	6.6	0.01	0.008	43	40	42
6.6	6.7	0.01	0.007	50	40	45
6.7	6.8	0.01	0.007	46	37	41
6.8	6.9	0.01	0.007	48	39	44
6.9	7.0	0.01	0.010	40	42	41
7.0	7.1	0.01	0.007	56	46	51
7.1	7.2	0.01	0.011	54	46	50
7.2	7.3	0.01	0.006	42	39	40
7.3	7.4	0.01	0.005	46	37	42
7.4	7.5	0.01	0.006	48	38	43
7.5	7.6	0.01	0.005	40	32	36
7.6	7.7	0.01	0.010	40	30	35
7.7	7.8	0.01	0.007	43	32	38
7.8	7.9	0.01	0.008	47	38	43
7.9	8.0	0.01	0.010	44	40	42
8.0	8.1	0.01	0.010	53	46	50
8.1	8.2	0.02	0.012	58	46	52
8.2	8.3	0.00	0.003	45	42	44
8.3	8.4	0.01	0.005	41	38	40
8.4	8.5	0.01	0.010	45	41	43
8.5	8.6	0.01	0.006	45	39	42
8.6	8.7	0.01	0.007	46	40	43
8.7	8.8	0.01	0.006	45	42	43
8.8	8.9	0.02	0.013	53	38	45
8.9	9.0	0.02	0.013	50	43	47
9.0	9.1	0.01	0.008	60	46	53
9.1	9.2	0.01	0.009	44	38	41
9.2	9.3	0.01	0.008	44	38	41
9.3	9.4	0.01	0.011	36	36	36
9.4	9.5	0.01	0.010	44	42	43
9.5	9.6	0.01	0.008	52	44	48
9.6	9.7	0.01	0.008	55	43	49
9.7	9.8	0.01	0.007	48	41	44
9.8	9.9	0.01	0.007	54	44	49
Bridge						
10.1	10.2	0.02	0.014	51	43	47
10.2	10.3	0.01	0.007	54	45	49
10.3	10.4	0.01	0.006	47	45	46
10.4	10.5	0.01	0.007	57	50	53
Averages:		**0.01**	**0.008**	**47**	**42**	**45**

Table C-2

Project: 450-03-0037
ICC Profiler Survey: 5/29/2002
Direction: West

FROM miles	TO miles	Rut Avg inches	Rut STD	IRI 1 in/mile	IRI 2 in/mile	Avg IRI in/mile
10.5	10.4	0.01	0.007	53	47	50
10.4	10.3	0.01	0.005	46	44	45
10.3	10.2	0.00	0.002	53	45	49
10.2	10.1	0.00	0.001	48	38	43
			Bridge			
9.9	9.8	0.01	0.012	94	91	93
9.8	9.7	0.01	0.006	49	43	46
9.7	9.6	0.01	0.005	49	41	45
9.6	9.5	0.01	0.006	52	37	45
9.5	9.4	0.01	0.005	56	45	50
9.4	9.3	0.01	0.006	48	41	45
9.3	9.2	0.01	0.008	46	36	41
9.2	9.1	0.01	0.010	46	39	43
9.1	9.0	0.01	0.008	51	39	45
9.0	8.9	0.01	0.007	45	38	41
8.9	8.8	0.01	0.007	44	45	45
8.8	8.7	0.01	0.007	46	37	41
8.7	8.6	0.01	0.006	50	36	43
8.6	8.5	0.01	0.008	44	34	39
8.5	8.4	0.01	0.009	47	40	44
8.4	8.3	0.01	0.008	44	40	42
8.3	8.2	0.01	0.007	56	37	46
8.2	8.1	0.00	0.003	52	39	46
8.1	8.0	0.01	0.009	49	36	43
8.0	7.9	0.00	0.005	49	34	41
7.9	7.8	0.01	0.005	52	39	46
7.8	7.7	0.01	0.006	47	33	40
7.7	7.6	0.00	0.005	43	33	38
7.6	7.5	0.01	0.006	46	35	41
7.5	7.4	0.01	0.004	50	34	42
7.4	7.3	0.00	0.005	48	34	41
7.3	7.2	0.01	0.005	57	34	46
7.2	7.1	0.01	0.008	47	41	44
7.1	7.0	0.01	0.005	46	38	42
7.0	6.9	0.00	0.000	46	39	42
6.9	6.8	0.00	0.003	50	40	45
6.8	6.7	0.00	0.003	43	35	39
6.7	6.6	0.00	0.005	50	35	42
6.6	6.5	0.00	0.004	46	34	40
6.5	6.4	0.01	0.005	50	34	42
6.4	6.3	0.00	0.004	48	36	42
6.3	6.2	0.00	0.003	51	32	42
6.2	6.1	0.01	0.015	66	51	59
6.1	6.0	0.01	0.006	53	42	48
6.0	5.9	0.00	0.004	53	40	46
5.9	5.8	0.00	0.004	45	36	41
5.8	5.7	0.01	0.006	54	37	45
5.7	5.6	0.01	0.007	54	43	49
5.6	5.5	0.01	0.010	54	40	47
5.5	5.4	0.01	0.008	49	40	45
5.4	5.3	0.01	0.005	60	41	51
5.3	5.2	0.00	0.004	59	31	45
5.1	5.0	0.01	0.009	71	56	64
5.0	4.9	0.01	0.014	111	74	93
4.9	4.8	0.01	0.010	65	56	60
4.8	4.7	0.01	0.004	84	55	69
4.7	4.6	0.00	0.003	65	50	57
4.6	4.5	0.01	0.007	59	49	54
4.5	4.4	0.01	0.007	58	43	51
4.4	4.3	0.01	0.008	61	45	53
4.3	4.2	0.01	0.006	49	44	47
4.2	4.1	0.01	0.008	52	47	49
4.1	4.0	0.01	0.011	67	53	60
4.0	3.9	0.01	0.011	55	49	52
3.9	3.8	0.01	0.005	52	44	48
3.8	3.7	0.00	0.003	48	41	45
3.7	3.6	0.01	0.009	48	33	40
3.6	3.5	0.00	0.002	46	36	41
3.5	3.4	0.01	0.007	63	37	50
3.4	3.3	0.01	0.004	54	32	43
3.3	3.2	0.00	0.003	47	31	39
3.2	3.1	0.01	0.006	61	33	47
3.1	3.0	0.00	0.004	47	33	40
3.0	2.9	0.00	0.005	50	32	41
2.9	2.8	0.01	0.006	45	34	39
2.8	2.7	0.01	0.007	53	38	46
2.7	2.6	0.01	0.006	45	33	39
2.6	2.5	0.01	0.006	44	33	39
2.5	2.4	0.01	0.006	44	31	37
2.4	2.3	0.01	0.006	41	31	36
2.3	2.2	0.01	0.006	51	33	42
2.2	2.1	0.01	0.008	46	37	42
2.1	2.0	0.02	0.013	45	32	39
2.0	1.9	0.02	0.016	41	39	40
1.9	1.8	0.01	0.011	38	34	36
1.8	1.7	0.02	0.014	41	28	35
1.7	1.6	0.02	0.015	38	33	36
1.6	1.5	0.01	0.011	39	43	41
1.5	1.4	0.01	0.008	37	36	37
1.4	1.3	0.01	0.008	43	39	41
1.3	1.2	0.01	0.010	41	37	39
1.2	1.1	0.01	0.010	44	38	41
1.1	1.0	0.01	0.011	44	37	40
1.0	0.9	0.02	0.015	47	36	42
0.9	0.8	0.02	0.016	61	45	53
0.8	0.7	0.02	0.016	66	62	64
			Bridge			
0.6	0.5	0.02	0.012	67	53	60
0.5	0.4	0.03	0.017	42	46	44
0.4	0.3	0.02	0.013	44	41	42
0.3	0.2	0.01	0.010	41	35	38
0.2	0.1	0.00	0.005	41	35	38
0.1	0.0	0.01	0.007	51	40	46
Averages:		**0.01**	**0.007**	**51**	**40**	**46**

Table C-3

Project: 450-03-0037
ICC Profiler Survey: 12/2/2002
Direction: East

FROM miles	TO miles	Rut Avg inches	Rut STD	IRI 1 in/mile	IRI 2 in/mile	Avg IRI in/mile
0.0	0.1	0.03	0.020	74	67	70
0.1	0.2	0.01	0.011	66	43	54
0.2	0.3	0.02	0.014	55	46	51
0.3	0.4	0.03	0.022	62	60	61
0.4	0.5	0.04	0.016	51	45	48
0.5	0.6	0.03	0.022	68	62	65
0.6	0.7	0.04	0.025	84	65	75
0.7	0.8	0.05	0.020	78	95	86
Bridge						
0.9	1.0	0.04	0.018	55	47	51
1.0	1.1	0.05	0.020	43	44	44
1.1	1.2	0.04	0.016	44	45	45
1.2	1.3	0.03	0.014	37	39	38
1.3	1.4	0.03	0.017	44	43	44
1.4	1.5	0.04	0.018	50	45	47
1.5	1.6	0.05	0.016	45	42	44
1.6	1.7	0.04	0.021	58	41	50
1.7	1.8	0.05	0.016	43	41	42
1.8	1.9	0.06	0.014	33	30	32
1.9	2.0	0.05	0.015	37	38	38
2.0	2.1	0.04	0.015	38	38	38
2.1	2.2	0.04	0.015	42	36	39
2.2	2.3	0.04	0.013	38	39	39
2.3	2.4	0.04	0.016	40	37	38
2.4	2.5	0.05	0.014	34	41	37
2.5	2.6	0.05	0.014	36	37	37
2.6	2.7	0.04	0.020	42	42	42
2.7	2.8	0.05	0.019	37	40	39
2.8	2.9	0.04	0.014	41	38	39
2.9	3.0	0.03	0.015	44	38	41
3.0	3.1	0.04	0.016	44	37	40
3.1	3.2	0.04	0.015	44	39	41
3.2	3.3	0.05	0.016	43	43	43
3.3	3.4	0.04	0.016	39	34	36
3.4	3.5	0.03	0.016	40	35	38
3.5	3.6	0.05	0.020	45	44	45
3.6	3.7	0.04	0.022	47	43	45
3.7	3.8	0.05	0.020	48	41	44
3.8	3.9	0.04	0.017	48	43	45
3.9	4.0	0.03	0.017	47	45	46
4.0	4.1	0.02	0.015	49	42	46
4.1	4.2	0.04	0.024	51	40	45
4.2	4.3	0.03	0.019	45	39	42
4.3	4.4	0.02	0.012	42	45	43
4.4	4.5	0.02	0.011	50	46	48
4.5	4.6	0.01	0.010	38	35	36
4.6	4.7	0.02	0.011	43	39	41
4.7	4.8	0.03	0.013	45	43	44
4.8	4.9	0.03	0.013	52	46	49
4.9	5.0	0.02	0.015	53	47	50
5.0	5.1	0.03	0.021	57	58	58
Bridge						
5.2	5.3	0.04	0.021	56	45	51
5.3	5.4	0.05	0.026	47	41	44
5.4	5.5	0.06	0.019	48	40	44
5.5	5.6	0.06	0.025	45	41	43
5.6	5.7	0.08	0.022	46	42	44
5.7	5.8	0.09	0.020	45	39	42
5.8	5.9	0.07	0.020	54	44	49
5.9	6.0	0.06	0.023	49	41	45
6.0	6.1	0.04	0.018	42	34	38
6.1	6.2	0.05	0.019	38	35	36
6.2	6.3	0.03	0.013	42	33	38
6.3	6.4	0.04	0.017	37	34	35
6.4	6.5	0.05	0.016	38	31	35
6.5	6.6	0.05	0.015	43	42	43
6.6	6.7	0.04	0.015	50	39	45
6.7	6.8	0.05	0.015	42	37	39
6.8	6.9	0.04	0.015	44	38	41
6.9	7.0	0.04	0.018	37	42	39
7.0	7.1	0.07	0.020	54	48	51
7.1	7.2	0.06	0.030	55	46	51
7.2	7.3	0.03	0.016	39	38	38
7.3	7.4	0.03	0.016	48	38	43
7.4	7.5	0.03	0.017	45	37	41
7.5	7.6	0.03	0.015	40	34	37
7.6	7.7	0.03	0.015	37	29	33
7.7	7.8	0.03	0.016	41	33	37
7.8	7.9	0.04	0.019	48	38	43
7.9	8.0	0.07	0.021	46	40	43
8.0	8.1	0.07	0.019	51	46	49
8.1	8.2	0.05	0.028	54	45	50
8.2	8.3	0.03	0.013	45	41	43
8.3	8.4	0.04	0.014	43	39	41
8.4	8.5	0.05	0.018	44	42	43
8.5	8.6	0.05	0.017	45	37	41
8.6	8.7	0.03	0.017	46	38	42
8.7	8.8	0.05	0.021	47	42	44
8.8	8.9	0.07	0.018	50	37	44
8.9	9.0	0.06	0.024	52	42	47
9.0	9.1	0.05	0.017	56	47	51
9.1	9.2	0.05	0.015	46	36	41
9.2	9.3	0.03	0.017	39	39	39
9.3	9.4	0.04	0.024	39	35	37
9.4	9.5	0.07	0.020	41	41	41
9.5	9.6	0.05	0.015	49	45	47
9.6	9.7	0.05	0.017	56	42	49
9.7	9.8	0.03	0.018	45	44	45
9.8	9.9	0.02	0.016	52	40	46
Bridge						
10.1	10.2	0.02	0.018	49	41	45
10.2	10.3	0.04	0.020	51	46	48
10.3	10.4	0.04	0.016	45	43	44
10.4	10.5	0.05	0.024	61	53	57
Averages:		**0.04**	**0.018**	**47**	**42**	**45**

Table C-4

Project: 450-03-0037
ICC Profiler Survey: 12/2/2002
Direction: West

FROM miles	TO miles	Rut Avg inches	Rut STD	IRI 1 in/mile	IRI 2 in/mile	Avg IRI in/mile
10.5	10.4	0.02	0.015	52	44	48
10.4	10.3	0.02	0.015	49	41	45
10.3	10.2	0.02	0.016	50	45	48
10.2	10.1	0.02	0.010	46	42	44
			Bridge			
9.9	9.8	0.01	0.017	98	92	95
9.8	9.7	0.04	0.021	55	44	49
9.7	9.6	0.03	0.016	50	40	45
9.6	9.5	0.03	0.014	50	38	44
9.5	9.4	0.04	0.014	52	42	47
9.4	9.3	0.04	0.014	48	37	43
9.3	9.2	0.04	0.014	43	35	39
9.2	9.1	0.02	0.017	47	50	48
9.1	9.0	0.03	0.020	56	39	47
9.0	8.9	0.04	0.017	44	38	41
8.9	8.8	0.02	0.015	41	44	42
8.8	8.7	0.03	0.015	44	36	40
8.7	8.6	0.04	0.014	45	37	41
8.6	8.5	0.05	0.018	41	33	37
8.5	8.4	0.05	0.019	45	40	42
8.4	8.3	0.03	0.018	48	37	42
8.3	8.2	0.02	0.015	51	38	44
8.2	8.1	0.03	0.013	52	37	44
8.1	8.0	0.03	0.013	48	36	42
8.0	7.9	0.03	0.012	50	33	41
7.9	7.8	0.02	0.014	51	37	44
7.8	7.7	0.03	0.014	47	33	40
7.7	7.6	0.02	0.016	47	32	40
7.6	7.5	0.03	0.012	50	35	43
7.5	7.4	0.03	0.014	51	37	44
7.4	7.3	0.03	0.014	49	34	41
7.3	7.2	0.02	0.012	52	35	43
7.2	7.1	0.02	0.013	45	47	46
7.1	7.0	0.02	0.011	49	40	44
7.0	6.9	0.02	0.012	47	36	42
6.9	6.8	0.02	0.014	48	40	44
6.8	6.7	0.02	0.009	46	34	40
6.7	6.6	0.02	0.012	50	36	43
6.6	6.5	0.01	0.010	42	34	38
6.5	6.4	0.03	0.013	52	34	43
6.4	6.3	0.02	0.014	48	36	42
6.3	6.2	0.01	0.010	45	32	39
6.2	6.1	0.03	0.018	63	51	57
6.1	6.0	0.03	0.015	51	40	45
6.0	5.9	0.03	0.013	54	40	47
5.9	5.8	0.02	0.012	44	36	40
5.8	5.7	0.03	0.015	50	39	44
5.7	5.6	0.03	0.015	52	42	47
5.6	5.5	0.04	0.016	53	41	47
5.5	5.4	0.04	0.017	48	41	45
5.4	5.3	0.03	0.013	55	42	49
5.3	5.2	0.03	0.012	57	28	43
5.1	5.0	0.03	0.021	72	56	64
5.0	4.9	0.03	0.017	96	80	88
4.9	4.8	0.03	0.021	66	53	59
4.8	4.7	0.03	0.020	77	49	63
4.7	4.6	0.04	0.017	59	46	53
4.6	4.5	0.04	0.020	60	46	53
4.5	4.4	0.05	0.023	59	46	53
4.4	4.3	0.06	0.016	57	43	50
4.3	4.2	0.07	0.022	48	47	48
4.2	4.1	0.05	0.027	51	46	49
4.1	4.0	0.06	0.029	64	52	58
4.0	3.9	0.02	0.018	55	50	52
3.9	3.8	0.01	0.013	50	47	48
3.8	3.7	0.02	0.015	46	40	43
3.7	3.6	0.03	0.017	45	33	39
3.6	3.5	0.02	0.012	39	33	36
3.5	3.4	0.02	0.015	54	38	46
3.4	3.3	0.03	0.017	50	34	42
3.3	3.2	0.02	0.016	45	31	38
3.2	3.1	0.04	0.016	59	35	47
3.1	3.0	0.03	0.018	47	35	41
3.0	2.9	0.03	0.013	52	32	42
2.9	2.8	0.03	0.014	50	33	41
2.8	2.7	0.04	0.018	50	36	43
2.7	2.6	0.04	0.019	45	31	38
2.6	2.5	0.05	0.018	41	35	38
2.5	2.4	0.03	0.017	39	35	37
2.4	2.3	0.03	0.019	38	33	35
2.3	2.2	0.04	0.016	43	32	38
2.2	2.1	0.05	0.018	44	36	40
2.1	2.0	0.07	0.020	45	33	39
2.0	1.9	0.07	0.026	39	36	37
1.9	1.8	0.06	0.024	36	34	35
1.8	1.7	0.04	0.021	37	28	33
1.7	1.6	0.06	0.024	37	34	36
1.6	1.5	0.05	0.025	39	38	38
1.5	1.4	0.04	0.022	36	34	35
1.4	1.3	0.04	0.019	40	45	43
1.3	1.2	0.06	0.023	40	35	37
1.2	1.1	0.07	0.019	43	38	41
1.1	1.0	0.05	0.021	44	38	41
1.0	0.9	0.09	0.026	42	34	38
0.9	0.8	0.07	0.031	56	42	49
0.8	0.7	0.03	0.021	73	62	67
			Bridge			
0.6	0.5	0.05	0.026	69	58	64
0.5	0.4	0.07	0.041	42	46	44
0.4	0.3	0.08	0.029	42	40	41
0.3	0.2	0.05	0.022	34	32	33
0.2	0.1	0.03	0.018	37	36	37
0.1	0.0	0.04	0.022	44	40	42
Averages:		**0.04**	**0.017**	**50**	**40**	**45**

Table C-5

Project: 450-03-0037
ICC Profiler Survey: 5/20/2003
Direction: East

FROM miles	TO miles	Rut Avg inches	Rut STD	IRI 1 in/mile	IRI 2 in/mile	Avg IRI in/mile
0.0	0.1	0.02	0.013	68	63	65
0.1	0.2	0.03	0.019	58	43	50
0.2	0.3	0.03	0.019	52	48	50
0.3	0.4	0.05	0.025	59	62	60
0.4	0.5	0.04	0.018	51	49	50
0.5	0.6	0.03	0.019	68	63	66
0.6	0.7	0.04	0.023	81	63	72
0.7	0.8	0.03	0.016	58	49	53
Bridge						
0.9	1.0	0.03	0.016	58	49	53
1.0	1.1	0.04	0.017	45	43	44
1.1	1.2	0.03	0.015	45	45	45
1.2	1.3	0.04	0.016	41	37	39
1.3	1.4	0.04	0.020	42	44	43
1.4	1.5	0.05	0.022	46	46	46
1.5	1.6	0.05	0.030	41	49	45
1.6	1.7	0.04	0.018	49	43	46
1.7	1.8	0.05	0.018	40	38	39
1.8	1.9	0.01	0.008	32	32	32
1.9	2.0	0.03	0.015	36	37	37
2.0	2.1	0.03	0.014	39	38	39
2.1	2.2	0.04	0.015	39	35	37
2.2	2.3	0.04	0.015	37	38	38
2.3	2.4	0.02	0.015	40	39	40
2.4	2.5	0.02	0.014	34	42	38
2.5	2.6	0.03	0.014	36	44	40
2.6	2.7	0.05	0.020	41	43	42
2.7	2.8	0.04	0.017	36	38	37
2.8	2.9	0.05	0.019	39	41	40
2.9	3.0	0.06	0.017	44	36	40
3.0	3.1	0.05	0.021	42	33	37
3.1	3.2	0.03	0.019	46	39	42
3.2	3.3	0.04	0.015	41	42	42
3.3	3.4	0.04	0.016	35	32	34
3.4	3.5	0.04	0.016	37	34	36
3.5	3.6	0.05	0.021	45	45	45
3.6	3.7	0.04	0.022	43	38	40
3.7	3.8	0.06	0.022	48	40	44
3.8	3.9	0.05	0.017	47	42	44
3.9	4.0	0.04	0.023	51	47	49
4.0	4.1	0.03	0.018	46	43	45
4.1	4.2	0.02	0.016	50	44	47
4.2	4.3	0.02	0.014	46	41	43
4.3	4.4	0.02	0.013	43	45	44
4.4	4.5	0.02	0.014	49	41	45
4.5	4.6	0.03	0.014	38	38	38
4.6	4.7	0.03	0.019	40	41	40
4.7	4.8	0.04	0.018	43	42	42
4.8	4.9	0.05	0.016	50	47	48
4.9	5.0	0.04	0.017	48	49	48
5.0	5.1	0.03	0.019	53	55	54
Bridge						

FROM miles	TO miles	Rut Avg inches	Rut STD	IRI 1 in/mile	IRI 2 in/mile	Avg IRI in/mile
5.2	5.3	0.04	0.021	53	48	51
5.3	5.4	0.04	0.021	45	45	45
5.4	5.5	0.06	0.018	48	42	45
5.5	5.6	0.04	0.016	44	42	43
5.6	5.7	0.07	0.022	47	42	45
5.7	5.8	0.08	0.024	43	38	41
5.8	5.9	0.09	0.023	51	43	47
5.9	6.0	0.07	0.027	46	41	43
6.0	6.1	0.05	0.022	38	34	36
6.1	6.2	0.06	0.020	36	31	33
6.2	6.3	0.06	0.019	38	32	35
6.3	6.4	0.03	0.015	33	35	34
6.4	6.5	0.04	0.016	38	34	36
6.5	6.6	0.06	0.019	40	44	42
6.6	6.7	0.06	0.015	48	39	44
6.7	6.8	0.06	0.016	46	38	42
6.8	6.9	0.06	0.015	44	37	41
6.9	7.0	0.06	0.019	37	42	40
7.0	7.1	0.06	0.021	56	47	51
7.1	7.2	0.08	0.033	56	48	52
7.2	7.3	0.05	0.017	41	38	40
7.3	7.4	0.03	0.019	45	36	40
7.4	7.5	0.03	0.017	46	35	41
7.5	7.6	0.03	0.015	37	31	34
7.6	7.7	0.02	0.014	41	34	37
7.7	7.8	0.04	0.019	41	32	37
7.8	7.9	0.04	0.019	47	39	43
7.9	8.0	0.03	0.018	43	38	40
8.0	8.1	0.03	0.018	53	47	50
8.1	8.2	0.04	0.022	54	43	49
8.2	8.3	0.03	0.014	42	40	41
8.3	8.4	0.02	0.013	40	38	39
8.4	8.5	0.05	0.020	42	38	40
8.5	8.6	0.05	0.017	43	38	41
8.6	8.7	0.06	0.016	45	39	42
8.7	8.8	0.05	0.019	44	41	42
8.8	8.9	0.06	0.025	47	37	42
8.9	9.0	0.06	0.020	47	41	44
9.0	9.1	0.04	0.019	55	46	50
9.1	9.2	0.05	0.017	44	37	41
9.2	9.3	0.05	0.018	45	39	42
9.3	9.4	0.06	0.024	35	37	36
9.4	9.5	0.07	0.026	43	44	43
9.5	9.6	0.05	0.017	49	45	47
9.6	9.7	0.05	0.019	53	42	47
9.7	9.8	0.06	0.016	47	42	45
9.8	9.9	0.04	0.017	53	45	49
Bridge						
10.1	10.2	0.10	0.019	43	39	41
10.2	10.3	0.08	0.023	47	44	46
10.3	10.4	0.03	0.021	49	46	47
10.4	10.5	0.02	0.012	57	55	56
Averages:		**0.04**	**0.018**	**46**	**42**	**44**

Table C-6

Project: 450-03-0037
ICC Profiler Survey: 5/20/2003
Direction: West

FROM miles	TO miles	Rut Avg inches	Rut STD	IRI 1 in/mile	IRI 2 in/mile	Avg IRI in/mile
10.5	10.4	0.02	0.016	52	53	52
10.4	10.3	0.02	0.015	50	45	47
10.3	10.2	0.03	0.018	53	49	51
10.2	10.1	0.03	0.013	45	41	43
			Bridge			
9.9	9.8	0.02	0.017	91	98	95
9.8	9.7	0.03	0.019	56	44	50
9.7	9.6	0.04	0.018	45	42	43
9.6	9.5	0.04	0.015	48	38	43
9.5	9.4	0.03	0.020	49	45	47
9.4	9.3	0.04	0.016	44	40	42
9.3	9.2	0.05	0.017	41	36	39
9.2	9.1	0.03	0.013	40	39	40
9.1	9.0	0.02	0.015	45	39	42
9.0	8.9	0.03	0.014	42	40	41
8.9	8.8	0.04	0.016	41	43	42
8.8	8.7	0.05	0.015	40	36	38
8.7	8.6	0.05	0.016	43	38	41
8.6	8.5	0.06	0.018	41	34	37
8.5	8.4	0.07	0.018	45	41	43
8.4	8.3	0.04	0.020	45	37	41
8.3	8.2	0.03	0.015	49	37	43
8.2	8.1	0.04	0.016	48	39	44
8.1	8.0	0.04	0.023	45	38	41
8.0	7.9	0.04	0.015	57	35	46
7.9	7.8	0.03	0.015	51	37	44
7.8	7.7	0.05	0.014	46	32	39
7.7	7.6	0.05	0.014	42	32	37
7.6	7.5	0.05	0.014	48	35	41
7.5	7.4	0.04	0.016	48	34	41
7.4	7.3	0.04	0.015	47	34	41
7.3	7.2	0.04	0.015	50	36	43
7.2	7.1	0.02	0.013	49	45	47
7.1	7.0	0.02	0.015	45	39	42
7.0	6.9	0.02	0.014	44	37	41
6.9	6.8	0.02	0.013	50	40	45
6.8	6.7	0.02	0.012	47	35	41
6.7	6.6	0.03	0.014	49	36	42
6.6	6.5	0.03	0.013	46	34	40
6.5	6.4	0.05	0.013	52	34	43
6.4	6.3	0.03	0.016	48	35	42
6.3	6.2	0.03	0.014	45	33	39
6.2	6.1	0.04	0.022	60	51	55
6.1	6.0	0.04	0.016	46	39	43
6.0	5.9	0.04	0.015	51	40	45
5.9	5.8	0.04	0.014	45	36	40
5.8	5.7	0.05	0.019	55	35	45
5.7	5.6	0.05	0.017	55	43	49
5.6	5.5	0.05	0.017	55	39	47
5.5	5.4	0.03	0.018	52	42	47
5.4	5.3	0.04	0.014	62	41	51
5.3	5.2	0.05	0.014	56	31	44

FROM miles	TO miles	Rut Avg inches	Rut STD	IRI 1 in/mile	IRI 2 in/mile	Avg IRI in/mile
			Bridge			
5.1	5.0	0.05	0.025	76	59	67
5.0	4.9	0.04	0.020	111	72	91
4.9	4.8	0.04	0.021	69	55	62
4.8	4.7	0.04	0.020	78	48	63
4.7	4.6	0.05	0.016	60	48	54
4.6	4.5	0.07	0.018	57	46	51
4.5	4.4	0.10	0.025	56	42	49
4.4	4.3	0.08	0.022	58	43	51
4.3	4.2	0.09	0.026	48	45	47
4.2	4.1	0.05	0.028	52	49	50
4.1	4.0	0.06	0.031	66	50	58
4.0	3.9	0.06	0.038	55	50	52
3.9	3.8	0.02	0.017	49	45	47
3.8	3.7	0.04	0.019	46	43	45
3.7	3.6	0.05	0.018	44	35	39
3.6	3.5	0.03	0.016	42	37	40
3.5	3.4	0.04	0.022	51	34	42
3.4	3.3	0.04	0.017	46	32	39
3.3	3.2	0.05	0.018	42	33	37
3.2	3.1	0.03	0.015	53	32	42
3.1	3.0	0.04	0.019	44	33	38
3.0	2.9	0.03	0.017	48	38	43
2.9	2.8	0.04	0.017	42	34	38
2.8	2.7	0.03	0.016	47	36	42
2.7	2.6	0.04	0.020	41	32	36
2.6	2.5	0.04	0.018	38	36	37
2.5	2.4	0.05	0.019	39	34	37
2.4	2.3	0.05	0.021	37	35	36
2.3	2.2	0.06	0.018	46	33	40
2.2	2.1	0.07	0.020	44	36	40
2.1	2.0	0.09	0.026	41	32	37
2.0	1.9	0.10	0.029	40	40	40
1.9	1.8	0.07	0.020	37	35	36
1.8	1.7	0.08	0.021	40	29	34
1.7	1.6	0.10	0.023	39	34	36
1.6	1.5	0.09	0.028	38	39	39
1.5	1.4	0.07	0.027	36	35	35
1.4	1.3	0.07	0.023	41	41	41
1.3	1.2	0.05	0.027	40	36	38
1.2	1.1	0.09	0.023	44	38	41
1.1	1.0	0.09	0.023	43	38	41
1.0	0.9	0.12	0.025	43	35	39
0.9	0.8	0.07	0.039	54	41	48
0.8	0.7	0.03	0.021	67	62	65
			Bridge			
0.6	0.5	0.04	0.024	79	68	73
0.5	0.4	0.07	0.033	46	51	48
0.4	0.3	0.10	0.036	42	40	41
0.3	0.2	0.07	0.030	36	33	35
0.2	0.1	0.05	0.026	36	35	35
0.1	0.0	0.06	0.023	47	40	44
Averages:		**0.05**	**0.019**	**49**	**40**	**45**

Table C-7

Project: 450-03-0037
ICC Profiler Survey: 11/5/2003
Direction: East

FROM miles	TO miles	Rut Avg inches	Rut STD	IRI 1 in/mile	IRI 2 in/mile	Avg IRI in/mile
0.0	0.1	0.08	0.031	72	66	69
0.1	0.2	0.07	0.021	59	45	52
0.2	0.3	0.07	0.027	48	55	52
0.3	0.4	0.10	0.031	58	61	59
0.4	0.5	0.09	0.025	50	48	49
0.5	0.6	0.08	0.031	70	61	65
0.6	0.7	0.09	0.036	77	68	73
0.7	0.8	0.08	0.016	86	119	103
Bridge						
0.9	1.0	0.07	0.034	61	52	57
1.0	1.1	0.10	0.018	44	43	44
1.1	1.2	0.06	0.039	45	48	47
1.2	1.3	0.07	0.023	40	41	40
1.3	1.4	0.08	0.029	46	48	47
1.4	1.5	0.11	0.030	46	47	47
1.5	1.6	0.09	0.033	42	48	45
1.6	1.7	0.08	0.022	51	41	46
1.7	1.8	0.10	0.019	40	40	40
1.8	1.9	0.05	0.019	32	33	33
1.9	2.0	0.07	0.022	36	37	37
2.0	2.1	0.10	0.018	37	37	37
2.1	2.2	0.09	0.014	39	38	38
2.2	2.3	0.08	0.015	37	39	38
2.3	2.4	0.09	0.016	38	37	38
2.4	2.5	0.09	0.017	33	42	38
2.5	2.6	0.10	0.018	35	43	39
2.6	2.7	0.11	0.023	39	43	41
2.7	2.8	0.10	0.022	36	39	38
2.8	2.9	0.10	0.018	37	39	38
2.9	3.0	0.11	0.017	43	36	40
3.0	3.1	0.11	0.020	43	36	39
3.1	3.2	0.08	0.016	45	37	41
3.2	3.3	0.09	0.019	42	41	41
3.3	3.4	0.07	0.018	35	34	35
3.4	3.5	0.07	0.019	37	36	36
3.5	3.6	0.11	0.025	44	47	46
3.6	3.7	0.10	0.024	44	39	42
3.7	3.8	0.09	0.023	47	40	44
3.8	3.9	0.10	0.017	47	41	44
3.9	4.0	0.08	0.029	50	45	48
4.0	4.1	0.06	0.026	44	43	43
4.1	4.2	0.09	0.025	51	43	47
4.2	4.3	0.08	0.023	46	42	44
4.3	4.4	0.05	0.022	43	47	45
4.4	4.5	0.09	0.018	48	44	46
4.5	4.6	0.08	0.019	39	37	38
4.6	4.7	0.09	0.021	43	40	41
4.7	4.8	0.08	0.018	42	40	41
4.8	4.9	0.10	0.016	52	47	49
4.9	5.0	0.07	0.025	48	49	49
5.0	5.1	0.06	0.021	46	53	50
Bridge						
5.2	5.3	0.11	0.023	50	45	48
5.3	5.4	0.14	0.027	43	43	43
5.4	5.5	0.14	0.022	49	43	46
5.5	5.6	0.12	0.029	43	41	42
5.6	5.7	0.15	0.023	47	41	44
5.7	5.8	0.16	0.026	46	40	43
5.8	5.9	0.14	0.024	49	43	46
5.9	6.0	0.13	0.029	47	40	44
6.0	6.1	0.13	0.020	42	36	39
6.1	6.2	0.12	0.023	36	31	33
6.2	6.3	0.11	0.019	42	33	37
6.3	6.4	0.11	0.017	38	33	35
6.4	6.5	0.11	0.019	37	32	35
6.5	6.6	0.12	0.017	39	44	42
6.6	6.7	0.11	0.016	46	39	43
6.7	6.8	0.12	0.017	46	38	42
6.8	6.9	0.11	0.019	43	38	40
6.9	7.0	0.11	0.029	40	38	39
7.0	7.1	0.13	0.026	58	49	53
7.1	7.2	0.12	0.036	55	45	50
7.2	7.3	0.09	0.023	42	40	41
7.3	7.4	0.09	0.020	45	37	41
7.4	7.5	0.10	0.021	46	38	42
7.5	7.6	0.09	0.018	37	33	35
7.6	7.7	0.10	0.018	38	31	34
7.7	7.8	0.10	0.018	40	31	35
7.8	7.9	0.10	0.019	48	42	45
7.9	8.0	0.10	0.024	44	39	42
8.0	8.1	0.14	0.026	51	45	48
8.1	8.2	0.12	0.031	54	45	49
8.2	8.3	0.10	0.018	43	41	42
8.3	8.4	0.10	0.019	41	40	41
8.4	8.5	0.12	0.020	44	40	42
8.5	8.6	0.10	0.028	45	38	41
8.6	8.7	0.08	0.019	43	44	43
8.7	8.8	0.12	0.022	43	41	42
8.8	8.9	0.13	0.022	50	40	45
8.9	9.0	0.12	0.019	50	42	46
9.0	9.1	0.11	0.023	51	47	49
9.1	9.2	0.11	0.023	42	38	40
9.2	9.3	0.07	0.023	43	40	42
9.3	9.4	0.12	0.018	38	38	38
9.4	9.5	0.14	0.028	41	45	43
9.5	9.6	0.14	0.019	52	48	50
9.6	9.7	0.13	0.027	51	44	47
9.7	9.8	0.11	0.029	47	44	46
9.8	9.9	0.10	0.022	55	45	50
Bridge						
10.1	10.2	0.15	0.020	45	40	43
10.2	10.3	0.14	0.031	47	45	46
10.3	10.4	0.07	0.023	48	51	50
10.4	10.5	0.04	0.026	55	56	56
Averages:		**0.10**	**0.023**	**46**	**43**	**45**

Table C-8

Project: 450-03-0037
ICC Profiler Survey: 11/5/2003
Direction: West

FROM miles	TO miles	Rut Avg inches	Rut STD	IRI 1 in/mile	IRI 2 in/mile	Avg IRI in/mile
10.5	10.4	0.07	0.024	53	47	50
10.4	10.3	0.08	0.035	59	49	54
10.3	10.2	0.09	0.020	49	42	45
10.2	10.1	0.07	0.017	40	37	39
Bridge						
9.9	9.8	0.10	0.031	57	43	50
9.8	9.7	0.10	0.020	46	45	45
9.7	9.6	0.09	0.017	45	36	40
9.6	9.5	0.09	0.023	50	41	46
9.5	9.4	0.10	0.023	47	41	44
9.4	9.3	0.03	0.019	34	34	34
9.3	9.2	0.07	0.020	41	43	42
9.2	9.1	0.09	0.019	48	37	42
9.1	9.0	0.10	0.018	46	37	41
9.0	8.9	0.09	0.019	42	47	45
8.9	8.8	0.10	0.017	41	39	40
8.8	8.7	0.10	0.015	43	39	41
8.7	8.6	0.10	0.018	40	35	37
8.6	8.5	0.10	0.017	43	40	41
8.5	8.4	0.07	0.020	41	40	41
8.4	8.3	0.08	0.015	46	37	41
8.3	8.2	0.08	0.019	54	42	48
8.2	8.1	0.08	0.023	39	39	39
8.1	8.0	0.06	0.017	47	36	41
8.0	7.9	0.08	0.016	44	40	42
7.9	7.8	0.10	0.016	49	33	41
7.8	7.7	0.11	0.014	45	33	39
7.7	7.6	0.09	0.022	40	34	37
7.6	7.5	0.08	0.015	51	36	44
7.5	7.4	0.10	0.016	45	33	39
7.4	7.3	0.08	0.017	49	37	43
7.3	7.2	0.06	0.023	44	44	44
7.2	7.1	0.06	0.017	46	46	46
7.1	7.0	0.04	0.019	46	37	41
7.0	6.9	0.03	0.017	45	38	42
6.9	6.8	0.06	0.018	43	36	40
6.8	6.7	0.07	0.014	48	34	41
6.7	6.6	0.07	0.019	43	33	38
6.6	6.5	0.09	0.014	49	31	40
6.5	6.4	0.08	0.016	48	35	42
6.4	6.3	0.06	0.014	47	33	40
6.3	6.2	0.09	0.025	59	46	53
6.2	6.1	0.09	0.017	48	43	45
6.1	6.0	0.10	0.017	50	39	45
6.0	5.9	0.09	0.014	45	36	40
5.9	5.8	0.09	0.022	48	40	44
5.8	5.7	0.10	0.017	55	41	48
5.7	5.6	0.10	0.019	50	41	46
5.6	5.5	0.12	0.017	44	38	41
5.5	5.4	0.10	0.016	59	44	52
5.4	5.3	0.09	0.015	58	36	47
5.3	5.2	0.09	0.016	55	37	46
Bridge						
5.1	5.0	0.06	0.027	119	78	99
5.0	4.9	0.09	0.025	67	57	62
4.9	4.8	0.08	0.022	73	49	61
4.8	4.7	0.11	0.019	63	47	55
4.7	4.6	0.12	0.018	57	47	52
4.6	4.5	0.15	0.032	53	43	48
4.5	4.4	0.15	0.020	61	44	52
4.4	4.3	0.16	0.024	49	47	48
4.3	4.2	0.12	0.047	52	45	49
4.2	4.1	0.09	0.041	61	45	53
4.1	4.0	0.04	0.023	63	56	60
4.0	3.9	0.05	0.020	44	49	47
3.9	3.8	0.07	0.027	44	42	43
3.8	3.7	0.10	0.020	45	33	39
3.7	3.6	0.08	0.020	41	36	38
3.6	3.5	0.10	0.028	52	38	45
3.5	3.4	0.09	0.032	48	34	41
3.4	3.3	0.10	0.023	40	30	35
3.3	3.2	0.10	0.020	50	35	42
3.2	3.1	0.08	0.022	45	37	41
3.1	3.0	0.10	0.016	51	34	43
3.0	2.9	0.12	0.015	46	30	38
2.9	2.8	0.10	0.016	50	38	44
2.8	2.7	0.11	0.017	45	34	40
2.7	2.6	0.11	0.018	37	35	36
2.6	2.5	0.10	0.020	38	36	37
2.5	2.4	0.10	0.026	39	36	37
2.4	2.3	0.10	0.017	42	33	38
2.3	2.2	0.10	0.019	39	38	38
2.2	2.1	0.13	0.024	43	34	38
2.1	2.0	0.12	0.025	38	34	36
2.0	1.9	0.14	0.040	37	38	37
1.9	1.8	0.11	0.020	35	28	31
1.8	1.7	0.11	0.031	38	32	35
1.7	1.6	0.09	0.024	39	38	39
1.6	1.5	0.10	0.037	35	37	36
1.5	1.4	0.11	0.028	42	44	43
1.4	1.3	0.10	0.027	38	36	37
1.3	1.2	0.07	0.022	42	40	41
1.2	1.1	0.08	0.029	45	37	41
1.1	1.0	0.13	0.028	43	36	40
1.0	0.9	0.15	0.029	52	43	47
0.9	0.8	0.08	0.027	53	45	49
0.8	0.7	0.11	0.023	91	59	75
Bridge						
0.6	0.5	0.14	0.044	56	60	58
0.5	0.4	0.15	0.041	42	40	41
0.4	0.3	0.12	0.028	36	34	35
0.3	0.2	0.12	0.035	35	37	36
0.2	0.1	0.10	0.017	42	40	41
0.1	0.0	0.11	0.020	53	39	46
Averages:		**0.09**	**0.022**	**48**	**40**	**44**

Table C-9

Project: 450-03-0037
ICC Profiler Survey: 6/22/2004
Direction: East

FROM miles	TO miles	Rut Avg inches	Rut STD	IRI 1 in/mile	IRI 2 in/mile	Avg IRI in/mile
0.0	0.1	0.02	0.014	83	74	78
0.1	0.2	0.02	0.013	69	48	59
0.2	0.3	0.02	0.015	61	45	53
0.3	0.4	0.01	0.010	73	59	66
0.4	0.5	0.05	0.026	55	43	49
0.5	0.6	0.04	0.022	70	61	65
0.6	0.7	0.05	0.037	95	70	83
0.7	0.8	0.10	0.019	77	105	91
Bridge						
0.9	1.0	0.11	0.035	60	53	56
1.0	1.1	0.07	0.028	44	45	45
1.1	1.2	0.09	0.018	47	45	46
1.2	1.3	0.09	0.016	39	39	39
1.3	1.4	0.08	0.022	43	44	44
1.4	1.5	0.10	0.020	47	44	46
1.5	1.6	0.08	0.041	50	44	47
1.6	1.7	0.08	0.028	60	38	49
1.7	1.8	0.10	0.019	43	39	41
1.8	1.9	0.12	0.015	34	31	32
1.9	2.0	0.12	0.015	37	37	37
2.0	2.1	0.11	0.014	37	41	39
2.1	2.2	0.10	0.014	42	36	39
2.2	2.3	0.10	0.014	38	38	38
2.3	2.4	0.11	0.019	39	38	39
2.4	2.5	0.11	0.014	35	42	38
2.5	2.6	0.12	0.017	37	38	37
2.6	2.7	0.11	0.016	40	41	41
2.7	2.8	0.12	0.021	38	42	40
2.8	2.9	0.11	0.017	40	41	40
2.9	3.0	0.09	0.019	44	37	41
3.0	3.1	0.08	0.020	45	36	40
3.1	3.2	0.11	0.016	45	39	42
3.2	3.3	0.11	0.016	42	42	42
3.3	3.4	0.09	0.017	39	35	37
3.4	3.5	0.10	0.017	39	34	37
3.5	3.6	0.10	0.021	43	43	43
3.6	3.7	0.10	0.030	51	44	47
3.7	3.8	0.09	0.028	48	39	43
3.8	3.9	0.09	0.025	49	41	45
3.9	4.0	0.10	0.021	49	45	47
4.0	4.1	0.09	0.025	55	50	53
4.1	4.2	0.09	0.026	56	48	52
4.2	4.3	0.03	0.022	47	44	45
4.3	4.4	0.05	0.018	52	52	52
4.4	4.5	0.06	0.020	51	45	48
4.5	4.6	0.09	0.021	38	37	37
4.6	4.7	0.10	0.022	43	41	42
4.7	4.8	0.10	0.019	43	40	42
4.8	4.9	0.09	0.024	53	47	50
4.9	5.0	0.09	0.017	49	43	46
5.0	5.1	0.10	0.027	58	60	59
Bridge						

FROM miles	TO miles	Rut Avg inches	Rut STD	IRI 1 in/mile	IRI 2 in/mile	Avg IRI in/mile
5.2	5.3	0.10	0.029	54	47	51
5.3	5.4	0.12	0.023	47	42	45
5.4	5.5	0.07	0.029	52	41	46
5.5	5.6	0.07	0.025	44	42	43
5.6	5.7	0.13	0.035	48	43	46
5.7	5.8	0.15	0.021	45	40	42
5.8	5.9	0.15	0.023	52	42	47
5.9	6.0	0.14	0.034	47	42	45
6.0	6.1	0.12	0.021	45	35	40
6.1	6.2	0.13	0.024	37	37	37
6.2	6.3	0.09	0.023	44	33	38
6.3	6.4	0.11	0.019	38	35	37
6.4	6.5	0.12	0.019	38	32	35
6.5	6.6	0.10	0.020	45	41	43
6.6	6.7	0.12	0.016	49	39	44
6.7	6.8	0.10	0.023	48	40	44
6.8	6.9	0.11	0.021	49	39	44
6.9	7.0	0.12	0.022	41	41	41
7.0	7.1	0.11	0.041	57	53	55
7.1	7.2	0.15	0.040	61	50	55
7.2	7.3	0.12	0.019	42	38	40
7.3	7.4	0.08	0.026	45	37	41
7.4	7.5	0.10	0.022	47	38	42
7.5	7.6	0.10	0.021	42	34	38
7.6	7.7	0.11	0.021	39	29	34
7.7	7.8	0.11	0.020	43	33	38
7.8	7.9	0.13	0.022	48	40	44
7.9	8.0	0.17	0.024	47	40	43
8.0	8.1	0.17	0.025	52	45	48
8.1	8.2	0.13	0.033	54	42	48
8.2	8.3	0.10	0.019	45	42	44
8.3	8.4	0.13	0.017	42	38	40
8.4	8.5	0.14	0.019	43	42	43
8.5	8.6	0.13	0.019	45	37	41
8.6	8.7	0.14	0.020	46	40	43
8.7	8.8	0.16	0.028	46	41	44
8.8	8.9	0.16	0.020	50	38	44
8.9	9.0	0.15	0.023	52	43	48
9.0	9.1	0.15	0.023	60	47	53
9.1	9.2	0.14	0.019	50	38	44
9.2	9.3	0.13	0.017	40	38	39
9.3	9.4	0.14	0.019	42	38	40
9.4	9.5	0.18	0.025	44	41	42
9.5	9.6	0.15	0.019	50	44	47
9.6	9.7	0.14	0.023	55	44	50
9.7	9.8	0.14	0.019	47	43	45
9.8	9.9	0.12	0.021	53	41	47
Bridge						
10.1	10.2	0.09	0.029	47	39	43
10.2	10.3	0.11	0.026	51	48	50
10.3	10.4	0.11	0.020	47	46	47
10.4	10.5	0.10	0.030	56	53	54
Averages:		**0.11**	**0.022**	**48**	**43**	**46**

Table C-10

Project: 450-03-0037
ICC Profiler Survey: 6/22/2004
Direction: West

FROM miles	TO miles	Rut Avg inches	Rut STD	IRI 1 in/mile	IRI 2 in/mile	Avg IRI in/mile
10.5	10.4	0.05	0.026	57	50	54
10.4	10.3	0.07	0.037	60	46	53
10.3	10.2	0.07	0.026	51	44	48
10.2	10.1	0.06	0.019	43	35	39
Bridge						
9.9	9.8	0.13	0.034	64	44	54
9.8	9.7	0.09	0.014	50	40	45
9.7	9.6	0.10	0.017	47	35	41
9.6	9.5	0.11	0.020	51	37	44
9.5	9.4	0.11	0.020	47	43	45
9.4	9.3	0.11	0.018	42	34	38
9.3	9.2	0.09	0.024	41	44	43
9.2	9.1	0.10	0.019	48	34	41
9.1	9.0	0.11	0.017	48	37	42
9.0	8.9	0.10	0.022	44	43	44
8.9	8.8	0.10	0.015	40	36	38
8.8	8.7	0.10	0.016	45	37	41
8.7	8.6	0.12	0.017	43	35	39
8.6	8.5	0.13	0.016	45	37	41
8.5	8.4	0.11	0.020	45	38	42
8.4	8.3	0.09	0.018	49	35	42
8.3	8.2	0.09	0.017	54	39	47
8.2	8.1	0.10	0.021	46	35	41
8.1	8.0	0.09	0.025	58	35	46
8.0	7.9	0.09	0.016	45	36	40
7.9	7.8	0.09	0.016	48	37	43
7.8	7.7	0.09	0.019	48	31	39
7.7	7.6	0.09	0.018	42	33	38
7.6	7.5	0.08	0.016	49	38	43
7.5	7.4	0.09	0.019	46	32	39
7.4	7.3	0.09	0.015	52	39	46
7.3	7.2	0.09	0.019	50	42	46
7.2	7.1	0.09	0.023	46	39	42
7.1	7.0	0.07	0.022	49	38	44
7.0	6.9	0.06	0.026	47	41	44
6.9	6.8	0.06	0.016	48	36	42
6.8	6.7	0.07	0.018	49	34	42
6.7	6.6	0.07	0.017	46	36	41
6.6	6.5	0.08	0.017	46	34	40
6.5	6.4	0.08	0.015	47	35	41
6.4	6.3	0.06	0.016	45	35	40
6.3	6.2	0.08	0.025	59	46	52
6.2	6.1	0.09	0.017	44	46	45
6.1	6.0	0.09	0.017	50	39	45
6.0	5.9	0.09	0.016	45	36	40
5.9	5.8	0.08	0.020	46	43	44
5.8	5.7	0.09	0.018	55	39	47
5.7	5.6	0.10	0.019	52	42	47
5.6	5.5	0.10	0.023	48	36	42
5.5	5.4	0.08	0.017	60	46	53
5.4	5.3	0.09	0.015	57	37	47
5.3	5.2	0.08	0.018	57	35	46
5.1	5.0	0.08	0.023	107	78	92
5.0	4.9	0.09	0.026	62	58	60
4.9	4.8	0.08	0.026	80	59	69
4.8	4.7	0.08	0.018	65	49	57
4.7	4.6	0.11	0.023	62	50	56
4.6	4.5	0.15	0.034	51	45	48
4.5	4.4	0.15	0.020	60	45	53
4.4	4.3	0.15	0.026	54	46	50
4.3	4.2	0.12	0.046	48	48	48
4.2	4.1	0.12	0.041	61	47	54
4.1	4.0	0.10	0.042	62	53	58
4.0	3.9	0.08	0.027	57	52	55
3.9	3.8	0.08	0.026	45	41	43
3.8	3.7	0.09	0.025	46	36	41
3.7	3.6	0.07	0.022	41	33	37
3.6	3.5	0.07	0.023	49	41	45
3.5	3.4	0.08	0.024	51	36	44
3.4	3.3	0.12	0.019	40	29	34
3.3	3.2	0.11	0.022	54	34	44
3.2	3.1	0.11	0.021	49	36	42
3.1	3.0	0.10	0.017	51	34	42
3.0	2.9	0.11	0.015	46	33	39
2.9	2.8	0.10	0.021	44	37	41
2.8	2.7	0.11	0.019	47	32	39
2.7	2.6	0.11	0.020	39	32	36
2.6	2.5	0.11	0.020	39	37	38
2.5	2.4	0.10	0.022	38	33	35
2.4	2.3	0.08	0.022	40	38	39
2.3	2.2	0.11	0.019	42	38	40
2.2	2.1	0.12	0.024	43	33	38
2.1	2.0	0.12	0.026	40	35	38
2.0	1.9	0.15	0.032	38	37	38
1.9	1.8	0.12	0.020	37	32	35
1.8	1.7	0.15	0.024	41	31	36
1.7	1.6	0.13	0.028	39	39	39
1.6	1.5	0.14	0.030	36	38	37
1.5	1.4	0.13	0.022	43	40	41
1.4	1.3	0.13	0.023	38	36	37
1.3	1.2	0.13	0.029	45	39	42
1.2	1.1	0.14	0.028	43	34	38
1.1	1.0	0.17	0.040	46	39	42
1.0	0.9	0.17	0.028	49	39	44
0.9	0.8	0.11	0.040	66	55	61
0.8	0.7	0.11	0.024	70	80	75
Bridge						
0.6	0.5	0.12	0.045	61	65	63
0.5	0.4	0.11	0.046	43	36	40
0.4	0.3	0.09	0.047	49	45	47
0.3	0.2	0.11	0.032	33	36	35
0.2	0.1	0.11	0.025	38	36	37
0.1	0.0	0.10	0.018	58	41	49
Averages:		**0.10**	**0.023**	**49**	**40**	**45**

Table C-11

Project: 450-03-0037
ICC Profiler Survey: 1/5/2005
Direction: East

FROM miles	TO miles	Rut Avg inches	Rut STD	IRI 1 in/mile	IRI 2 in/mile	Avg IRI in/mile
0.0	0.1	0.05	0.028	74	69	72
0.1	0.2	0.03	0.018	64	45	55
0.2	0.3	0.02	0.015	55	44	49
0.3	0.4	0.05	0.024	64	62	63
0.4	0.5	0.07	0.016	52	43	48
0.5	0.6	0.05	0.025	67	59	63
0.6	0.7	0.06	0.034	71	65	68
0.7	0.8	0.06	0.017	58	50	54
Bridge						
0.9	1.0	0.11	0.035	60	53	56
1.0	1.1	0.07	0.022	43	44	43
1.1	1.2	0.06	0.017	47	47	47
1.2	1.3	0.06	0.015	38	38	38
1.3	1.4	0.04	0.021	45	42	43
1.4	1.5	0.05	0.020	50	43	46
1.5	1.6	0.06	0.029	45	43	44
1.6	1.7	0.07	0.028	57	40	48
1.7	1.8	0.07	0.022	42	40	41
1.8	1.9	0.09	0.020	32	32	32
1.9	2.0	0.07	0.016	41	35	38
2.0	2.1	0.07	0.015	37	38	38
2.1	2.2	0.07	0.015	41	35	38
2.2	2.3	0.07	0.014	37	38	37
2.3	2.4	0.07	0.019	37	39	38
2.4	2.5	0.07	0.030	35	37	36
2.5	2.6	0.06	0.026	35	37	36
2.6	2.7	0.07	0.018	39	39	39
2.7	2.8	0.08	0.020	38	37	37
2.8	2.9	0.04	0.023	40	43	41
2.9	3.0	0.08	0.019	44	35	40
3.0	3.1	0.08	0.016	42	35	38
3.1	3.2	0.07	0.016	43	38	41
3.2	3.3	0.05	0.020	41	43	42
3.3	3.4	0.05	0.017	35	32	34
3.4	3.5	0.06	0.019	38	34	36
3.5	3.6	0.08	0.025	44	45	44
3.6	3.7	0.07	0.029	44	41	43
3.7	3.8	0.07	0.025	46	40	43
3.8	3.9	0.07	0.017	47	40	43
3.9	4.0	0.06	0.022	48	45	46
4.0	4.1	0.03	0.019	49	42	46
4.1	4.2	0.06	0.024	51	41	46
4.2	4.3	0.05	0.022	47	42	44
4.3	4.4	0.03	0.018	42	46	44
4.4	4.5	0.05	0.019	49	45	47
4.5	4.6	0.04	0.019	38	38	38
4.6	4.7	0.05	0.020	38	39	38
4.7	4.8	0.05	0.018	41	39	40
4.8	4.9	0.07	0.016	51	46	48
4.9	5.0	0.05	0.025	48	48	48
5.0	5.1	0.04	0.023	49	52	51
Bridge						
5.2	5.3	0.08	0.025	52	47	50
5.3	5.4	0.06	0.026	45	39	42
5.4	5.5	0.09	0.024	48	41	44
5.5	5.6	0.10	0.024	43	38	41
5.6	5.7	0.11	0.026	44	41	43
5.7	5.8	0.11	0.027	44	36	40
5.8	5.9	0.11	0.027	49	43	46
5.9	6.0	0.10	0.033	48	39	44
6.0	6.1	0.09	0.021	41	36	39
6.1	6.2	0.09	0.021	38	34	36
6.2	6.3	0.06	0.027	43	33	38
6.3	6.4	0.08	0.023	35	32	34
6.4	6.5	0.08	0.018	36	33	35
6.5	6.6	0.10	0.018	41	41	41
6.6	6.7	0.09	0.016	48	39	43
6.7	6.8	0.08	0.018	43	36	40
6.8	6.9	0.09	0.016	47	36	41
6.9	7.0	0.09	0.023	38	42	40
7.0	7.1	0.09	0.032	57	48	52
7.1	7.2	0.05	0.028	54	48	51
7.2	7.3	0.05	0.023	39	41	40
7.3	7.4	0.05	0.019	41	33	37
7.4	7.5	0.05	0.020	42	36	39
7.5	7.6	0.05	0.017	36	35	35
7.6	7.7	0.06	0.018	38	31	34
7.7	7.8	0.07	0.021	41	32	36
7.8	7.9	0.07	0.033	50	36	43
7.9	8.0	0.13	0.022	47	38	42
8.0	8.1	0.12	0.028	50	45	48
8.1	8.2	0.10	0.040	52	44	48
8.2	8.3	0.08	0.019	49	39	44
8.3	8.4	0.09	0.020	40	37	38
8.4	8.5	0.08	0.035	45	42	43
8.5	8.6	0.09	0.021	44	36	40
8.6	8.7	0.09	0.031	45	40	43
8.7	8.8	0.08	0.036	42	41	41
8.8	8.9	0.11	0.025	56	40	48
8.9	9.0	0.10	0.028	48	42	45
9.0	9.1	0.09	0.023	52	46	49
9.1	9.2	0.10	0.017	43	35	39
9.2	9.3	0.08	0.025	43	37	40
9.3	9.4	0.09	0.023	38	36	37
9.4	9.5	0.12	0.043	45	40	43
9.5	9.6	0.11	0.020	51	44	47
9.6	9.7	0.08	0.025	50	43	47
9.7	9.8	0.12	0.021	48	42	45
9.8	9.9	0.07	0.019	54	44	49
Bridge						
10.1	10.2	0.10	0.033	46	40	43
10.2	10.3	0.11	0.038	44	44	44
10.3	10.4	0.04	0.024	46	47	47
10.4	10.5	0.06	0.033	58	53	56
Averages:		**0.07**	**0.023**	**46**	**41**	**43**

Table C-12

Project: 450-03-0037
ICC Profiler Survey: 1/5/2005
Direction: West

FROM miles	TO miles	Rut Avg inches	Rut STD	IRI 1 in/mile	IRI 2 in/mile	Avg IRI in/mile
10.5	10.4	0.03	0.019	54	50	52
10.4	10.3	0.04	0.026	55	47	51
10.3	10.2	0.05	0.019	50	47	49
10.2	10.1	0.04	0.016	42	37	40
Bridge						
9.9	9.8	0.07	0.027	55	46	50
9.8	9.7	0.05	0.020	51	43	47
9.7	9.6	0.06	0.016	50	37	43
9.6	9.5	0.07	0.019	49	40	44
9.5	9.4	0.07	0.019	47	44	45
9.4	9.3	0.08	0.016	43	37	40
9.3	9.2	0.07	0.018	44	41	42
9.2	9.1	0.07	0.020	46	36	41
9.1	9.0	0.07	0.019	47	36	42
9.0	8.9	0.06	0.018	43	45	44
8.9	8.8	0.06	0.016	39	38	39
8.8	8.7	0.07	0.017	46	39	43
8.7	8.6	0.09	0.017	42	36	39
8.6	8.5	0.09	0.019	44	36	40
8.5	8.4	0.07	0.017	43	40	41
8.4	8.3	0.05	0.017	48	39	43
8.3	8.2	0.06	0.017	58	40	49
8.2	8.1	0.06	0.016	47	37	42
8.1	8.0	0.06	0.015	57	34	46
8.0	7.9	0.05	0.016	45	36	40
7.9	7.8	0.06	0.015	49	34	42
7.8	7.7	0.03	0.015	50	33	41
7.7	7.6	0.06	0.016	45	33	39
7.6	7.5	0.06	0.017	53	39	46
7.5	7.4	0.05	0.017	47	35	41
7.4	7.3	0.05	0.017	48	36	42
7.3	7.2	0.06	0.020	51	37	44
7.2	7.1	0.04	0.020	48	42	45
7.1	7.0	0.03	0.017	49	36	43
7.0	6.9	0.03	0.019	49	39	44
6.9	6.8	0.03	0.014	49	36	43
6.8	6.7	0.04	0.015	48	33	40
6.7	6.6	0.03	0.018	49	38	44
6.6	6.5	0.05	0.016	50	33	41
6.5	6.4	0.05	0.015	47	34	41
6.4	6.3	0.03	0.015	47	34	40
6.3	6.2	0.05	0.026	62	46	54
6.2	6.1	0.05	0.016	48	45	47
6.1	6.0	0.05	0.017	56	43	49
6.0	5.9	0.05	0.016	46	34	40
5.9	5.8	0.05	0.019	53	38	46
5.8	5.7	0.06	0.016	54	40	47
5.7	5.6	0.06	0.017	51	41	46
5.6	5.5	0.06	0.027	53	38	46
5.5	5.4	0.04	0.019	63	46	54
5.4	5.3	0.05	0.016	56	35	46
5.3	5.2	0.03	0.014	58	38	48
5.1	5.0	0.04	0.020	106	86	96
5.0	4.9	0.05	0.024	68	61	64
4.9	4.8	0.04	0.019	78	53	65
4.8	4.7	0.06	0.021	65	51	58
4.7	4.6	0.08	0.019	58	48	53
4.6	4.5	0.10	0.023	55	47	51
4.5	4.4	0.12	0.023	62	44	53
4.4	4.3	0.13	0.026	50	46	48
4.3	4.2	0.10	0.038	47	45	46
4.2	4.1	0.07	0.039	63	45	54
4.1	4.0	0.06	0.038	67	61	64
4.0	3.9	0.04	0.025	52	50	51
3.9	3.8	0.03	0.018	44	43	43
3.8	3.7	0.06	0.020	47	34	41
3.7	3.6	0.04	0.019	39	33	36
3.6	3.5	0.04	0.022	49	38	43
3.5	3.4	0.06	0.028	51	38	44
3.4	3.3	0.08	0.022	39	29	34
3.3	3.2	0.07	0.021	55	34	44
3.2	3.1	0.07	0.018	48	35	41
3.1	3.0	0.07	0.018	54	35	45
3.0	2.9	0.07	0.017	41	33	37
2.9	2.8	0.06	0.019	47	38	43
2.8	2.7	0.06	0.017	45	34	40
2.7	2.6	0.09	0.018	39	34	37
2.6	2.5	0.07	0.020	42	37	39
2.5	2.4	0.07	0.023	41	34	37
2.4	2.3	0.05	0.019	41	35	38
2.3	2.2	0.08	0.020	42	39	41
2.2	2.1	0.10	0.024	42	33	38
2.1	2.0	0.09	0.023	37	33	35
2.0	1.9	0.10	0.035	38	38	38
1.9	1.8	0.08	0.018	37	30	34
1.8	1.7	0.09	0.030	38	34	36
1.7	1.6	0.11	0.027	39	40	39
1.6	1.5	0.08	0.036	35	36	36
1.5	1.4	0.06	0.025	49	42	45
1.4	1.3	0.07	0.041	41	35	38
1.3	1.2	0.09	0.033	43	41	42
1.2	1.1	0.11	0.024	43	36	40
1.1	1.0	0.14	0.032	46	35	40
1.0	0.9	0.08	0.034	58	44	51
0.9	0.8	0.07	0.037	68	56	62
0.8	0.7	0.08	0.024	68	66	67
Bridge						
0.6	0.5	0.12	0.051	56	60	58
0.5	0.4	0.10	0.028	43	41	42
0.4	0.3	0.09	0.030	40	35	38
0.3	0.2	0.05	0.027	34	37	35
0.2	0.1	0.07	0.028	40	37	39
0.1	0.0	0.07	0.019	53	41	47
Averages:		**0.06**	**0.022**	**50**	**40**	**45**

Table C-13

Project: 450-03-0037
ICC Profiler Survey: 11/29/2005
Direction: East

FROM miles	TO miles	Rut Avg inches	Rut STD	IRI 1 in/mile	IRI 2 in/mile	Avg IRI in/mile
0.0	0.1	0.06	0.025	73	67	70
0.1	0.2	0.01	0.027	63	44	53
0.2	0.3	0.02	0.019	55	44	49
0.3	0.4	0.07	0.031	59	63	61
0.4	0.5	0.04	0.037	47	47	47
0.5	0.6	0.05	0.030	65	62	63
0.6	0.7	0.06	0.042	76	67	72
0.7	0.8	0.05	0.043	144	140	142
Bridge						
0.9	1.0	0.05	0.029	68	58	63
1.0	1.1	0.07	0.020	42	44	43
1.1	1.2	0.06	0.020	43	45	44
1.2	1.3	0.06	0.019	37	39	38
1.3	1.4	0.06	0.021	45	43	44
1.4	1.5	0.08	0.022	47	45	46
1.5	1.6	0.07	0.019	44	45	45
1.6	1.7	0.07	0.022	50	38	44
1.7	1.8	0.09	0.019	39	38	38
1.8	1.9	0.07	0.028	32	33	32
1.9	2.0	0.04	0.018	34	36	35
2.0	2.1	0.07	0.017	35	39	37
2.1	2.2	0.06	0.016	40	36	38
2.2	2.3	0.06	0.018	36	38	37
2.3	2.4	0.06	0.017	36	36	36
2.4	2.5	0.04	0.016	32	41	36
2.5	2.6	0.06	0.018	36	42	39
2.6	2.7	0.05	0.016	38	43	41
2.7	2.8	0.05	0.019	35	40	38
2.8	2.9	0.06	0.019	39	40	39
2.9	3.0	0.08	0.018	42	33	37
3.0	3.1	0.07	0.017	40	37	39
3.1	3.2	0.06	0.015	44	36	40
3.2	3.3	0.06	0.020	40	42	41
3.3	3.4	0.05	0.017	34	32	33
3.4	3.5	0.06	0.017	37	34	36
3.5	3.6	0.06	0.021	41	46	44
3.6	3.7	0.06	0.024	42	40	41
3.7	3.8	0.06	0.021	46	39	43
3.8	3.9	0.07	0.017	47	41	44
3.9	4.0	0.03	0.032	48	47	47
4.0	4.1	0.03	0.022	46	42	44
4.1	4.2	0.03	0.022	49	41	45
4.2	4.3	0.04	0.025	45	48	46
4.3	4.4	0.01	0.023	42	49	46
4.4	4.5	0.04	0.020	49	44	46
4.5	4.6	0.03	0.028	36	38	37
4.6	4.7	0.06	0.022	39	37	38
4.7	4.8	0.05	0.019	39	38	39
4.8	4.9	0.06	0.019	48	43	46
4.9	5.0	0.04	0.033	45	47	46
5.0	5.1	0.01	0.034	87	96	91
Bridge						
5.2	5.3	0.08	0.026	48	46	47
5.3	5.4	0.11	0.035	40	47	44
5.4	5.5	0.13	0.025	47	39	43
5.5	5.6	0.10	0.021	40	39	39
5.6	5.7	0.12	0.024	44	42	43
5.7	5.8	0.11	0.025	42	36	39
5.8	5.9	0.12	0.025	49	42	45
5.9	6.0	0.10	0.033	46	38	42
6.0	6.1	0.09	0.023	38	36	37
6.1	6.2	0.09	0.023	34	33	33
6.2	6.3	0.08	0.021	37	32	35
6.3	6.4	0.08	0.019	34	33	34
6.4	6.5	0.08	0.018	37	32	35
6.5	6.6	0.09	0.017	38	40	39
6.6	6.7	0.08	0.021	45	41	43
6.7	6.8	0.09	0.018	47	37	42
6.8	6.9	0.09	0.017	45	38	41
6.9	7.0	0.10	0.022	38	42	40
7.0	7.1	0.09	0.030	56	50	53
7.1	7.2	0.11	0.034	57	46	52
7.2	7.3	0.07	0.021	41	37	39
7.3	7.4	0.06	0.021	43	36	39
7.4	7.5	0.06	0.026	44	36	40
7.5	7.6	0.05	0.019	36	34	35
7.6	7.7	0.06	0.020	37	32	35
7.7	7.8	0.08	0.019	40	32	36
7.8	7.9	0.07	0.025	47	48	48
7.9	8.0	0.08	0.024	42	36	39
8.0	8.1	0.11	0.035	46	42	44
8.1	8.2	0.11	0.034	53	41	47
8.2	8.3	0.07	0.020	41	38	39
8.3	8.4	0.06	0.021	38	37	38
8.4	8.5	0.11	0.019	44	39	41
8.5	8.6	0.09	0.020	43	38	41
8.6	8.7	0.10	0.021	41	40	41
8.7	8.8	0.08	0.023	43	39	41
8.8	8.9	0.09	0.027	48	39	43
8.9	9.0	0.11	0.022	50	43	47
9.0	9.1	0.10	0.022	48	42	45
9.1	9.2	0.10	0.020	39	36	38
9.2	9.3	0.08	0.017	41	41	41
9.3	9.4	0.09	0.019	35	36	35
9.4	9.5	0.10	0.024	40	43	41
9.5	9.6	0.09	0.023	47	45	46
9.6	9.7	0.11	0.022	49	40	45
9.7	9.8	0.09	0.022	45	42	43
9.8	9.9	0.08	0.024	55	45	50
Bridge						
10.1	10.2	0.14	0.022	40	39	40
10.2	10.3	0.11	0.023	44	45	45
10.3	10.4	0.03	0.036	51	48	50
10.4	10.5	0.02	0.025	52	56	54
Averages:		**0.07**	**0.023**	**46**	**43**	**44**

Table C-14

Project: 450-03-0037
ICC Profiler Survey: 11/29/2005
Direction: West

FROM miles	TO miles	Rut Avg inches	Rut STD	IRI 1 in/mile	IRI 2 in/mile	Avg IRI in/mile
10.5	10.4	0.04	0.027	55	45	50
10.4	10.3	0.05	0.039	56	45	50
10.3	10.2	0.04	0.030	50	41	46
10.2	10.1	0.03	0.018	42	33	37
			Bridge			
9.9	9.8	0.06	0.048	116	105	110
9.8	9.7	0.07	0.018	45	40	42
9.7	9.6	0.06	0.018	47	35	41
9.6	9.5	0.08	0.019	46	36	41
9.5	9.4	0.09	0.018	48	40	44
9.4	9.3	0.08	0.017	42	34	38
9.3	9.2	0.07	0.020	45	40	42
9.2	9.1	0.08	0.020	43	33	38
9.1	9.0	0.08	0.018	48	37	42
9.0	8.9	0.07	0.017	45	40	43
8.9	8.8	0.07	0.017	39	37	38
8.8	8.7	0.08	0.016	45	39	42
8.7	8.6	0.10	0.018	40	32	36
8.6	8.5	0.11	0.018	43	38	41
8.5	8.4	0.08	0.019	42	38	40
8.4	8.3	0.06	0.016	47	35	41
8.3	8.2	0.07	0.016	55	38	46
8.2	8.1	0.08	0.019	44	37	40
8.1	8.0	0.06	0.018	51	36	43
8.0	7.9	0.07	0.017	45	34	40
7.9	7.8	0.07	0.015	49	33	41
7.8	7.7	0.08	0.014	44	32	38
7.7	7.6	0.07	0.018	43	34	38
7.6	7.5	0.06	0.016	50	38	44
7.5	7.4	0.06	0.016	46	31	39
7.4	7.3	0.07	0.017	47	36	41
7.3	7.2	0.07	0.024	48	41	44
7.2	7.1	0.05	0.031	43	45	44
7.1	7.0	0.03	0.022	47	35	41
7.0	6.9	0.02	0.028	45	40	43
6.9	6.8	0.04	0.014	49	35	42
6.8	6.7	0.05	0.018	47	33	40
6.7	6.6	0.05	0.015	44	35	39
6.6	6.5	0.07	0.016	52	33	43
6.5	6.4	0.06	0.017	45	34	40
6.4	6.3	0.04	0.016	43	36	40
6.3	6.2	0.06	0.028	57	46	52
6.2	6.1	0.04	0.022	53	44	48
6.1	6.0	0.06	0.016	52	40	46
6.0	5.9	0.06	0.014	45	36	40
5.9	5.8	0.06	0.018	50	39	45
5.8	5.7	0.07	0.020	54	38	46
5.7	5.6	0.07	0.017	52	38	45
5.6	5.5	0.09	0.017	42	36	39
5.5	5.4	0.08	0.017	57	45	51
5.4	5.3	0.07	0.014	56	34	45
5.3	5.2	0.06	0.020	58	35	46
5.1	5.0	0.03	0.045	144	127	136
5.0	4.9	0.07	0.043	95	87	91
4.9	4.8	0.05	0.024	76	52	64
4.8	4.7	0.09	0.022	61	47	54
4.7	4.6	0.10	0.023	58	46	52
4.6	4.5	0.14	0.035	51	40	46
4.5	4.4	0.14	0.023	60	44	52
4.4	4.3	0.14	0.028	48	43	46
4.3	4.2	0.10	0.045	46	46	46
4.2	4.1	0.08	0.046	58	40	49
4.1	4.0	0.08	0.046	61	54	58
4.0	3.9	0.04	0.028	49	49	49
3.9	3.8	0.05	0.027	41	42	42
3.8	3.7	0.04	0.033	49	33	41
3.7	3.6	0.01	0.025	42	32	37
3.6	3.5	0.07	0.033	52	38	45
3.5	3.4	0.08	0.026	49	34	42
3.4	3.3	0.10	0.019	40	29	34
3.3	3.2	0.08	0.024	56	34	45
3.2	3.1	0.09	0.020	47	35	41
3.1	3.0	0.07	0.021	54	35	44
3.0	2.9	0.08	0.017	46	31	38
2.9	2.8	0.08	0.016	46	37	42
2.8	2.7	0.08	0.020	48	33	40
2.7	2.6	0.10	0.021	36	32	34
2.6	2.5	0.08	0.020	39	35	37
2.5	2.4	0.08	0.024	38	34	36
2.4	2.3	0.08	0.017	41	31	36
2.3	2.2	0.09	0.018	41	36	38
2.2	2.1	0.10	0.021	46	31	38
2.1	2.0	0.11	0.026	42	34	38
2.0	1.9	0.12	0.033	38	37	38
1.9	1.8	0.11	0.023	38	31	35
1.8	1.7	0.10	0.029	37	34	36
1.7	1.6	0.11	0.032	38	37	37
1.6	1.5	0.11	0.033	32	35	33
1.5	1.4	0.10	0.024	41	41	41
1.4	1.3	0.12	0.025	41	33	37
1.3	1.2	0.12	0.022	40	37	38
1.2	1.1	0.13	0.027	43	33	38
1.1	1.0	0.16	0.028	43	37	40
1.0	0.9	0.12	0.035	47	41	44
0.9	0.8	0.02	0.033	71	64	67
0.8	0.7	0.06	0.047	172	181	176
			Bridge			
0.6	0.5	0.13	0.061	59	61	60
0.5	0.4	0.14	0.043	40	36	38
0.4	0.3	0.10	0.037	37	32	35
0.3	0.2	0.06	0.031	34	36	35
0.2	0.1	0.07	0.028	42	37	40
0.1	0.0	0.05	0.030	55	39	47
Averages:		**0.08**	**0.024**	**51**	**41**	**46**

Table C-15

Project: 450-03-0037
ICC Profiler Survey: 5/18/2006
Direction: East

FROM miles	TO miles	Rut Avg inches	Rut STD	IRI 1 in/mile	IRI 2 in/mile	Avg IRI in/mile
0.0	0.1	0.05	0.020	114	69	91
0.1	0.2	0.03	0.017	73	46	59
0.2	0.3	0.04	0.021	66	47	57
0.3	0.4	0.07	0.029	77	62	70
0.4	0.5	0.07	0.017	64	45	54
0.5	0.6	0.05	0.032	78	62	70
0.6	0.7	0.07	0.035	85	58	72
0.7	0.8	0.05	0.043	144	140	142
Bridge						
0.9	1.0	0.07	0.020	70	48	59
1.0	1.1	0.07	0.022	53	45	49
1.1	1.2	0.07	0.018	61	44	53
1.2	1.3	0.07	0.016	50	40	45
1.3	1.4	0.06	0.022	67	43	55
1.4	1.5	0.08	0.025	57	44	50
1.5	1.6	0.07	0.021	53	44	49
1.6	1.7	0.06	0.021	60	43	52
1.7	1.8	0.08	0.017	52	39	46
1.8	1.9	0.07	0.019	42	33	38
1.9	2.0	0.05	0.031	45	39	42
2.0	2.1	0.07	0.017	45	37	41
2.1	2.2	0.07	0.015	50	37	43
2.2	2.3	0.07	0.016	48	37	43
2.3	2.4	0.07	0.018	48	39	43
2.4	2.5	0.08	0.015	44	42	43
2.5	2.6	0.08	0.017	44	38	41
2.6	2.7	0.06	0.022	49	41	45
2.7	2.8	0.09	0.019	51	43	47
2.8	2.9	0.06	0.019	53	43	48
2.9	3.0	0.09	0.020	54	37	46
3.0	3.1	0.06	0.015	54	36	45
3.1	3.2	0.07	0.016	52	39	46
3.2	3.3	0.06	0.018	51	42	46
3.3	3.4	0.06	0.019	44	39	42
3.4	3.5	0.07	0.017	44	31	38
3.5	3.6	0.08	0.027	46	44	45
3.6	3.7	0.08	0.029	65	47	56
3.7	3.8	0.07	0.020	61	39	50
3.8	3.9	0.07	0.021	60	42	51
3.9	4.0	0.06	0.021	52	44	48
4.0	4.1	0.06	0.022	77	53	65
4.1	4.2	0.05	0.022	65	48	57
4.2	4.3	0.04	0.022	58	44	51
4.3	4.4	0.02	0.017	68	58	63
4.4	4.5	0.05	0.020	62	50	56
4.5	4.6	0.06	0.016	43	38	40
4.6	4.7	0.07	0.024	48	39	44
4.7	4.8	0.06	0.018	51	39	45
4.8	4.9	0.08	0.020	57	50	53
4.9	5.0	0.07	0.020	50	40	45
5.0	5.1	0.05	0.026	73	58	66
Bridge						
5.2	5.3	0.06	0.025	64	49	57
5.3	5.4	0.10	0.029	57	45	51
5.4	5.5	0.14	0.023	52	43	47
5.5	5.6	0.10	0.023	55	45	50
5.6	5.7	0.12	0.027	62	44	53
5.7	5.8	0.12	0.024	49	38	44
5.8	5.9	0.12	0.024	61	42	52
5.9	6.0	0.12	0.030	56	45	51
6.0	6.1	0.09	0.023	53	33	43
6.1	6.2	0.09	0.020	54	39	46
6.2	6.3	0.07	0.020	50	32	41
6.3	6.4	0.08	0.022	49	37	43
6.4	6.5	0.08	0.021	45	34	40
6.5	6.6	0.10	0.021	53	41	47
6.6	6.7	0.10	0.017	52	42	47
6.7	6.8	0.08	0.016	55	38	46
6.8	6.9	0.09	0.018	57	41	49
6.9	7.0	0.10	0.018	49	41	45
7.0	7.1	0.10	0.024	58	50	54
7.1	7.2	0.13	0.042	68	49	58
7.2	7.3	0.06	0.036	52	44	48
7.3	7.4	0.07	0.025	48	39	43
7.4	7.5	0.03	0.021	57	41	49
7.5	7.6	0.07	0.021	53	39	46
7.6	7.7	0.07	0.023	44	31	37
7.7	7.8	0.05	0.034	55	37	46
7.8	7.9	0.09	0.020	46	34	40
7.9	8.0	0.12	0.026	56	40	48
8.0	8.1	0.14	0.026	48	47	48
8.1	8.2	0.13	0.027	60	41	50
8.2	8.3	0.09	0.022	63	43	53
8.3	8.4	0.09	0.019	47	42	44
8.4	8.5	0.10	0.017	51	37	44
8.5	8.6	0.11	0.021	50	41	46
8.6	8.7	0.08	0.024	48	38	43
8.7	8.8	0.09	0.023	44	43	43
8.8	8.9	0.12	0.023	56	39	48
8.9	9.0	0.13	0.023	63	45	54
9.0	9.1	0.10	0.021	68	43	56
9.1	9.2	0.12	0.019	56	42	49
9.2	9.3	0.11	0.020	53	38	46
9.3	9.4	0.10	0.014	53	36	45
9.4	9.5	0.13	0.024	50	39	45
9.5	9.6	0.12	0.041	56	48	52
9.6	9.7	0.11	0.023	55	45	50
9.7	9.8	0.04	0.016	52	45	49
9.8	9.9	0.07	0.032	59	43	51
Bridge						
10.1	10.2	0.18	0.053	70	41	56
10.2	10.3	0.13	0.024	54	44	49
10.3	10.4	0.10	0.021	58	49	53
10.4	10.5	0.07	0.028	66	49	57
Averages:		**0.08**	**0.023**	**57**	**44**	**50**

Table C-16

Project: 450-03-0037
ICC Profiler Survey: 5/18/2006
Direction: West

FROM miles	TO miles	Rut Avg inches	Rut STD	IRI 1 in/mile	IRI 2 in/mile	Avg IRI in/mile
10.5	10.4	0.05	0.037	64	47	56
10.4	10.3	0.04	0.020	50	42	46
10.3	10.2	0.04	0.019	40	37	39
10.2	10.1	0.02	0.015	54	46	50
			Bridge			
9.9	9.8	0.06	0.018	55	41	48
9.8	9.7	0.07	0.018	49	36	43
9.7	9.6	0.08	0.019	50	38	44
9.6	9.5	0.09	0.018	47	42	45
9.5	9.4	0.08	0.016	42	36	39
9.4	9.3	0.08	0.018	45	41	43
9.3	9.2	0.07	0.019	46	36	41
9.2	9.1	0.07	0.020	50	40	45
9.1	9.0	0.07	0.018	44	42	43
9.0	8.9	0.07	0.016	39	35	37
8.9	8.8	0.08	0.018	44	40	42
8.8	8.7	0.09	0.017	41	35	38
8.7	8.6	0.09	0.019	46	38	42
8.6	8.5	0.08	0.021	41	42	41
8.5	8.4	0.06	0.017	49	36	42
8.4	8.3	0.07	0.018	52	40	46
8.3	8.2	0.07	0.018	46	36	41
8.2	8.1	0.06	0.015	49	36	43
8.1	8.0	0.06	0.016	45	40	42
8.0	7.9	0.05	0.016	48	37	42
7.9	7.8	0.07	0.015	46	32	39
7.8	7.7	0.08	0.015	42	36	39
7.7	7.6	0.07	0.016	51	36	43
7.6	7.5	0.06	0.016	45	33	39
7.5	7.4	0.06	0.015	53	37	45
7.4	7.3	0.06	0.020	52	42	47
7.3	7.2	0.06	0.027	45	44	45
7.2	7.1	0.04	0.020	50	41	46
7.1	7.0	0.03	0.020	52	40	46
7.0	6.9	0.03	0.015	47	35	41
6.9	6.8	0.04	0.014	50	36	43
6.8	6.7	0.05	0.017	45	37	41
6.7	6.6	0.06	0.018	47	36	42
6.6	6.5	0.06	0.016	50	34	42
6.5	6.4	0.04	0.016	44	38	41
6.4	6.3	0.05	0.027	59	42	51
6.3	6.2	0.05	0.017	51	45	48
6.2	6.1	0.05	0.023	56	40	48
6.1	6.0	0.06	0.015	50	37	44
6.0	5.9	0.05	0.019	47	38	42
5.9	5.8	0.07	0.017	51	42	46
5.8	5.7	0.07	0.019	54	43	48
5.7	5.6	0.08	0.021	48	38	43
5.6	5.5	0.08	0.016	53	42	47
5.5	5.4	0.05	0.015	61	39	50
5.4	5.3	0.06	0.015	56	34	45
5.3	5.2	0.06	0.021	58	43	50
5.1	5.0	0.05	0.024	75	56	66
5.0	4.9	0.06	0.023	75	51	63
4.9	4.8	0.09	0.021	59	50	55
4.8	4.7	0.09	0.027	50	46	48
4.7	4.6	0.13	0.019	59	45	52
4.6	4.5	0.14	0.026	55	45	50
4.5	4.4	0.13	0.033	47	45	46
4.4	4.3	0.06	0.031	57	53	55
4.3	4.2	0.09	0.039	65	54	60
4.2	4.1	0.06	0.029	61	58	59
4.1	4.0	0.04	0.024	45	42	44
4.0	3.9	0.05	0.024	45	38	42
3.9	3.8	0.05	0.021	43	33	38
3.8	3.7	0.04	0.028	48	38	43
3.7	3.6	0.09	0.026	56	38	47
3.6	3.5	0.09	0.023	43	29	36
3.5	3.4	0.07	0.021	46	34	40
3.4	3.3	0.08	0.020	52	35	43
3.3	3.2	0.08	0.018	49	38	43
3.2	3.1	0.08	0.016	45	34	40
3.1	3.0	0.08	0.020	46	37	42
3.0	2.9	0.07	0.017	48	34	41
2.9	2.8	0.07	0.024	43	35	39
2.8	2.7	0.09	0.021	41	36	38
2.7	2.6	0.08	0.023	39	33	36
2.6	2.5	0.07	0.020	39	33	36
2.5	2.4	0.07	0.018	46	35	40
2.4	2.3	0.10	0.019	42	33	37
2.3	2.2	0.11	0.025	42	34	38
2.2	2.1	0.11	0.031	41	39	40
2.1	2.0	0.10	0.016	34	32	33
2.0	1.9	0.11	0.025	41	30	36
1.9	1.8	0.12	0.022	36	38	37
1.8	1.7	0.11	0.034	37	40	38
1.7	1.6	0.10	0.026	38	36	37
1.6	1.5	0.10	0.026	41	39	40
1.5	1.4	0.12	0.030	40	35	37
1.4	1.3	0.13	0.023	43	39	41
1.3	1.2	0.13	0.031	43	36	40
1.2	1.1	0.16	0.028	46	36	41
1.1	1.0	0.11	0.039	57	45	51
1.0	0.9	0.09	0.044	82	68	75
0.9	0.8	0.15	0.040	47	55	51
0.8	0.7	0.13	0.040	45	38	42
			Bridge			
0.6	0.5	0.09	0.039	39	35	37
0.5	0.4	0.07	0.031	36	35	35
0.4	0.3	0.09	0.026	51	43	47
0.3	0.2	0.08	0.018	44	40	42
0.2	0.1	0.03	0.025	53	67	60
0.1	0.0	0.05	0.030	55	39	47
Averages:		**0.08**	**0.022**	**49**	**40**	**44**

Table C-17
Friction Testing Summary

I-10
East Bound 05/23/02

Ribbed Tire			Smooth Tire		
Log Mile	FN	Speed	Log Mile	FN	Speed
0.0	46.4	50.2	0.1	33.5	50.0
0.5	40.7	50.8	0.6	33.1	49.8
1.2	41.8	49.2	1.3	32.5	49.8
1.5	44.8	49.6	1.6	35.5	50.3
2.0	42.7	49.9	2.1	34.9	50.1
2.5	43.5	49.8	2.6	35.1	50.0
3.0	43.6	49.5	3.1	36.7	50.1
3.5	45.8	49.5	3.6	31.7	50.2
4.0	43.3	49.7	4.1	36.5	50.2
4.5	44.3	49.9	4.6	37.5	50.1
5.0	42.9	49.8	5.2	32.6	50.3
5.5	42.1	49.7	5.6	36.5	50.1
6.0	43.9	49.3	6.1	31.3	50.2
6.5	43.1	49.4	6.6	35.4	50.0
7.0	43.7	49.3	7.1	32.6	50.2
7.5	44.6	48.4	7.6	32.3	50.2
8.1	44.1	49.6	8.2	31.6	50.2
8.5	44.3	49.4	8.6	32.3	50.4
9.0	44.4	49.7	9.2	32.2	50.4
9.5	45.0	49.6	9.6	33.4	50.3
10.1	46.5	49.9	10.2	37.2	49.9
10.5	45.4	49.7	10.6	35.4	50.2
Avg	**44.0**	**49.6**	**Avg**	**34.1**	**50.1**
Max	**46.5**	**50.8**	**Max**	**37.5**	**50.4**
Min	**40.7**	**48.4**	**Min**	**31.3**	**49.8**
SD	**1.44**	**0.44**	**SD**	**2.02**	**0.17**
# Tests	**22**	**22**	**# Tests**	**22**	**22**

I-10
West Bound 05/23/02

Ribbed Tire			Smooth Tire		
Log Mile	FN	Speed	Log Mile	FN	Speed
0.3	41.7	48.3	0.2	30.3	50.7
0.6	40.9	49.7	0.5	32.4	49.8
1.3	44.6	48.2	1.2	31.4	50.7
1.8	42.1	48.1	1.7	32.0	50.7
2.3	43.3	48.5	2.2	31.1	50.7
2.8	43.3	48.1	2.7	30.8	50.6
3.3	41.6	48.4	3.2	33.1	50.7
3.8	44.4	48.4	3.7	34.1	50.6
4.2	44.3	48.4	4.2	31.4	50.7
4.7	44.1	48.4	4.6	35.3	50.6
5.3	43.1	48.9	5.2	33.8	50.7
5.8	44.8	48.2	5.7	30.9	50.6
6.3	44.1	48.6	6.2	28.2	50.7
6.8	45.3	48.5	6.7	33.8	50.5
7.1	43.9	49.0	7.0	34.0	50.5
7.7	43.9	49.0	7.7	34.0	50.6
8.2	44.1	48.4	8.1	36.2	50.6
8.8	43.5	48.6	8.7	31.2	50.7
9.3	44.0	49.1	9.2	34.6	50.5
9.8	44.3	48.9	9.7	30.5	50.6
10.3	45.2	48.1	10.2	34.5	50.5
10.8	45.4	48.8	10.7	29.7	50.6
Avg	**43.7**	**48.6**	**Avg**	**32.4**	**50.6**
Max	**45.4**	**49.7**	**Max**	**36.2**	**50.7**
Min	**40.9**	**48.1**	**Min**	**28.2**	**49.8**
SD	**1.22**	**0.40**	**SD**	**2.04**	**0.19**
# Tests	**22**	**22**	**# Tests**	**22**	**22**

Table C-18
Friction Testing Summary

I-10
East Bound 12/05/02

Ribbed Tire			Smooth Tire		
Log Mile	FN	Speed	Log Mile	FN	Speed
0.1	38.6	50.4	0.0	33.9	50.4
0.6	37.3	50.3	0.5	31.6	50.5
1.3	37.4	50.0	1.2	31.9	49.4
1.7	37.7	50.5	1.6	32.8	50.3
2.1	40.0	50.5	2.0	31.2	50.3
2.7	40.4	50.5	2.6	33.0	50.4
3.2	40.5	50.6	3.1	32.2	50.6
3.6	42.7	47.7	3.6	33.9	50.5
4.1	40.5	50.6	4.0	33.3	50.4
4.6	41.6	50.6	4.5	35.2	50.2
5.1	44.0	50.0	5.0	35.5	50.5
5.6	36.5	50.4	5.5	33.7	50.2
6.1	36.8	50.5	6.0	30.8	50.4
6.6	38.0	50.5	6.6	31.1	50.3
7.1	38.0	50.7	7.0	30.7	50.5
7.6	39.2	50.5	7.5	29.5	50.1
8.1	39.6	50.6	8.0	28.0	50.3
8.6	39.6	50.6	8.5	33.9	50.3
9.1	38.6	50.8	9.0	31.3	50.3
9.6	38.5	50.5	9.5	29.9	50.6
10.2	41.1	50.4	10.1	31.4	50.7
10.6	40.1	50.4	10.5	32.1	50.3
Avg	**39.4**	**50.3**	**Avg**	**32.1**	**50.3**
Max	**44.0**	**50.8**	**Max**	**35.5**	**50.7**
Min	**36.5**	**47.7**	**Min**	**28.0**	**49.4**
SD	**1.91**	**0.62**	**SD**	**1.84**	**0.26**
# Tests	**22**	**22**	**# Tests**	**22**	**22**

I-10
West Bound 12/05/02

Ribbed Tire			Smooth Tire		
Log Mile	FN	Speed	Log Mile	FN	Speed
0.2	38.4	50.7	0.2	43.2	50.7
0.4	38.0	48.3	0.5	29.5	50.3
1.2	38.3	50.7	1.3	35.2	50.6
1.7	39.2	50.8	1.8	34.8	50.7
2.2	38.2	48.5	2.3	32.8	50.6
2.6	38.4	50.8	2.7	31.8	50.6
3.2	38.9	50.8	3.3	33.5	50.7
3.7	39.1	50.7	3.8	34.8	50.5
4.2	40.0	50.8	4.3	34.3	50.3
4.7	38.1	50.8	4.8	38.6	50.4
5.0	40.1	50.4	5.1	32.7	50.6
5.6	40.4	50.8	5.7	32.5	50.6
6.1	40.1	50.6	6.2	31.5	50.6
6.8	39.1	50.6	6.7	38.5	50.6
7.3	39.6	50.4	7.2	37.3	50.7
7.8	39.1	50.5	7.6	35.9	50.8
8.3	42.1	50.5	7.7	38.2	50.6
8.8	37.3	50.3	8.2	37.9	50.5
9.3	38.4	50.6	8.7	40.6	50.6
9.8	36.8	50.2	9.2	37.2	50.5
10.3	37.6	50.5	9.7	36.9	50.5
10.8	38.5	50.3	10.2	39.7	50.5
			10.7	38.7	50.4
Avg	**38.9**	**50.4**	**Avg**	**35.9**	**50.6**
Max	**42.1**	**50.8**	**Max**	**43.2**	**50.8**
Min	**36.8**	**48.3**	**Min**	**29.5**	**50.3**
SD	**1.18**	**0.67**	**SD**	**3.34**	**0.13**
# Tests	**22**	**22**	**# Tests**	**23**	**23**

Table C-19
Friction Testing Summary

I-10
East Bound 05/20/03

Ribbed Tire			Smooth Tire		
Log Mile	FN	Speed	Log Mile	FN	Speed
0.1	30.7	48.7	0.0	23.8	50.5
0.6	31.5	49.6	0.5	22.6	50.7
1.2	29.9	49.2	1.1	26.6	50.1
1.6	31.6	49.2	1.5	24.0	50.7
2.1	31.7	49.0	2.0	25.5	50.8
2.6	31.0	49.1	2.5	26.3	50.7
3.1	32.1	49.3	3.0	26.2	50.8
3.6	32.3	49.4	3.5	26.9	50.5
4.1	32.3	49.3	4.0	22.4	50.8
4.6	31.5	49.3	4.5	25.4	51.0
5.2	29.5	49.4	5.0	21.6	50.9
5.6	28.1	49.3	5.5	22.2	50.8
6.1	29.4	49.2	6.0	23.4	50.9
6.6	29.9	49.2	6.5	24.6	50.6
7.2	30.7	49.3	7.0	23.1	50.9
7.7	30.5	49.0	7.6	23.5	51.1
8.1	30.3	49.0	8.0	20.7	51.0
8.6	30.3	49.0	8.5	25.8	50.9
9.1	29.4	49.1	9.0	23.7	50.7
9.6	30.9	49.0	9.5	21.3	50.9
10.1	31.9	48.7	10.1	21.8	51.3
10.6	34.0	48.6	10.5	25.0	50.7
Avg	**30.9**	**49.1**	**Avg**	**23.9**	**50.8**
Max	**34.0**	**49.6**	**Max**	**26.9**	**51.3**
Min	**28.1**	**48.6**	**Min**	**20.7**	**50.1**
SD	**1.29**	**0.25**	**SD**	**1.85**	**0.24**
# Tests	**22**	**22**	**# Tests**	**22**	**22**

I-10
West Bound 05/20/03

Ribbed Tire			Smooth Tire		
Log Mile	FN	Speed	Log Mile	FN	Speed
0.4	29.4	48.7	0.5	23.3	49.5
0.9	31.2	49.8	1.1	21.8	50.3
1.5	29.2	49.1	1.6	23.1	50.5
2.0	29.4	49.0	2.1	21.3	50.4
2.5	30.8	49.3	2.6	23.1	50.6
3.0	30.7	49.3	3.1	22.1	50.3
3.5	29.3	49.3	3.6	24.3	50.5
4.0	32.3	49.2	4.1	26.3	50.3
4.5	31.1	49.3	4.6	23.7	50.6
5.0	30.1	49.3	5.1	20.0	50.9
5.4	30.6	49.3	5.5	26.1	50.3
6.0	29.7	49.2	6.1	23.9	50.4
6.5	30.5	49.2	6.6	25.2	50.4
7.0	29.5	49.3	7.1	21.7	50.4
7.5	30.6	49.2	7.6	22.9	50.6
8.0	29.8	49.2	8.1	21.8	50.3
8.5	29.6	49.2	8.6	22.4	50.4
9.0	28.8	49.4	9.1	26.5	50.1
9.5	28.9	49.3	9.6	24.1	50.5
9.9	28.4	49.4	10.1	20.1	50.3
10.5	31.2	49.1	10.6	22.4	50.2
Avg	**30.1**	**49.2**	**Avg**	**23.1**	**50.4**
Max	**32.3**	**49.8**	**Max**	**26.5**	**50.9**
Min	**28.4**	**48.7**	**Min**	**20.0**	**49.5**
SD	**0.98**	**0.20**	**SD**	**1.84**	**0.26**
# Tests	**21**	**21**	**# Tests**	**21**	**21**

Table C-20
Friction Testing Summary

I-10
East Bound 11/05/03

Ribbed Tire			Smooth Tire		
Log Mile	FN	Speed	Log Mile	FN	Speed
0.1	32.6	50.3	0.0	25.3	50.8
0.6	32.4	50.1	0.5	24.8	50.9
1.3	32.5	49.7	1.2	23.9	50.2
1.6	32.1	50.2	1.5	27.6	50.8
2.1	33.7	49.9	2.0	25.0	50.9
2.6	33.9	49.8	2.5	24.9	51.1
3.1	33.6	49.6	3.0	26.3	51.1
3.6	34.1	49.5	3.5	24.5	51.0
4.1	33.7	49.6	4.0	24.4	50.9
4.6	33.4	49.3	4.6	25.2	50.9
5.2	30.7	49.7	5.0	24.4	50.9
5.6	29.0	49.4	5.5	23.4	51.2
6.1	29.9	49.3	6.0	21.0	51.0
6.6	31.0	49.3	6.5	23.1	51.1
7.1	33.0	49.5	7.0	23.5	51.1
7.7	32.6	49.3	7.5	19.7	51.2
8.1	31.4	49.4	8.0	20.6	51.1
8.7	31.4	49.2	8.5	25.4	51.0
9.1	30.8	49.1	9.0	23.6	51.2
9.6	31.9	48.9	9.5	23.7	51.1
10.1	32.7	49.1	10.0	21.8	51.3
10.7	32.8	48.9	10.6	24.1	50.8
Avg	**32.2**	**49.5**	**Avg**	**23.9**	**51.0**
Max	**34.1**	**50.3**	**Max**	**27.6**	**51.3**
Min	**29.0**	**48.9**	**Min**	**19.7**	**50.2**
SD	**1.36**	**0.39**	**SD**	**1.85**	**0.23**
# Tests	**22**	**22**	**# Tests**	**22**	**22**

I-10
West Bound 11/05/03

Ribbed Tire			Smooth Tire		
Log Mile	FN	Speed	Log Mile	FN	Speed
0.1	29.7	49.5	0.1	21.7	50.9
0.5	28.6	49.3	0.6	21.4	50.2
0.9	29.9	50.6	1.1	21.1	50.2
1.5	30.2	49.7	1.6	22.5	51.1
2.0	29.8	49.9	2.1	23.0	51.1
2.5	29.6	49.5	2.6	20.9	50.8
2.9	29.8	49.9	3.0	22.4	51.0
3.5	30.4	50.1	3.6	21.1	50.8
4.0	30.8	49.9	4.1	24.5	51.1
4.5	30.2	49.8	4.6	21.0	51.0
5.0	29.6	50.1	5.1	18.3	51.4
5.5	31.7	50.1	5.6	23.4	51.0
6.0	30.2	50.1	6.1	22.2	50.8
6.5	30.2	50.2	6.6	23.7	51.0
7.0	30.5	49.9	7.1	20.3	50.8
7.5	29.6	50.1	7.6	24.9	50.7
8.0	29.4	50.1	8.1	22.5	51.0
8.5	29.0	50.2	8.6	23.1	50.7
9.0	28.7	50.2	9.1	23.3	50.6
9.5	29.1	50.2	9.6	20.9	50.7
10.0	29.5	50.2	10.1	22.7	50.8
10.6	28.9	49.7	10.6	20.6	51.1
Avg	**29.8**	**50.0**	**Avg**	**22.1**	**50.9**
Max	**31.7**	**50.6**	**Max**	**24.9**	**51.4**
Min	**28.6**	**49.3**	**Min**	**18.3**	**50.2**
SD	**0.73**	**0.30**	**SD**	**1.52**	**0.28**
# Tests	**22**	**22**	**# Tests**	**22**	**22**

Table C-21
Friction Testing Summary

I-10
East Bound 04/06/04

Ribbed Tire			Smooth Tire		
Log Mile	FN	Speed	Log Mile	FN	Speed
0.1	31.0	51.0	0.0	21.9	50.6
0.6	31.7	50.7	0.5	21.0	50.9
1.2	29.7	50.5	1.2	22.7	50.0
1.6	29.8	51.0	1.5	24.5	50.8
2.1	31.8	51.2	2.0	23.9	50.7
2.6	31.0	50.9	2.5	25.1	51.0
3.1	31.6	50.9	3.0	24.7	50.7
3.6	31.2	51.0	3.5	24.6	50.9
4.1	31.2	51.1	4.0	27.7	50.8
4.6	32.2	51.0	4.5	28.5	50.8
5.2	29.0	51.1	5.0	24.1	51.0
5.6	29.6	51.0	5.5	21.0	50.7
6.1	28.4	51.1	6.0	22.4	50.8
6.6	30.1	51.2	6.5	23.8	50.9
7.1	31.3	51.1	7.0	22.0	50.9
7.6	30.6	51.1	7.5	21.4	50.9
8.1	31.5	51.1	8.0	19.6	50.8
8.6	30.2	51.0	8.5	24.8	50.8
9.1	29.6	51.3	9.0	25.0	50.9
9.6	31.1	51.1	9.5	19.9	51.0
10.1	31.9	50.9	10.0	21.1	51.3
Avg	**30.7**	**51.0**	**Avg**	**23.3**	**50.8**
Max	**32.2**	**51.3**	**Max**	**28.5**	**51.3**
Min	**28.4**	**50.5**	**Min**	**19.6**	**50.0**
SD	**1.04**	**0.17**	**SD**	**2.35**	**0.24**
# Tests	**21**	**21**	**# Tests**	**21**	**21**

I-10
West Bound 04/06/04

Ribbed Tire			Smooth Tire		
Log Mile	FN	Speed	Log Mile	FN	Speed
0.0	29.8	51.1	0.1	23.7	50.7
0.5	29.6	50.3	0.5	20.8	50.7
1.0	32.2	50.0	1.1	21.2	50.8
1.5	32.4	51.1	1.6	22.9	50.5
2.0	29.9	51.1	2.1	20.5	51.0
2.5	32.3	51.1	2.6	24.7	50.7
3.0	30.0	51.2	3.1	23.5	51.0
3.5	30.0	51.0	3.6	21.8	50.9
4.0	29.7	51.0	4.1	26.3	50.9
4.5	30.5	51.2	4.6	25.5	50.7
5.0	30.0	50.9	5.0	20.5	51.2
5.5	31.4	51.0	5.6	25.7	50.9
6.0	31.2	51.1	6.1	21.6	50.7
6.5	30.4	51.1	6.6	24.4	50.7
7.0	30.2	50.9	7.1	24.9	50.8
7.5	30.6	51.2	7.6	25.9	50.8
8.0	30.0	51.1	8.1	25.8	50.8
8.5	29.7	51.2	8.6	22.1	50.9
9.0	30.1	51.0	9.1	25.3	50.5
9.5	29.6	51.1	9.6	21.4	50.7
9.9	28.5	51.3	10.1	25.1	50.8
Avg	**30.4**	**51.0**	**Avg**	**23.5**	**50.8**
Max	**32.4**	**51.3**	**Max**	**26.3**	**51.2**
Min	**28.5**	**50.0**	**Min**	**20.5**	**50.5**
SD	**0.99**	**0.30**	**SD**	**2.02**	**0.16**
# Tests	**21**	**21**	**# Tests**	**21**	**21**

Table C-22
Friction Testing Summary

I-10
East Bound 04/06/04 40mph

Ribbed Tire			Smooth Tire		
Log Mile	FN	Speed	Log Mile	FN	Speed
0.0	31.8	40.0	0.1	34.0	39.9
0.5	31.5	40.0	0.6	31.4	40.0
1.0	31.0	41.5	1.1	27.7	41.0
1.5	33.1	40.0	1.6	31.1	40.1
2.0	33.5	40.1	2.1	34.1	40.2
2.6	32.8	40.3	2.5	29.1	40.0
3.1	33.8	40.3	3.0	24.8	40.2
3.6	33.2	40.4	3.5	27.7	40.2
4.1	34.7	40.4	4.0	30.0	40.0
4.6	33.9	40.4	4.5	28.2	40.0
5.1	35.5	40.1	5.0	24.8	40.2
5.6	30.1	40.5	5.5	22.0	40.0
6.1	31.7	40.5	6.0	26.0	40.1
6.6	30.8	40.3	6.5	24.6	40.1
7.1	32.9	40.5	7.0	28.9	40.0
7.6	33.2	40.4	7.5	28.1	39.9
8.1	35.3	40.4	8.0	25.5	40.0
8.6	33.5	40.5	8.5	27.6	40.0
9.1	31.5	40.6	9.0	24.8	40.2
9.6	33.0	40.5	9.5	25.1	40.2
10.1	34.1	40.4	10.0	25.3	40.4
Avg	32.9	40.4	Avg	27.7	40.1
Max	35.5	41.5	Max	34.1	41.0
Min	30.1	40.0	Min	22.0	39.9
SD	1.46	0.32	SD	3.18	0.23
# Tests	21	21	# Tests	21	21

I-10
West Bound 04/06/04 40mph

Ribbed Tire			Smooth Tire		
Log Mile	FN	Speed	Log Mile	FN	Speed
0.1	32.2	41.3	0.1	24.7	40.8
0.5	31.0	40.5	0.5	26.3	41.1
1.0	33.0	40.5	1.1	23.8	40.0
1.5	32.7	41.1	1.6	28.0	40.8
2.0	33.5	41.1	2.0	25.2	40.8
2.5	33.7	41.0	2.6	23.5	40.7
3.0	32.4	41.1	3.1	23.8	40.9
3.5	33.7	40.9	3.6	25.3	40.8
4.0	34.9	41.0	4.1	29.9	40.7
4.5	33.9	41.0	4.6	25.8	40.8
5.0	33.4	41.0	5.1	21.0	41.2
5.5	34.6	40.9	5.6	29.9	40.8
6.0	36.4	40.8	6.1	27.1	40.6
6.5	32.6	41.0	6.6	26.7	40.6
7.0	33.5	41.1	7.1	24.9	40.6
7.5	32.8	41.1	7.6	26.9	40.8
8.0	32.5	41.1	8.1	26.8	40.5
8.5	31.7	41.1	8.6	25.0	40.6
9.0	32.5	41.2	9.1	29.2	40.4
9.5	32.0	41.1	9.6	25.5	40.6
10.0	30.0	41.2	10.1	28.6	40.4
10.6	35.0	40.9	10.6	28.3	40.9
Avg	33.1	41.0	Avg	26.2	40.7
Max	36.4	41.3	Max	29.9	41.2
Min	30.0	40.5	Min	21.0	40.0
SD	1.41	0.20	SD	2.24	0.25
# Tests	22	22	# Tests	22	22

Table C-23
Friction Testing Summary

I-10
East Bound 01/11/05

Ribbed Tire			Smooth Tire		
Log Mile	FN	Speed	Log Mile	FN	Speed
0.1	33.5	49.0	0.0	29.7	50.9
0.6	32.6	49.3	0.5	27.3	51.1
1.2	32.1	49.1	1.2	28.5	50.1
1.6	32.9	49.5	1.6	32.1	50.9
2.1	34.3	49.5	2.0	29.4	51.0
2.6	34.2	49.3	2.5	31.6	51.0
3.1	33.4	49.4	3.0	31.2	51.0
3.6	34.2	49.4	3.6	35.0	51.0
4.1	34.4	49.4	4.0	29.9	50.9
4.6	34.4	49.2	4.5	32.6	50.8
5.2	31.8	49.7	5.0	30.2	51.2
5.6	30.1	49.5	5.5	23.2	51.0
6.1	30.9	49.3	6.0	24.3	51.0
6.6	31.6	49.6	6.5	28.9	51.0
7.1	32.6	49.4	7.0	29.8	50.8
7.6	31.9	49.6	7.5	24.4	51.0
8.1	33.3	49.3	8.0	25.4	51.2
8.6	33.0	49.4	8.5	24.9	51.1
9.1	31.7	49.8	9.0	27.3	50.9
9.6	32.3	49.6	9.5	27.9	51.3
10.2	33.7	49.1	10.1	27.2	51.3
10.6	35.3	49.0	10.5	27.2	51.0
Avg	**32.9**	**49.4**	**Avg**	**28.5**	**51.0**
Max	**35.3**	**49.8**	**Max**	**35.0**	**51.3**
Min	**30.1**	**49.0**	**Min**	**23.2**	**50.1**
SD	**1.30**	**0.22**	**SD**	**3.00**	**0.24**
# Tests	**22**	**22**	**# Tests**	**22**	**22**

I-10
West Bound 01/11/05

Ribbed Tire			Smooth Tire		
Log Mile	FN	Speed	Log Mile	FN	Speed
0.1	32.1	48.9	0.2	26.6	50.3
0.8	32.7	49.4	0.9	31.1	50.8
1.3	32.6	49.3	1.4	29.0	50.6
1.8	32.4	49.4	1.9	29.4	50.7
2.3	32.9	49.3	2.3	28.6	50.7
2.8	32.6	49.5	2.9	29.6	51.1
3.3	33.4	49.4	3.4	28.5	50.9
3.8	32.3	49.5	3.9	28.7	50.8
4.2	31.8	49.9	4.3	30.7	50.7
4.7	32.4	49.6	4.8	26.1	50.7
5.3	33.6	49.5	5.4	28.8	50.8
5.7	33.0	49.5	5.9	27.3	50.6
6.3	32.6	49.5	6.4	30.2	50.5
6.8	32.7	49.4	6.9	30.7	50.4
7.6	35.4	49.1	7.5	36.4	50.8
7.8	33.0	49.6	7.9	32.3	50.4
8.2	32.2	49.4	8.3	29.5	50.6
8.8	31.9	49.2	8.9	28.6	50.5
9.3	32.8	49.5	9.4	28.3	50.5
9.8	33.1	49.6	9.9	35.1	50.6
10.4	32.3	49.4	10.4	27.3	51.0
Avg	**32.8**	**49.4**	**Avg**	**29.7**	**50.7**
Max	**35.4**	**49.9**	**Max**	**36.4**	**51.1**
Min	**31.8**	**48.9**	**Min**	**26.1**	**50.3**
SD	**0.76**	**0.20**	**SD**	**2.52**	**0.20**
# Tests	**21**	**21**	**# Tests**	**21**	**21**

Table C-24
Friction Testing Summary

I-10
East Bound 05/17/06

Ribbed Tire			Smooth Tire		
Log Mile	FN	Speed	Log Mile	FN	Speed
0.1	30.1	50.6	0.0	25.0	50.5
0.7	32.5	49.6	0.6	25.1	50.6
1.2	31.5	49.9	1.2	24.4	50.2
1.7	32.0	50.6	1.6	27.3	50.6
2.2	32.7	50.4	2.1	27.8	50.6
2.6	31.0	50.4	2.5	27.0	50.8
3.1	31.7	50.4	3.0	29.2	50.8
3.6	32.5	50.2	3.6	28.3	50.7
4.1	32.5	49.9	4.1	27.7	51.0
4.7	31.8	49.7	4.6	29.2	50.7
5.2	30.1	50.4	5.1	20.3	51.4
5.6	28.2	50.1	5.5	20.8	51.0
6.1	28.7	50.0	6.0	24.8	51.0
6.6	32.6	50.1	6.5	25.1	50.8
7.1	32.7	50.0	7.0	25.8	51.0
7.7	32.0	50.0	7.5	22.8	51.0
8.2	31.5	49.7	8.1	21.5	50.9
8.6	32.9	49.8	8.5	26.0	51.0
9.1	31.5	49.8	9.0	24.9	51.2
9.7	33.5	50.1	9.6	23.5	50.9
10.1	33.3	50.2	10.0	22.0	51.2
10.6	34.7	50.4	10.5	26.7	51.1
Avg	**31.8**	**50.1**	**Avg**	**25.2**	**50.9**
Max	**34.7**	**50.6**	**Max**	**29.2**	**51.4**
Min	**28.2**	**49.6**	**Min**	**20.3**	**50.2**
SD	**1.51**	**0.30**	**SD**	**2.60**	**0.27**
# Tests	**22**	**22**	**# Tests**	**22**	**22**

I-10
West Bound 05/17/06

Ribbed Tire			Smooth Tire		
Log Mile	FN	Speed	Log Mile	FN	Speed
0.4	29.9	49.5	0.5	26.4	50.1
1.4	30.9	49.7	1.5	26.6	50.8
1.9	30.4	49.7	2.0	26.4	50.7
2.4	30.7	49.7	2.4	26.8	50.6
2.9	29.4	49.6	2.9	25.2	50.8
3.4	30.8	49.7	3.5	23.9	50.7
3.9	30.2	49.9	3.9	27.2	50.4
4.3	29.7	49.8	4.4	24.6	50.8
4.8	29.7	49.8	4.8	26.8	50.8
5.3	30.4	49.7	5.5	27.5	50.6
5.7	34.2	49.9	5.8	27.8	50.7
6.3	29.9	50.0	6.4	26.6	50.6
6.8	31.7	50.0	6.9	25.7	50.7
7.3	30.4	49.4	7.4	27.3	50.7
7.8	30.5	50.0	7.9	28.2	50.4
8.4	30.6	49.7	8.4	25.7	50.6
8.9	30.9	49.5	8.9	27.1	50.7
9.4	30.8	49.3	9.4	26.0	50.4
9.9	31.2	49.2	9.9	24.6	50.7
10.4	31.6	49.3	10.5	24.4	50.5
Avg	**30.7**	**49.7**	**Avg**	**26.2**	**50.6**
Max	**34.2**	**50.0**	**Max**	**28.2**	**50.8**
Min	**29.4**	**49.2**	**Min**	**23.9**	**50.1**
SD	**1.02**	**0.24**	**SD**	**1.20**	**0.18**
# Tests	**20**	**20**	**# Tests**	**20**	**20**

APPENDIX D

LA 422: Detailed Summary of Profiler and Friction Testing Conducted by LTRC

Table D-0
Summary of Profiler and Friction Testing Conducted by LTRC on LA 422

	Age (yrs)	Mean	Standard Error	Median	Mode	Standard Deviation	Sample Variance	Kurtosis	Skewness	Range	Min	Max	Segment Count	95th Percentile	Mean + 95%
Avg IRI (in/mile)	0.060	58.4	0.886	55	53	13.2	174	16.7	3.07	115	41	156	222	1.75	60.1
	0.578	59.3	0.754	57.5	51	11.2	126	3.75	1.49	72	41	113	222	1.49	60.8
	1.04	62.7	0.983	60	52	14.6	215	6.88	2.09	103	39	142	222	1.94	64.6
	1.50	61.0	0.696	59	55	10.4	107	0.716	0.86	57	41	98	222	1.37	62.4
	2.02	59.3	0.656	58	50	9.77	95.5	0.924	0.94	53	40	93	222	1.29	60.6
	2.67	61.9	0.734	59	54	10.9	120	2.04	1.15	69	42	111	222	1.45	63.3
	3.52	66.9	3.22	59	58	48.0	2301	90.8	8.96	571	41	612	222	6.35	73.3
	4.02	66.4	0.787	64.55	72.7	11.7	138	3.51	1.27	84	46.6	130.6	222	1.55	68.0
IRI 1 (in/mile)	0.060	50.9	0.778	48	47	11.6	134	19.7	3.66	99	37	136	222	1.53	52.4
	0.578	51.3	0.686	50	46	10.2	104	9.78	2.44	75	38	113	222	1.35	52.6
	1.04	53.8	0.928	51	50	13.8	191	18.8	3.64	114	37	151	222	1.83	55.6
	1.50	51.5	0.526	50	47	7.84	61.5	3.71	1.30	55	37	92	222	1.04	52.6
	2.02	51.7	0.534	50	50	7.96	63.4	3.39	1.39	51	37	88	222	1.05	52.8
	2.67	53.5	0.613	52	51	9.13	83.4	11.5	2.40	78	39	117	222	1.21	54.7
	3.52	60.8	4.13	52	53	61.5	3783	98.5	9.54	728	38	766	222	8.14	69.0
	4.02	57.6	0.687	56.05	55.4	10.2	105	8.34	2.08	79.8	42	121.8	222	1.35	58.9
IRI 2 (in/mile)	0.060	65.9	1.17	62	54	17.5	305	8.08	2.13	135	41	176	222	2.31	68.2
	0.578	67.3	1.03	64	59	15.4	237	1.24	1.14	78	41	119	222	2.04	69.3
	1.04	71.5	1.24	67	71	18.5	341	1.90	1.30	97	40	137	222	2.44	74.0
	1.50	70.5	1.06	67	60	15.8	248	1.40	1.09	88	43	131	222	2.08	72.6
	2.02	67.0	0.983	64	72	14.6	214	2.17	1.23	87	39	126	222	1.94	68.9
	2.67	70.3	1.05	67.5	60	15.6	245	1.38	1.04	95	37	132	222	2.07	72.4
	3.52	73.1	2.45	65	59	36.5	1335	63.4	6.92	417	42	459	222	4.83	77.9
	4.02	75.3	1.08	72.45	62.6	16.1	259	1.00	0.95	94	45.4	139.4	222	2.13	77.4
Rut Standard Deviation	0.060	0.0173	0.000854	0.015	0.012	0.0127	0.000162	79.0	7.41	0.163	0	0.163	222	0.00168	0.0190
	0.578	0.0226	0.000500	0.022	0.023	0.00745	0.0000555	8.11	1.99	0.059	0.008	0.067	222	0.000985	0.0236
	1.04	0.0187	0.00111	0.016	0.016	0.0165	0.000272	44.1	5.49	0.178	0	0.178	222	0.00218	0.0209
	1.50	0.0245	0.000462	0.024	0.021	0.00689	0.0000474	2.18	0.87	0.045	0.01	0.055	222	0.000911	0.0255
	2.02	0.0252	0.000384	0.024	0.024	0.00572	0.0000327	11.2	2.21	0.05	0.016	0.066	222	0.000756	0.0260
	2.67	0.0223	0.000569	0.022	0.023	0.00848	0.0000719	20.1	2.74	0.085	0.007	0.092	222	0.00112	0.0234
	3.52	0.0336	0.00118	0.03	0.026	0.0175	0.000307	41.8	5.78	0.167	0.019	0.186	222	0.00232	0.0359
	4.02	0.0234	0.000638	0.022	0.021	0.00951	0.0000905	17.8	2.72	0.099	0	0.099	222	0.00126	0.0246
Rut Avg (inches)	0.060	0.0256	0.00100	0.02	0.02	0.0149	0.00022296	7.46	1.85	0.12	0	0.12	222	0.00198	0.0276
	0.578	0.0455	0.00130	0.04	0.04	0.0193	0.00	-0.077	0.51	0.09	0.01	0.1	222	0.00256	0.0480
	1.04	0.0267	0.00116	0.02	0.01	0.0174	0.00	3.63	1.42	0.11	0	0.11	222	0.00229	0.0290
	1.50	0.0563	0.00152	0.06	0.07	0.0226	0.00051299	-0.0168	0.256	0.12	0.01	0.13	222	0.00300	0.0593
	2.02	0.0801	0.00161	0.08	0.08	0.0240	0.000576	-0.488	-0.0240	0.11	0.03	0.14	222	0.00317	0.0833
	2.67	0.0383	0.00122	0.04	0.03	0.0182	0.00	0.387	0.620	0.09	0.01	0.1	222	0.00241	0.0407
	3.52	0.0414	0.00182	0.04	0.04	0.0270	0.00	0.0540	-0.304	0.15	-0.04	0.11	222	0.00358	0.0450
	4.02	0.0377	0.00117	0.04	0.03	0.0174	0.00	0.682	0.69	0.1	0	0.1	222	0.00231	0.0400
Friction Number – Ribbed Tire	0.575	54.6	0.496	55.2	52.9	3.47	12.1	0.711	-0.61	16.8	46	62.8	49	0.998	55.6
	0.677	55.9	0.445	56.6	55	3.02	9.09	0.0416	-0.76	12.4	48.2	60.6	46	0.895	56.8
	1.04	54.5	0.346	54.9	53.5	2.35	5.51	1.04	-0.76	12	47.2	59.2	46	0.697	55.2
	1.50	50.9	0.437	51.5	53.4	3.00	8.99	3.69	-1.49	16.3	39.7	56	47	0.880	51.8
	2.08	53.5	0.293	53.3	52.9	2.01	4.03	0.813	-0.61	10.1	47.4	57.5	47	0.590	54.1
	2.69	48.4	0.400	48.5	49.3	2.74	7.51	-0.0207	0.291	12	43.2	55.2	47	0.804	49.2
	4.02	50.2	0.729	51.4	49.7	3.72	13.8	-0.131	-0.74	14.1	41.1	55.2	26	1.50	51.7
Friction Number – Smooth Tire	0.575	54.3	0.674	54.3	55.4	4.72	22.2	3.29	0.0557	31.1	38.9	70	49	1.35	55.7
	0.677	41.1	0.681	41.7	41.8	4.62	21.3	0.765	0.0639	22.8	30.2	53	46	1.37	42.5
	1.04	38.6	0.768	39.3	42.6	5.21	27.1	-0.440	-0.430	20.3	27.2	47.5	46	1.55	40.2
	1.50	35.8	0.565	36.2	38.7	3.91	15.3	-0.691	-0.415	15.4	26.8	42.2	48	1.14	36.9
	2.08	39.4	0.741	39.4	36	5.13	26.3	3.41	1.10	28	28.9	56.9	48	1.49	40.8
	2.69	39.0	0.471	38.7	38.7	3.23	10.4	-0.690	0.162	12.1	33.6	45.7	47	0.948	40.0
	4.02	36.7	0.558	37.35	37.8	2.84	8.09	1.21	-0.812	13.1	28.7	41.8	26	1.15	37.9

3-Year Projected Distress (derived by linear regression of above data)		Mean	Standard Error	Median	Mode	Standard Deviation	Sample Variance	Kurtosis	Skewness	95th Percentile	Mean + 95%
Average IRI (in/mile)	Projected Distress	64.1	1.37	60.6	59.8	20.4	669	24.4	3.10	2.69	66.8
	R^2 Error	0.7258	0.1735	0.5765	0.5350	0.1735	0.1952	0.1348	0.0878	0.1735	0.5913
IRI 1 (in/mile)	Projected Distress	56.1	1.51	52.7	52.2	22.5	1013	30.7	3.90	2.97	59.1
	R^2 Error	0.6697	0.1791	0.7530	0.8416	0.1791	0.2010	0.1374	0.0832	0.1791	0.4794
IRI 2 (in/mile)	Projected Distress	72.1	1.41	67.8	62.8	21.0	521	16.7	2.51	2.78	74.9
	R^2 Error	0.6506	0.1592	0.4836	0.0160	0.1592	0.1777	0.1606	0.1158	0.1592	0.6480
Rut Standard Dev.	Projected Distress	0.0259	0.00076	0.0242	0.0231	0.0107	0.000121	21.9	3.29	0.00139	0.0273
	R^2 Error	0.4285	0.0056	0.4300	0.3941	0.0056	0.0083	0.0985	0.0427	0.0056	0.4203
Rut Avg. (inches)	Projected Distress	0.0459	0.00144	0.0466	0.042	0.0214	0.00045	0.259	0.308	0.003	0.0486
	R^2 Error	0.0197	0.1709	0.0668	0.0127	0.1709	0.1716	0.3214	0.3395	0.1709	0.0225
Friction Number – Ribbed Tire	Projected Distress	50.5	0.523	51.1	50.7	3.03	9.60	0.501	-0.528	1.07	51.6
	R^2 Error	0.6028	0.2904	0.5390	0.7257	0.0485	0.0696	0.0858	0.0770	0.3058	0.5431
Friction Number – Smooth Tire	Projected Distress	37.5	0.576	37.7	37.7	3.53	13.3	0.808	-0.174	1.17	38.6
	R^2 Error	0.2845	0.3367	0.2998	0.3733	0.6093	0.5462	0.0098	0.0516	0.3044	0.2996

Table D-1

Project: 819-02-0012
ICC Profiler Survey: 5/28/2002
Direction: East

FROM miles	TO miles	Rut Avg inches	Rut STD	IRI 1 in/mile	IRI 2 in/mile	Avg IRI in/mile
0.0	0.1	0.06	0.066	105	109	107
0.1	0.2	0.05	0.063	87	96	91
0.2	0.3	0.02	0.015	51	66	58
0.3	0.4	0.01	0.010	45	70	58
0.4	0.5	0.01	0.012	58	76	67
0.5	0.6	0.02	0.012	50	68	59
0.6	0.7	0.03	0.018	53	73	63
0.7	0.8	0.02	0.013	45	72	58
0.8	0.9	0.02	0.011	51	63	57
0.9	1.0	0.01	0.007	47	50	48
1.0	1.1	0.02	0.013	43	59	51
1.1	1.2	0.02	0.013	39	52	45
1.2	1.3	0.02	0.012	47	60	53
1.3	1.4	0.02	0.020	52	61	57
1.4	1.5	0.03	0.018	43	54	48
1.5	1.6	0.02	0.015	44	48	46
1.6	1.7	0.02	0.018	49	63	56
1.7	1.8	0.04	0.019	43	53	48
Bridges						
2.3	2.4	0.06	0.023	37	46	41
2.4	2.5	0.04	0.028	50	61	55
2.5	2.6	0.02	0.013	41	47	44
2.6	2.7	0.03	0.018	53	109	81
2.7	2.8	0.03	0.016	52	86	69
2.8	2.9	0.02	0.013	44	85	64
2.9	3.0	0.02	0.012	51	94	73
3.0	3.1	0.02	0.015	49	113	81
3.1	3.2	0.02	0.013	55	124	89
3.2	3.3	0.02	0.016	59	112	86
3.3	3.4	0.03	0.020	42	98	70
3.4	3.5	0.03	0.015	45	91	68
3.5	3.6	0.02	0.016	44	91	67
3.6	3.7	0.02	0.013	41	87	64
Bridge						
4.0	4.1	0.02	0.014	47	85	66
4.1	4.2	0.02	0.015	49	91	70
4.2	4.3	0.03	0.017	48	96	72
4.3	4.4	0.02	0.015	54	66	60
4.4	4.5	0.02	0.012	47	47	47
4.5	4.6	0.02	0.012	46	48	47
4.6	4.7	0.02	0.012	51	62	57
4.7	4.8	0.03	0.017	53	87	70
4.8	4.9	0.02	0.012	41	99	70
4.9	5.0	0.03	0.017	46	87	66
5.0	5.1	0.03	0.020	45	59	52
5.1	5.2	0.04	0.020	42	56	49
5.2	5.3	0.02	0.016	48	54	51
5.3	5.4	0.04	0.023	37	45	41
5.4	5.5	0.04	0.023	43	55	49
5.5	5.6	0.02	0.016	50	61	56
5.6	5.7	0.02	0.015	57	99	78
5.7	5.8	0.01	0.009	48	96	72
5.8	5.9	0.02	0.014	44	80	62
5.9	6.0	0.01	0.009	62	100	81
6.0	6.1	0.02	0.011	56	75	66
6.1	6.2	0.01	0.012	53	54	54
6.2	6.3	0.02	0.012	58	58	58
6.3	6.4	0.02	0.022	71	75	73
Bridges						
6.6	6.7	0.02	0.014	59	64	61
6.7	6.8	0.02	0.011	63	66	65
6.8	6.9	0.02	0.012	41	54	47
6.9	7.0	0.02	0.013	45	63	54
7.0	7.1	0.02	0.011	44	55	50
7.1	7.2	0.03	0.018	48	59	53
7.2	7.3	0.03	0.019	49	58	54
7.3	7.4	0.03	0.021	42	55	48
7.4	7.5	0.03	0.025	50	58	54
7.5	7.6	0.03	0.031	54	72	63
7.6	7.7	0.02	0.013	40	49	44
7.7	7.8	0.04	0.031	56	74	65
7.8	7.9	0.04	0.018	49	70	59
7.9	8.0	0.04	0.022	53	62	57
8.0	8.1	0.04	0.025	56	89	72
8.1	8.2	0.04	0.018	44	58	51
8.2	8.3	0.04	0.021	67	98	83
8.3	8.4	0.08	0.029	51	73	62
8.4	8.5	0.08	0.038	62	83	73
8.5	8.6	0.06	0.032	49	74	61
8.6	8.7	0.05	0.027	48	49	49
8.7	8.8	0.04	0.026	52	46	49
8.8	8.9	0.04	0.027	52	44	48
8.9	9.0	0.04	0.026	50	57	53
9.0	9.1	0.03	0.023	53	54	54
9.1	9.2	0.05	0.035	74	73	73
9.2	9.3	0.04	0.019	46	56	51
9.3	9.4	0.04	0.021	46	51	48
9.4	9.5	0.03	0.019	50	51	50
9.5	9.6	0.04	0.015	44	63	53
9.6	9.7	0.05	0.027	62	68	65
9.7	9.8	0.03	0.018	47	59	53
9.8	9.9	0.04	0.019	52	64	58
9.9	10.0	0.04	0.017	47	62	55
10.0	10.1	0.03	0.018	42	63	52
10.1	10.2	0.03	0.016	56	70	63
10.2	10.3	0.05	0.024	58	68	63
10.3	10.4	0.05	0.040	41	63	52
10.4	10.5	0.04	0.026	70	90	80
10.5	10.6	0.05	0.029	57	71	64
10.6	10.7	0.04	0.021	53	69	61
10.7	10.8	0.05	0.027	47	60	54
10.8	10.9	0.06	0.024	48	60	54
10.9	11.0	0.04	0.024	54	68	61
11.0	11.1	0.02	0.020	60	70	65
11.1	11.2	0.03	0.018	54	64	59
11.2	11.3	0.03	0.023	53	70	61
11.3	11.4	0.03	0.021	72	66	69
11.4	11.5	0.03	0.018	45	47	46
11.5	11.6	0.03	0.019	66	66	66
11.6	11.7	0.04	0.025	53	54	53
11.7	11.8	0.04	0.016	43	54	49
11.8	11.9	0.03	0.018	57	70	63
11.9	12.0	0.05	0.023	67	79	73
12.0	12.1	0.05	0.020	67	80	74
Averages		**0.03**	**0.019**	**52**	**69**	**60**

Table D-2

Project: 819-02-0012
ICC Profiler Survey: 5/28/2002
Direction: West

FROM miles	TO miles	Rut Avg inches	Rut STD	IRI 1 in/mile	IRI 2 in/mile	Avg IRI in/mile
12.1	12.0	0.01	0.014	136	176	156
12.0	11.9	0.02	0.018	54	71	62
11.9	11.8	0.02	0.015	46	61	54
11.8	11.7	0.03	0.018	46	62	54
11.7	11.6	0.04	0.021	46	58	52
11.6	11.5	0.03	0.031	69	88	79
11.5	11.4	0.03	0.017	44	54	49
11.4	11.3	0.02	0.013	46	59	52
11.3	11.2	0.03	0.015	46	57	52
11.2	11.1	0.03	0.019	48	62	55
11.1	11.0	0.04	0.020	47	62	55
11.0	10.9	0.04	0.022	41	52	46
10.9	10.8	0.02	0.013	42	54	48
10.8	10.7	0.02	0.015	41	59	50
10.7	10.6	0.03	0.015	47	67	57
10.6	10.5	0.02	0.014	47	53	50
10.5	10.4	0.02	0.011	48	58	53
10.4	10.3	0.02	0.014	41	54	47
10.3	10.2	0.03	0.017	48	63	55
10.2	10.1	0.03	0.015	53	69	61
10.1	10.0	0.03	0.018	44	73	58
10.0	9.9	0.03	0.015	41	65	53
9.9	9.8	0.03	0.018	45	62	53
9.8	9.7	0.02	0.014	44	62	53
9.7	9.6	0.02	0.017	65	70	67
9.6	9.5	0.01	0.011	50	58	54
9.5	9.4	0.02	0.012	44	73	59
9.4	9.3	0.02	0.011	46	63	55
9.3	9.2	0.02	0.015	45	72	59
9.2	9.1	0.03	0.015	55	80	67
9.1	9.0	0.03	0.015	45	61	53
9.0	8.9	0.02	0.014	41	47	44
8.9	8.8	0.02	0.013	46	61	53
8.8	8.7	0.02	0.012	48	70	59
8.7	8.6	0.03	0.025	56	74	65
8.6	8.5	0.04	0.030	81	82	81
8.5	8.4	0.01	0.012	51	87	69
8.4	8.3	0.02	0.013	49	60	54
8.3	8.2	0.02	0.015	60	68	64
8.2	8.1	0.02	0.012	40	53	46
8.1	8.0	0.05	0.036	49	91	70
8.0	7.9	0.02	0.016	47	42	44
7.9	7.8	0.01	0.011	48	49	48
7.8	7.7	0.01	0.008	46	69	58
7.7	7.6	0.01	0.013	52	66	59
7.6	7.5	0.01	0.009	46	60	53
7.5	7.4	0.01	0.009	52	68	60
7.4	7.3	0.01	0.012	45	49	47
7.3	7.2	0.02	0.011	38	55	47
7.2	7.1	0.01	0.009	37	56	47
7.1	7.0	0.02	0.018	40	64	52
7.0	6.9	0.01	0.008	47	70	58
6.9	6.8	0.01	0.009	47	78	63
6.8	6.7	0.02	0.016	53	66	60
6.7	6.6	0.01	0.010	54	64	59
6.6	6.5	0.02	0.023	64	85	74
Bridge						
6.3	6.2	0.01	0.008	54	54	54
6.2	6.1	0.01	0.009	45	50	47
6.1	6.0	0.02	0.014	55	59	57
6.0	5.9	0.01	0.011	57	60	58
5.9	5.8	0.03	0.017	45	52	48
5.8	5.7	0.03	0.015	41	64	53
5.7	5.6	0.03	0.018	41	49	45
5.6	5.5	0.02	0.012	53	58	56
5.5	5.4	0.01	0.009	48	56	52
5.4	5.3	0.02	0.014	50	48	49
5.3	5.2	0.01	0.011	47	47	47
5.2	5.1	0.02	0.013	46	53	49
5.1	5.0	0.01	0.006	49	71	60
5.0	4.9	0.02	0.014	47	75	61
4.9	4.8	0.01	0.009	44	49	46
4.8	4.7	0.02	0.013	48	43	45
4.7	4.6	0.03	0.020	52	45	48
4.6	4.5	0.03	0.021	45	53	49
4.5	4.4	0.02	0.014	47	58	53
4.4	4.3	0.01	0.009	52	73	62
4.3	4.2	0.01	0.011	58	56	57
4.2	4.1	0.02	0.014	43	53	48
4.1	4.0	0.02	0.015	44	46	45
4.0	3.9	0.01	0.012	44	59	52
Bridges						
3.6	3.5	0.01	0.007	41	41	41
3.5	3.4	0.01	0.012	45	51	48
3.4	3.3	0.01	0.010	43	54	49
3.3	3.2	0.01	0.012	51	54	53
3.2	3.1	0.01	0.009	51	69	60
3.1	3.0	0.01	0.007	45	63	54
3.0	2.9	0.01	0.008	49	66	58
2.9	2.8	0.01	0.006	42	54	48
2.8	2.7	0.01	0.010	48	72	60
2.7	2.6	0.01	0.005	51	61	56
2.6	2.5	0.00	0.005	44	45	44
2.5	2.4	0.12	0.163	45	50	47
2.4	2.3	0.00	0.003	50	64	57
2.3	2.2	0.01	0.011	55	50	52
Bridges						
1.7	1.6	0.00	0.000	52	69	60
1.6	1.5	0.01	0.007	41	46	44
1.5	1.4	0.03	0.014	47	49	48
1.4	1.3	0.01	0.010	67	69	68
1.3	1.2	0.02	0.016	56	52	54
1.2	1.1	0.02	0.016	57	61	59
1.1	1.0	0.03	0.021	42	52	47
1.0	0.9	0.01	0.012	50	56	53
0.9	0.8	0.01	0.006	40	49	44
0.8	0.7	0.01	0.011	47	57	52
0.7	0.6	0.02	0.013	54	58	56
0.6	0.5	0.01	0.012	46	55	51
0.5	0.4	0.02	0.022	59	62	61
0.4	0.3	0.02	0.014	49	61	55
0.3	0.2	0.01	0.009	54	62	58
0.2	0.1	0.02	0.013	92	88	90
0.1	0.0	0.05	0.046	118	139	129
Averages		**0.02**	**0.015**	**50**	**62**	**56**

Table D-3

Project: 819-02-0012
ICC Profiler Survey: 12/03/2002
Direction: East

FROM miles	TO miles	Rut Avg inches	Rut STD	IRI 1 in/mile	IRI 2 in/mile	Avg IRI in/mile
0.0	0.1	0.05	0.067	113	110	111
0.1	0.2	0.06	0.060	84	97	91
0.2	0.3	0.05	0.027	50	67	59
0.3	0.4	0.02	0.013	43	75	59
0.4	0.5	0.04	0.020	58	77	67
0.5	0.6	0.03	0.020	50	69	60
0.6	0.7	0.05	0.028	53	76	64
0.7	0.8	0.06	0.016	41	68	54
0.8	0.9	0.05	0.022	47	61	54
0.9	1.0	0.02	0.012	46	51	49
1.0	1.1	0.04	0.017	43	59	51
1.1	1.2	0.05	0.020	39	51	45
1.2	1.3	0.04	0.020	46	62	54
1.3	1.4	0.05	0.020	52	62	57
1.4	1.5	0.04	0.019	43	57	50
1.5	1.6	0.06	0.025	46	58	52
1.6	1.7	0.05	0.023	46	62	54
1.7	1.8	0.06	0.023	41	52	46
Bridges						
2.3	2.4	0.10	0.027	38	46	42
2.4	2.5	0.07	0.031	51	65	58
2.5	2.6	0.06	0.020	39	45	42
2.6	2.7	0.07	0.023	52	110	81
2.7	2.8	0.06	0.025	47	78	63
2.8	2.9	0.04	0.021	39	80	59
2.9	3.0	0.03	0.017	44	83	64
3.0	3.1	0.04	0.022	50	113	81
3.1	3.2	0.05	0.020	46	114	80
3.2	3.3	0.04	0.027	61	115	88
3.3	3.4	0.06	0.028	42	93	67
3.4	3.5	0.06	0.023	41	79	60
3.5	3.6	0.04	0.023	43	93	68
3.6	3.7	0.04	0.020	41	80	61
Bridge						
4.0	4.1	0.06	0.039	45	90	68
4.1	4.2	0.05	0.022	58	98	78
4.2	4.3	0.04	0.020	59	102	81
4.3	4.4	0.05	0.025	59	85	72
4.4	4.5	0.04	0.019	52	51	51
4.5	4.6	0.04	0.035	52	58	55
4.6	4.7	0.04	0.025	50	66	58
4.7	4.8	0.04	0.028	57	109	83
4.8	4.9	0.04	0.030	47	105	76
4.9	5.0	0.04	0.033	57	88	73
5.0	5.1	0.06	0.025	55	76	65
5.1	5.2	0.06	0.025	44	58	51
5.2	5.3	0.05	0.024	51	59	55
5.3	5.4	0.06	0.031	41	51	46
5.4	5.5	0.05	0.023	46	59	52
5.5	5.6	0.03	0.028	48	59	53
5.6	5.7	0.04	0.024	54	102	78
5.7	5.8	0.02	0.025	54	104	79
5.8	5.9	0.03	0.028	49	81	65
5.9	6.0	0.03	0.017	72	102	87
6.0	6.1	0.04	0.023	55	81	68
6.1	6.2	0.03	0.018	44	48	46
6.2	6.3	0.04	0.021	59	64	61
6.3	6.4	0.04	0.023	63	75	69
Bridge						
6.6	6.7	0.04	0.019	57	70	63
6.7	6.8	0.03	0.017	61	77	69
6.8	6.9	0.04	0.018	42	59	51
6.9	7.0	0.05	0.030	51	70	61
7.0	7.1	0.04	0.025	62	70	66
7.1	7.2	0.04	0.039	58	66	62
7.2	7.3	0.05	0.025	51	67	59
7.3	7.4	0.05	0.027	43	61	52
7.4	7.5	0.03	0.023	58	67	62
7.5	7.6	0.05	0.032	60	81	71
7.6	7.7	0.05	0.022	45	56	51
7.7	7.8	0.06	0.025	55	87	71
7.8	7.9	0.07	0.020	49	69	59
7.9	8.0	0.07	0.023	55	57	56
8.0	8.1	0.08	0.028	61	95	78
8.1	8.2	0.07	0.022	52	57	55
8.2	8.3	0.08	0.023	64	92	78
8.3	8.4	0.10	0.038	54	77	66
8.4	8.5	0.09	0.039	62	89	75
8.5	8.6	0.09	0.037	51	79	65
8.6	8.7	0.06	0.030	56	49	52
8.7	8.8	0.06	0.036	52	58	55
8.8	8.9	0.06	0.031	68	48	58
8.9	9.0	0.05	0.029	50	70	60
9.0	9.1	0.04	0.024	57	67	62
9.1	9.2	0.07	0.044	70	73	71
9.2	9.3	0.08	0.022	48	55	51
9.3	9.4	0.07	0.023	49	56	52
9.4	9.5	0.05	0.026	43	51	47
9.5	9.6	0.07	0.022	43	65	54
9.6	9.7	0.08	0.034	55	70	62
9.7	9.8	0.08	0.018	53	61	57
9.8	9.9	0.06	0.021	46	65	55
9.9	10.0	0.07	0.027	51	72	62
10.0	10.1	0.07	0.028	42	59	51
10.1	10.2	0.06	0.021	54	72	63
10.2	10.3	0.10	0.028	51	69	60
10.3	10.4	0.09	0.044	41	59	50
10.4	10.5	0.05	0.029	66	92	79
10.5	10.6	0.06	0.036	58	76	67
10.6	10.7	0.06	0.022	51	67	59
10.7	10.8	0.08	0.032	44	65	54
10.8	10.9	0.09	0.022	47	58	53
10.9	11.0	0.09	0.032	51	64	57
11.0	11.1	0.05	0.023	56	68	62
11.1	11.2	0.06	0.019	55	60	58
11.2	11.3	0.08	0.026	51	74	62
11.3	11.4	0.06	0.023	74	71	72
11.4	11.5	0.05	0.024	62	62	62
11.5	11.6	0.06	0.021	56	67	61
11.6	11.7	0.08	0.023	79	74	77
11.7	11.8	0.07	0.019	51	61	56
11.8	11.9	0.04	0.025	58	69	64
11.9	12.0	0.07	0.027	61	76	68
12.0	12.1	0.08	0.029	69	87	78
Averages		**0.06**	**0.026**	**53**	**73**	**63**

Table D-4

Project: 819-02-0012
ICC Profiler Survey: 12/03/2002
Direction: West

FROM miles	TO miles	Rut Avg inches	Rut STD	IRI 1 in/mile	IRI 2 in/mile	Avg IRI in/mile
12.1	12.0	0.05	0.021	55	73	64
12.0	11.9	0.06	0.018	51	60	55
11.9	11.8	0.06	0.022	47	63	55
11.8	11.7	0.06	0.021	46	55	50
11.7	11.6	0.05	0.032	78	99	89
11.6	11.5	0.04	0.026	46	63	54
11.5	11.4	0.04	0.020	57	66	62
11.4	11.3	0.05	0.021	50	59	55
11.3	11.2	0.06	0.028	55	66	60
11.2	11.1	0.07	0.028	47	62	54
11.1	11.0	0.08	0.024	41	52	46
11.0	10.9	0.06	0.019	43	56	50
10.9	10.8	0.06	0.021	41	61	51
10.8	10.7	0.05	0.021	48	64	56
10.7	10.6	0.04	0.020	45	55	50
10.6	10.5	0.03	0.017	55	62	58
10.5	10.4	0.04	0.022	47	55	51
10.4	10.3	0.05	0.019	48	61	55
10.3	10.2	0.05	0.023	49	66	58
10.2	10.1	0.06	0.020	43	72	57
10.1	10.0	0.05	0.023	40	60	50
10.0	9.9	0.06	0.025	45	62	54
9.9	9.8	0.05	0.019	42	59	50
9.8	9.7	0.05	0.023	58	65	61
9.7	9.6	0.03	0.018	49	55	52
9.6	9.5	0.04	0.020	67	76	72
9.5	9.4	0.05	0.017	46	64	55
9.4	9.3	0.05	0.022	45	72	58
9.3	9.2	0.05	0.019	55	78	66
9.2	9.1	0.04	0.020	46	60	53
9.1	9.0	0.04	0.022	41	47	44
9.0	8.9	0.04	0.017	44	59	51
8.9	8.8	0.05	0.023	48	69	58
8.8	8.7	0.07	0.027	53	73	63
8.7	8.6	0.06	0.027	77	80	79
8.6	8.5	0.02	0.015	52	90	71
8.5	8.4	0.03	0.017	49	62	56
8.4	8.3	0.03	0.017	51	66	58
8.3	8.2	0.02	0.015	41	54	47
8.2	8.1	0.04	0.027	52	91	72
8.1	8.0	0.04	0.020	44	41	43
8.0	7.9	0.02	0.017	46	48	47
7.9	7.8	0.03	0.014	44	71	58
7.8	7.7	0.03	0.025	53	70	62
7.7	7.6	0.02	0.014	45	58	52
7.6	7.5	0.02	0.015	51	72	62
7.5	7.4	0.02	0.011	43	49	46
7.4	7.3	0.03	0.014	39	54	47
7.3	7.2	0.03	0.017	41	59	50
7.2	7.1	0.03	0.017	40	65	52
7.1	7.0	0.02	0.015	46	68	57
7.0	6.9	0.02	0.014	47	76	62
6.9	6.8	0.03	0.021	49	64	57
6.8	6.7	0.02	0.020	51	63	57
6.7	6.6	0.03	0.021	56	83	69
6.6	6.5	0.02	0.016	40	48	44
Bridge						
6.3	6.2	0.02	0.013	38	45	41
6.2	6.1	0.03	0.021	54	64	59
6.1	6.0	0.03	0.019	56	64	60
6.0	5.9	0.05	0.022	47	55	51
5.9	5.8	0.05	0.023	43	66	55
5.8	5.7	0.06	0.025	40	49	45
5.7	5.6	0.04	0.030	52	59	56
5.6	5.5	0.02	0.017	51	59	55
5.5	5.4	0.03	0.022	52	50	51
5.4	5.3	0.02	0.022	66	56	61
5.3	5.2	0.03	0.017	42	53	47
5.2	5.1	0.01	0.013	44	72	58
5.1	5.0	0.03	0.019	47	78	62
5.0	4.9	0.03	0.017	44	48	46
4.9	4.8	0.04	0.016	46	41	44
4.8	4.7	0.05	0.023	49	47	48
4.7	4.6	0.04	0.027	43	55	49
4.6	4.5	0.04	0.022	51	61	56
4.5	4.4	0.02	0.015	48	73	60
4.4	4.3	0.02	0.015	55	55	55
4.3	4.2	0.03	0.018	43	52	47
4.2	4.1	0.05	0.023	43	49	46
4.1	4.0	0.03	0.018	47	60	54
4.0	3.9	0.02	0.020	53	62	58
Bridges						
3.6	3.5	0.03	0.015	47	52	49
3.5	3.4	0.02	0.014	46	56	51
3.4	3.3	0.03	0.022	52	60	56
3.3	3.2	0.02	0.016	50	68	59
3.2	3.1	0.03	0.027	46	69	58
3.1	3.0	0.02	0.019	48	74	61
3.0	2.9	0.02	0.020	41	59	50
2.9	2.8	0.02	0.013	51	75	63
2.8	2.7	0.02	0.014	49	64	57
2.7	2.6	0.02	0.011	40	46	43
2.6	2.5	0.01	0.008	46	52	49
2.5	2.4	0.01	0.010	50	67	58
2.4	2.3	0.02	0.014	52	50	51
2.3	2.2	0.02	0.013	53	75	64
Bridges						
1.7	1.6	0.01	0.013	41	45	43
1.6	1.5	0.02	0.018	45	52	49
1.5	1.4	0.04	0.023	62	65	63
1.4	1.3	0.03	0.017	53	49	51
1.3	1.2	0.04	0.019	55	57	56
1.2	1.1	0.05	0.017	44	57	50
1.1	1.0	0.03	0.017	56	62	59
1.0	0.9	0.02	0.011	46	53	49
0.9	0.8	0.03	0.018	46	57	52
0.8	0.7	0.04	0.019	52	57	55
0.7	0.6	0.03	0.021	45	56	51
0.6	0.5	0.04	0.026	58	64	61
0.5	0.4	0.05	0.028	48	61	54
0.4	0.3	0.02	0.016	53	60	57
0.3	0.2	0.03	0.024	86	87	87
0.2	0.1	0.04	0.047	106	119	113
0.1	0.0	0.02	0.012	81	66	74
Averages		**0.04**	**0.020**	**50**	**62**	**56**

Table D-5

Project: 819-02-0012
ICC Profiler Survey: 5/19/2003
Direction: East

FROM miles	TO miles	Rut Avg inches	Rut STD	IRI 1 in/mile	IRI 2 in/mile	Avg IRI in/mile
0.0	0.1	0.08	0.076	136	130	133
0.1	0.2	0.04	0.040	93	97	95
0.2	0.3	0.01	0.010	54	67	60
0.3	0.4	0.10	0.059	51	92	71
0.4	0.5	0.01	0.009	60	81	70
0.5	0.6	0.01	0.005	53	69	61
0.6	0.7	0.01	0.007	59	79	69
0.7	0.8	0.00	0.000	50	79	64
0.8	0.9	0.05	0.000	52	70	61
0.9	1.0	0.00	0.000	46	52	49
1.0	1.1	0.01	0.006	42	58	50
1.1	1.2	0.02	0.016	44	54	49
1.2	1.3	0.01	0.010	49	63	56
1.3	1.4	0.01	0.007	52	65	59
1.4	1.5	0.00	0.003	46	64	55
1.5	1.6	0.01	0.011	45	49	47
1.6	1.7	0.00	0.000	53	65	59
1.7	1.8	0.00	0.000	45	57	51
Bridges						
2.3	2.4	0.01	0.011	37	56	47
2.4	2.5	0.01	0.007	59	57	58
2.5	2.6	0.01	0.008	39	46	43
2.6	2.7	0.02	0.016	62	123	93
2.7	2.8	0.01	0.009	53	89	71
2.8	2.9	0.01	0.011	44	98	71
2.9	3.0	0.02	0.016	51	97	74
3.0	3.1	0.01	0.010	65	133	99
3.1	3.2	0.02	0.013	61	137	99
3.2	3.3	0.02	0.017	72	130	101
3.3	3.4	0.02	0.014	53	102	78
3.4	3.5	0.01	0.007	50	98	74
3.5	3.6	0.01	0.010	54	108	81
3.6	3.7	0.01	0.009	52	97	75
Bridge						
4.0	4.1	0.01	0.009	51	90	71
4.1	4.2	0.01	0.011	62	98	80
4.2	4.3	0.01	0.011	62	107	84
4.3	4.4	0.03	0.019	60	68	64
4.4	4.5	0.01	0.006	54	53	54
4.5	4.6	0.01	0.007	48	50	49
4.6	4.7	0.01	0.007	58	65	61
4.7	4.8	0.01	0.009	61	86	74
4.8	4.9	0.01	0.008	53	109	81
4.9	5.0	0.01	0.005	54	94	74
5.0	5.1	0.01	0.009	51	71	61
5.1	5.2	0.02	0.015	48	56	52
5.2	5.3	0.02	0.013	50	58	54
5.3	5.4	0.02	0.014	41	47	44
5.4	5.5	0.07	0.093	151	133	142
5.5	5.6	0.03	0.040	50	60	55
5.6	5.7	0.01	0.010	60	102	81
5.7	5.8	0.01	0.011	60	111	86
5.8	5.9	0.02	0.012	49	85	67
5.9	6.0	0.01	0.008	66	107	86
6.0	6.1	0.01	0.010	58	81	69
6.1	6.2	0.01	0.008	39	47	43
6.2	6.3	0.02	0.012	50	55	53
6.3	6.4	0.04	0.032	60	78	69
Bridges						
6.6	6.7	0.03	0.022	54	71	62
6.7	6.8	0.03	0.019	58	71	64
6.8	6.9	0.06	0.106	48	57	52
6.9	7.0	0.11	0.178	60	59	59
7.0	7.1	0.02	0.014	46	62	54
7.1	7.2	0.03	0.020	55	75	65
7.2	7.3	0.03	0.019	52	65	58
7.3	7.4	0.05	0.028	54	58	56
7.4	7.5	0.04	0.026	61	63	62
7.5	7.6	0.04	0.020	62	77	70
7.6	7.7	0.04	0.020	43	52	48
7.7	7.8	0.03	0.020	60	77	69
7.8	7.9	0.02	0.013	55	91	73
7.9	8.0	0.02	0.014	55	63	59
8.0	8.1	0.02	0.018	67	113	90
8.1	8.2	0.04	0.024	45	62	54
8.2	8.3	0.03	0.021	68	102	85
8.3	8.4	0.08	0.037	56	75	65
8.4	8.5	0.07	0.036	69	82	75
8.5	8.6	0.08	0.033	57	84	71
8.6	8.7	0.03	0.025	46	58	52
8.7	8.8	0.04	0.029	51	52	52
8.8	8.9	0.02	0.016	50	46	48
8.9	9.0	0.03	0.021	50	62	56
9.0	9.1	0.03	0.018	48	56	52
9.1	9.2	0.02	0.020	81	80	80
9.2	9.3	0.02	0.015	50	59	55
9.3	9.4	0.02	0.012	57	59	58
9.4	9.5	0.02	0.017	46	54	50
9.5	9.6	0.02	0.013	47	75	61
9.6	9.7	0.04	0.035	59	78	68
9.7	9.8	0.02	0.015	57	67	62
9.8	9.9	0.04	0.020	46	63	54
9.9	10.0	0.04	0.020	51	71	61
10.0	10.1	0.01	0.007	45	72	59
10.1	10.2	0.02	0.012	55	75	65
10.2	10.3	0.03	0.016	56	74	65
10.3	10.4	0.05	0.029	46	58	52
10.4	10.5	0.04	0.025	63	95	79
10.5	10.6	0.05	0.034	59	73	66
10.6	10.7	0.03	0.019	58	71	64
10.7	10.8	0.05	0.028	52	60	56
10.8	10.9	0.04	0.027	46	57	52
10.9	11.0	0.07	0.034	49	66	58
11.0	11.1	0.05	0.022	57	68	63
11.1	11.2	0.03	0.017	58	62	60
11.2	11.3	0.03	0.020	53	75	64
11.3	11.4	0.02	0.015	76	72	74
11.4	11.5	0.03	0.020	52	53	52
11.5	11.6	0.03	0.016	57	60	59
11.6	11.7	0.03	0.022	117	112	114
11.7	11.8	0.02	0.022	47	67	57
11.8	11.9	0.01	0.009	57	77	67
11.9	12.0	0.01	0.007	68	85	77
12.0	12.1	0.03	0.021	68	84	76
Averages		**0.03**	**0.020**	**57**	**76**	**66**

Table D-6

Project: 819-02-0012
ICC Profiler Survey: 5/19/2003
Direction: West

FROM miles	TO miles	Rut Avg inches	Rut STD	IRI 1 in/mile	IRI 2 in/mile	Avg IRI in/mile
12.1	12.0	0.04	0.022	53	73	63
12.0	11.9	0.02	0.015	46	69	58
11.9	11.8	0.04	0.020	42	62	52
11.8	11.7	0.05	0.022	46	60	53
11.7	11.6	0.04	0.049	103	125	114
11.6	11.5	0.04	0.025	50	73	62
11.5	11.4	0.03	0.018	45	59	52
11.4	11.3	0.04	0.021	55	66	61
11.3	11.2	0.03	0.020	45	66	56
11.2	11.1	0.03	0.019	49	67	58
11.1	11.0	0.03	0.022	40	59	49
11.0	10.9	0.03	0.022	43	59	51
10.9	10.8	0.03	0.016	44	71	57
10.8	10.7	0.02	0.015	48	68	58
10.7	10.6	0.02	0.017	44	60	52
10.6	10.5	0.03	0.019	43	69	56
10.5	10.4	0.02	0.014	43	70	57
10.4	10.3	0.03	0.016	50	71	60
10.3	10.2	0.02	0.013	57	80	69
10.2	10.1	0.03	0.019	45	77	61
10.1	10.0	0.05	0.018	42	72	57
10.0	9.9	0.03	0.016	45	69	57
9.9	9.8	0.03	0.016	45	83	64
9.8	9.7	0.04	0.024	57	67	62
9.7	9.6	0.03	0.021	48	69	59
9.6	9.5	0.04	0.016	49	79	64
9.5	9.4	0.03	0.017	49	81	65
9.4	9.3	0.03	0.017	56	87	71
9.3	9.2	0.03	0.016	58	90	74
9.2	9.1	0.04	0.021	47	64	55
9.1	9.0	0.03	0.022	46	50	48
9.0	8.9	0.04	0.019	49	64	56
8.9	8.8	0.04	0.018	49	74	62
8.8	8.7	0.05	0.031	59	81	70
8.7	8.6	0.03	0.020	76	81	79
8.6	8.5	0.02	0.017	55	94	75
8.5	8.4	0.04	0.020	54	65	59
8.4	8.3	0.04	0.026	58	73	66
8.3	8.2	0.04	0.024	42	62	52
8.2	8.1	0.07	0.036	60	90	75
8.1	8.0	0.04	0.022	52	42	47
8.0	7.9	0.03	0.020	48	53	50
7.9	7.8	0.04	0.023	51	77	64
7.8	7.7	0.04	0.026	62	72	67
7.7	7.6	0.03	0.018	50	68	59
7.6	7.5	0.04	0.023	59	87	73
7.5	7.4	0.03	0.019	45	52	48
7.4	7.3	0.03	0.017	46	64	55
7.3	7.2	0.03	0.018	42	60	51
7.2	7.1	0.05	0.024	41	65	53
7.1	7.0	0.03	0.016	50	74	62
7.0	6.9	0.02	0.017	51	81	66
6.9	6.8	0.04	0.025	58	71	65
6.8	6.7	0.05	0.028	49	63	56
6.7	6.6	0.03	0.021	58	83	71
6.6	6.5	0.02	0.012	38	40	39
Bridge						
6.3	6.2	0.03	0.016	47	56	52
6.2	6.1	0.04	0.023	56	54	55
6.1	6.0	0.04	0.019	57	66	62
6.0	5.9	0.03	0.016	50	66	58
5.9	5.8	0.04	0.021	43	67	55
5.8	5.7	0.05	0.027	42	58	50
5.7	5.6	0.03	0.023	60	64	62
5.6	5.5	0.02	0.037	86	72	79
5.5	5.4	0.02	0.011	45	51	48
5.4	5.3	0.01	0.011	48	59	54
5.3	5.2	0.01	0.010	44	55	50
5.2	5.1	0.00	0.004	51	77	64
5.1	5.0	0.02	0.013	49	78	64
5.0	4.9	0.02	0.015	42	46	44
4.9	4.8	0.02	0.015	43	44	43
4.8	4.7	0.03	0.017	48	45	46
4.7	4.6	0.02	0.015	43	61	52
4.6	4.5	0.02	0.016	47	64	56
4.5	4.4	0.02	0.013	56	82	69
4.4	4.3	0.01	0.011	57	52	55
4.3	4.2	0.02	0.015	45	54	50
4.2	4.1	0.02	0.015	42	49	45
4.1	4.0	0.01	0.012	45	69	57
4.0	3.9	0.01	0.011	50	64	57
Bridges						
3.6	3.5	0.01	0.008	46	55	50
3.5	3.4	0.02	0.011	44	62	53
3.4	3.3	0.02	0.013	50	56	53
3.3	3.2	0.01	0.011	50	69	60
3.2	3.1	0.04	0.034	44	79	62
3.1	3.0	0.01	0.011	53	80	66
3.0	2.9	0.01	0.005	39	65	52
2.9	2.8	0.01	0.008	54	81	68
2.8	2.7	0.03	0.050	52	75	64
2.7	2.6	0.00	0.004	37	51	44
2.6	2.5	0.01	0.009	40	59	49
2.5	2.4	0.01	0.005	53	67	60
2.4	2.3	0.01	0.006	46	53	49
2.3	2.2	0.01	0.007	55	78	66
Bridges						
1.7	1.6	0.01	0.012	40	47	43
1.6	1.5	0.01	0.009	43	53	48
1.5	1.4	0.01	0.013	61	63	62
1.4	1.3	0.01	0.007	47	56	52
1.3	1.2	0.02	0.016	52	58	55
1.2	1.1	0.03	0.017	44	64	54
1.1	1.0	0.02	0.017	57	66	62
1.0	0.9	0.00	0.004	44	53	49
0.9	0.8	0.02	0.012	48	60	54
0.8	0.7	0.03	0.018	54	60	57
0.7	0.6	0.02	0.018	46	63	54
0.6	0.5	0.03	0.019	63	59	61
0.5	0.4	0.04	0.019	50	73	62
0.4	0.3	0.02	0.015	57	71	64
0.3	0.2	0.01	0.012	84	88	86
0.2	0.1	0.05	0.042	107	122	114
0.1	0.0	0.01	0.009	62	66	64
Averages		**0.03**	**0.018**	**51**	**67**	**59**

Table D-7

Project: 819-02-0012
ICC Profiler Survey: 11/04/2003
Direction: East

FROM miles	TO miles	Rut Avg inches	Rut STD	IRI 1 in/mile	IRI 2 in/mile	Avg IRI in/mile
0.0	0.1	0.03	0.018	70	71	70
0.1	0.2	0.07	0.055	92	92	92
0.2	0.3	0.06	0.032	52	70	61
0.3	0.4	0.03	0.022	52	84	68
0.4	0.5	0.04	0.018	59	79	69
0.5	0.6	0.03	0.025	56	70	63
0.6	0.7	0.06	0.029	59	81	70
0.7	0.8	0.05	0.028	48	76	62
0.8	0.9	0.05	0.029	48	66	57
0.9	1.0	0.03	0.022	48	51	50
1.0	1.1	0.04	0.027	44	58	51
1.1	1.2	0.05	0.019	42	54	48
1.2	1.3	0.05	0.023	49	62	55
1.3	1.4	0.04	0.021	51	66	58
1.4	1.5	0.05	0.023	47	63	55
1.5	1.6	0.02	0.015	47	51	49
1.6	1.7	0.03	0.021	50	62	56
1.7	1.8	0.08	0.039	42	53	48
Bridge						
2.3	2.4	0.04	0.024	39	58	49
2.4	2.5	0.01	0.010	62	65	63
2.5	2.6	0.06	0.031	39	49	44
2.6	2.7	0.10	0.032	54	112	83
2.7	2.8	0.07	0.025	51	82	67
2.8	2.9	0.07	0.025	41	94	68
2.9	3.0	0.07	0.026	46	93	70
3.0	3.1	0.06	0.023	57	122	89
3.1	3.2	0.06	0.020	58	131	94
3.2	3.3	0.04	0.025	67	129	98
3.3	3.4	0.04	0.023	51	98	74
3.4	3.5	0.05	0.023	46	96	71
3.5	3.6	0.05	0.022	51	102	76
3.6	3.7	0.03	0.018	49	98	74
Bridge						
4.0	4.1	0.07	0.021	48	88	68
4.1	4.2	0.04	0.020	61	99	80
4.2	4.3	0.05	0.028	55	104	79
4.3	4.4	0.05	0.030	56	71	64
4.4	4.5	0.04	0.019	51	49	50
4.5	4.6	0.07	0.028	51	53	52
4.6	4.7	0.07	0.034	54	65	59
4.7	4.8	0.03	0.017	60	86	73
4.8	4.9	0.07	0.036	48	105	76
4.9	5.0	0.08	0.023	48	93	70
5.0	5.1	0.05	0.029	50	69	59
5.1	5.2	0.04	0.027	48	59	53
5.2	5.3	0.05	0.028	51	60	56
5.3	5.4	0.03	0.020	44	49	46
5.4	5.5	0.07	0.034	46	58	52
5.5	5.6	0.04	0.026	46	56	51
5.6	5.7	0.04	0.023	57	104	81
5.7	5.8	0.04	0.026	57	109	83
5.8	5.9	0.03	0.018	50	92	71
5.9	6.0	0.02	0.015	65	109	87
6.0	6.1	0.04	0.025	63	87	75
6.1	6.2	0.03	0.015	41	49	45
6.2	6.3	0.04	0.024	49	58	53
6.3	6.4	0.04	0.035	62	83	72
Bridges						
6.6	6.7	0.08	0.020	55	72	64
6.7	6.8	0.05	0.025	69	79	74
6.8	6.9	0.07	0.024	44	62	53
6.9	7.0	0.07	0.022	46	64	55
7.0	7.1	0.06	0.021	47	63	55
7.1	7.2	0.06	0.026	51	67	59
7.2	7.3	0.07	0.024	52	67	59
7.3	7.4	0.07	0.029	42	60	51
7.4	7.5	0.07	0.021	47	57	52
7.5	7.6	0.09	0.029	60	74	67
7.6	7.7	0.08	0.019	38	51	45
7.7	7.8	0.08	0.022	59	76	67
7.8	7.9	0.10	0.025	50	79	65
7.9	8.0	0.08	0.024	52	59	55
8.0	8.1	0.07	0.036	63	104	83
8.1	8.2	0.08	0.036	45	65	55
8.2	8.3	0.06	0.030	68	102	85
8.3	8.4	0.06	0.043	57	73	65
8.4	8.5	0.11	0.039	62	81	71
8.5	8.6	0.13	0.030	52	83	67
8.6	8.7	0.08	0.024	45	63	54
8.7	8.8	0.09	0.028	53	56	55
8.8	8.9	0.05	0.026	52	53	53
8.9	9.0	0.05	0.027	50	64	57
9.0	9.1	0.03	0.017	47	59	53
9.1	9.2	0.07	0.039	72	76	74
9.2	9.3	0.05	0.027	50	58	54
9.3	9.4	0.05	0.021	53	60	57
9.4	9.5	0.04	0.021	43	54	48
9.5	9.6	0.04	0.017	45	77	61
9.6	9.7	0.07	0.035	56	78	67
9.7	9.8	0.05	0.022	54	63	58
9.8	9.9	0.05	0.028	50	67	58
9.9	10.0	0.05	0.022	50	72	61
10.0	10.1	0.02	0.015	51	76	64
10.1	10.2	0.04	0.019	57	77	67
10.2	10.3	0.02	0.013	57	79	68
10.3	10.4	0.07	0.034	47	63	55
10.4	10.5	0.07	0.033	63	97	80
10.5	10.6	0.10	0.037	56	75	66
10.6	10.7	0.09	0.026	58	71	64
10.7	10.8	0.10	0.029	47	63	55
10.8	10.9	0.10	0.028	51	58	54
10.9	11.0	0.13	0.030	49	64	57
11.0	11.1	0.07	0.021	56	67	62
11.1	11.2	0.08	0.023	59	64	61
11.2	11.3	0.08	0.036	50	75	63
11.3	11.4	0.06	0.025	67	66	67
11.4	11.5	0.05	0.021	48	54	51
11.5	11.6	0.04	0.016	54	59	56
11.6	11.7	0.05	0.028	47	65	56
11.7	11.8	0.05	0.029	53	77	65
11.8	11.9	0.06	0.030	57	72	64
11.9	12.0	0.04	0.031	67	87	77
12.0	12.1	0.05	0.032	70	85	78
Averages		**0.06**	**0.026**	**53**	**74**	**63**

Table D-8

Project: 819-02-0012
ICC Profiler Survey: 11/04/2003
Direction: West

FROM miles	TO miles	Rut Avg inches	Rut STD	IRI 1 in/mile	IRI 2 in/mile	Avg IRI in/mile
12.1	12.0	0.06	0.024	50	63	57
12.0	11.9	0.06	0.024	62	90	76
11.9	11.8	0.09	0.025	57	67	62
11.8	11.7	0.08	0.024	53	60	56
11.7	11.6	0.09	0.024	49	65	57
11.6	11.5	0.04	0.031	49	69	59
11.5	11.4	0.04	0.026	45	67	56
11.4	11.3	0.05	0.021	47	70	58
11.3	11.2	0.06	0.029	46	60	53
11.2	11.1	0.06	0.024	50	63	57
11.1	11.0	0.07	0.019	45	69	57
11.0	10.9	0.08	0.025	47	65	56
10.9	10.8	0.07	0.026	37	55	46
10.8	10.7	0.06	0.021	42	60	51
10.7	10.6	0.08	0.022	42	66	54
10.6	10.5	0.07	0.025	47	70	58
10.5	10.4	0.06	0.021	43	58	50
10.4	10.3	0.07	0.026	47	67	57
10.3	10.2	0.05	0.019	46	71	59
10.2	10.1	0.08	0.022	53	65	59
10.1	10.0	0.07	0.021	55	74	64
10.0	9.9	0.07	0.022	49	77	63
9.9	9.8	0.07	0.020	43	75	59
9.8	9.7	0.07	0.021	47	68	58
9.7	9.6	0.07	0.019	44	81	63
9.6	9.5	0.08	0.023	57	70	64
9.5	9.4	0.05	0.021	45	66	56
9.4	9.3	0.07	0.020	57	91	74
9.3	9.2	0.07	0.020	55	82	68
9.2	9.1	0.05	0.027	53	84	68
9.1	9.0	0.06	0.019	60	88	74
9.0	8.9	0.08	0.019	47	64	56
8.9	8.8	0.06	0.020	42	48	45
8.8	8.7	0.07	0.024	53	69	61
8.7	8.6	0.08	0.022	51	79	65
8.6	8.5	0.08	0.031	62	77	69
8.5	8.4	0.05	0.028	76	83	80
8.4	8.3	0.06	0.027	57	94	75
8.3	8.2	0.07	0.023	53	71	62
8.2	8.1	0.07	0.033	54	71	63
8.1	8.0	0.07	0.029	42	60	51
8.0	7.9	0.10	0.039	61	96	78
7.9	7.8	0.07	0.024	47	49	48
7.8	7.7	0.08	0.022	48	52	50
7.7	7.6	0.08	0.032	52	76	64
7.6	7.5	0.09	0.053	57	87	72
7.5	7.4	0.07	0.020	49	69	59
7.4	7.3	0.09	0.033	56	92	74
7.3	7.2	0.08	0.027	45	60	52
7.2	7.1	0.08	0.020	43	61	52
7.1	7.0	0.08	0.025	46	64	55
7.0	6.9	0.08	0.028	43	68	55
6.9	6.8	0.06	0.019	50	79	65
6.8	6.7	0.06	0.020	47	82	65
6.7	6.6	0.07	0.028	56	70	63
6.6	6.5	0.10	0.026	56	69	62
Bridge						
6.3	6.2	0.06	0.023	58	70	64
6.2	6.1	0.06	0.022	52	56	54
6.1	6.0	0.06	0.024	38	51	45
6.0	5.9	0.07	0.023	58	60	59
5.9	5.8	0.07	0.022	57	64	61
5.8	5.7	0.08	0.032	48	60	54
5.7	5.6	0.09	0.032	46	74	60
5.6	5.5	0.09	0.034	42	57	50
5.5	5.4	0.05	0.034	44	54	49
5.4	5.3	0.03	0.018	52	61	57
5.3	5.2	0.04	0.023	56	51	53
5.2	5.1	0.03	0.016	47	60	54
5.1	5.0	0.03	0.018	44	57	50
5.0	4.9	0.03	0.019	52	77	65
4.9	4.8	0.06	0.026	49	80	64
4.8	4.7	0.03	0.021	46	50	48
4.7	4.6	0.05	0.022	48	46	47
4.6	4.5	0.06	0.038	45	49	47
4.5	4.4	0.04	0.023	44	57	51
4.4	4.3	0.04	0.022	52	64	58
4.3	4.2	0.04	0.019	59	88	74
4.2	4.1	0.04	0.021	59	52	55
4.1	4.0	0.05	0.031	46	56	51
4.0	3.9	0.05	0.020	41	52	47
Bridges						
3.6	3.5	0.04	0.017	48	52	50
3.5	3.4	0.03	0.017	40	43	41
3.4	3.3	0.02	0.015	46	55	51
3.3	3.2	0.02	0.016	46	63	54
3.2	3.1	0.03	0.018	50	57	54
3.1	3.0	0.02	0.016	54	73	64
3.0	2.9	0.04	0.039	45	90	67
2.9	2.8	0.02	0.017	54	77	65
2.8	2.7	0.02	0.014	39	66	53
2.7	2.6	0.02	0.014	54	85	69
2.6	2.5	0.02	0.032	49	76	63
2.5	2.4	0.01	0.010	37	58	48
2.4	2.3	0.01	0.010	43	67	55
2.3	2.2	0.03	0.018	52	76	64
Bridges						
1.7	1.6	0.01	0.010	49	59	54
1.6	1.5	0.02	0.014	58	81	69
1.5	1.4	0.02	0.016	42	49	46
1.4	1.3	0.02	0.013	46	52	49
1.3	1.2	0.03	0.017	64	63	63
1.2	1.1	0.03	0.015	50	57	53
1.1	1.0	0.04	0.027	55	59	57
1.0	0.9	0.05	0.028	48	65	57
0.9	0.8	0.04	0.026	55	62	59
0.8	0.7	0.02	0.013	46	56	51
0.7	0.6	0.03	0.023	47	62	55
0.6	0.5	0.06	0.030	55	60	58
0.5	0.4	0.06	0.027	45	60	52
0.4	0.3	0.04	0.026	61	61	61
0.3	0.2	0.07	0.037	50	75	62
0.2	0.1	0.04	0.027	57	67	62
0.1	0.0	0.04	0.033	83	89	86
Averages		**0.06**	**0.023**	**50**	**67**	**59**

Table D-9

Project: 819-02-0012
ICC Profiler Survey: 05/11/2004
Direction: East

FROM miles	TO miles	Rut Avg inches	Rut STD	IRI 1 in/mile	IRI 2 in/mile	Avg IRI in/mile
0.0	0.1	0.03	0.019	58	64	61
0.1	0.2	0.10	0.066	88	92	90
0.2	0.3	0.07	0.038	52	67	59
0.3	0.4	0.04	0.023	47	72	60
0.4	0.5	0.07	0.028	59	77	68
0.5	0.6	0.05	0.026	51	66	58
0.6	0.7	0.08	0.033	58	81	69
0.7	0.8	0.10	0.022	46	70	58
0.8	0.9	0.09	0.026	57	67	62
0.9	1.0	0.03	0.017	45	48	46
1.0	1.1	0.06	0.027	48	65	56
1.1	1.2	0.08	0.023	45	56	51
1.2	1.3	0.07	0.026	54	64	59
1.3	1.4	0.08	0.022	53	64	58
1.4	1.5	0.07	0.024	47	62	54
1.5	1.6	0.08	0.027	47	50	49
1.6	1.7	0.06	0.022	50	59	54
1.7	1.8	0.05	0.020	42	56	49
Bridges						
2.3	2.4	0.11	0.030	38	70	54
2.4	2.5	0.11	0.029	50	71	60
2.5	2.6	0.10	0.026	44	49	47
2.6	2.7	0.11	0.029	56	112	84
2.7	2.8	0.09	0.031	50	79	64
2.8	2.9	0.08	0.026	40	85	62
2.9	3.0	0.08	0.020	44	89	66
3.0	3.1	0.07	0.031	59	119	89
3.1	3.2	0.07	0.022	54	126	90
3.2	3.3	0.04	0.026	64	123	93
3.3	3.4	0.05	0.034	49	99	74
3.4	3.5	0.11	0.025	42	88	65
3.5	3.6	0.07	0.032	53	100	76
3.6	3.7	0.06	0.024	48	93	70
Bridge						
4.0	4.1	0.09	0.024	47	77	62
4.1	4.2	0.09	0.024	56	95	75
4.2	4.3	0.09	0.023	48	90	69
4.3	4.4	0.10	0.024	52	67	59
4.4	4.5	0.07	0.024	52	49	51
4.5	4.6	0.06	0.024	49	52	50
4.6	4.7	0.08	0.025	53	62	58
4.7	4.8	0.05	0.025	60	85	73
4.8	4.9	0.08	0.027	54	101	78
4.9	5.0	0.09	0.023	47	88	67
5.0	5.1	0.10	0.022	49	74	61
5.1	5.2	0.10	0.023	47	63	55
5.2	5.3	0.08	0.024	56	65	60
5.3	5.4	0.08	0.037	43	52	47
5.4	5.5	0.10	0.028	49	51	50
5.5	5.6	0.07	0.023	46	55	50
5.6	5.7	0.08	0.026	54	93	73
5.7	5.8	0.05	0.024	53	106	80
5.8	5.9	0.07	0.025	49	81	65
5.9	6.0	0.06	0.022	60	98	79
6.0	6.1	0.07	0.023	59	80	70
6.1	6.2	0.06	0.022	43	46	45
6.2	6.3	0.07	0.024	48	52	50
6.3	6.4	0.08	0.028	64	72	68
Bridges						
6.6	6.7	0.09	0.023	55	71	63
6.7	6.8	0.05	0.021	65	70	67
6.8	6.9	0.08	0.021	44	58	51
6.9	7.0	0.08	0.018	44	57	51
7.0	7.1	0.08	0.019	41	59	50
7.1	7.2	0.08	0.027	50	64	57
7.2	7.3	0.08	0.021	49	58	53
7.3	7.4	0.09	0.025	41	55	48
7.4	7.5	0.07	0.021	48	56	52
7.5	7.6	0.10	0.035	58	74	66
7.6	7.7	0.09	0.018	46	56	51
7.7	7.8	0.10	0.039	57	77	67
7.8	7.9	0.12	0.020	51	75	63
7.9	8.0	0.10	0.022	53	53	53
8.0	8.1	0.12	0.028	55	89	72
8.1	8.2	0.11	0.025	53	63	58
8.2	8.3	0.10	0.034	65	91	78
8.3	8.4	0.13	0.039	61	78	69
8.4	8.5	0.13	0.043	60	79	69
8.5	8.6	0.14	0.034	50	80	65
8.6	8.7	0.12	0.027	45	54	50
8.7	8.8	0.10	0.030	52	49	50
8.8	8.9	0.09	0.040	55	50	53
8.9	9.0	0.09	0.033	50	58	54
9.0	9.1	0.08	0.024	47	53	50
9.1	9.2	0.09	0.034	73	72	73
9.2	9.3	0.11	0.023	49	58	53
9.3	9.4	0.11	0.019	57	62	59
9.4	9.5	0.11	0.022	44	48	46
9.5	9.6	0.11	0.022	44	63	54
9.6	9.7	0.09	0.030	52	69	60
9.7	9.8	0.11	0.019	56	64	60
9.8	9.9	0.12	0.021	44	57	50
9.9	10.0	0.11	0.022	51	70	60
10.0	10.1	0.11	0.027	46	65	56
10.1	10.2	0.09	0.021	56	72	64
10.2	10.3	0.11	0.029	55	72	64
10.3	10.4	0.10	0.033	43	59	51
10.4	10.5	0.10	0.034	61	89	75
10.5	10.6	0.09	0.034	61	72	66
10.6	10.7	0.10	0.029	62	76	69
10.7	10.8	0.12	0.029	47	63	55
10.8	10.9	0.13	0.021	48	59	53
10.9	11.0	0.13	0.031	50	64	57
11.0	11.1	0.09	0.026	59	69	64
11.1	11.2	0.10	0.020	54	64	59
11.2	11.3	0.12	0.024	51	72	62
11.3	11.4	0.10	0.024	71	68	69
11.4	11.5	0.08	0.025	65	62	64
11.5	11.6	0.10	0.021	49	57	53
11.6	11.7	0.11	0.025	72	73	72
11.7	11.8	0.10	0.020	54	66	60
11.8	11.9	0.09	0.027	63	65	64
11.9	12.0	0.11	0.034	76	82	79
12.0	12.1	0.13	0.028	71	85	78
Averages		**0.09**	**0.026**	**53**	**71**	**62**

Table D-10

Project: 819-02-0012
ICC Profiler Survey: 05/11/2004
Direction: West

FROM miles	TO miles	Rut Avg inches	Rut STD	IRI 1 in/mile	IRI 2 in/mile	Avg IRI in/mile
12.1	12.0	0.07	0.025	66	101	84
12.0	11.9	0.08	0.029	43	61	52
11.9	11.8	0.09	0.025	59	75	67
11.8	11.7	0.10	0.021	50	62	56
11.7	11.6	0.11	0.020	44	61	53
11.6	11.5	0.11	0.021	51	62	56
11.5	11.4	0.09	0.031	76	77	77
11.4	11.3	0.08	0.029	43	61	52
11.3	11.2	0.07	0.026	48	58	53
11.2	11.1	0.11	0.023	48	55	52
11.1	11.0	0.10	0.022	47	61	54
11.0	10.9	0.12	0.024	46	63	54
10.9	10.8	0.13	0.024	41	53	47
10.8	10.7	0.10	0.019	43	53	48
10.7	10.6	0.10	0.022	40	56	48
10.6	10.5	0.11	0.025	50	69	60
10.5	10.4	0.10	0.022	50	58	54
10.4	10.3	0.07	0.024	46	64	55
10.3	10.2	0.07	0.029	44	56	50
10.2	10.1	0.09	0.027	50	70	60
10.1	10.0	0.07	0.021	61	70	65
10.0	9.9	0.10	0.021	50	72	61
9.9	9.8	0.10	0.022	46	69	58
9.8	9.7	0.10	0.027	46	62	54
9.7	9.6	0.10	0.021	46	61	53
9.6	9.5	0.09	0.026	60	69	65
9.5	9.4	0.06	0.026	51	54	52
9.4	9.3	0.08	0.023	52	86	69
9.3	9.2	0.08	0.021	51	71	61
9.2	9.1	0.09	0.024	51	78	65
9.1	9.0	0.09	0.022	55	78	67
9.0	8.9	0.09	0.017	50	69	59
8.9	8.8	0.07	0.021	39	45	42
8.8	8.7	0.09	0.023	52	66	59
8.7	8.6	0.08	0.019	48	72	60
8.6	8.5	0.11	0.027	55	70	63
8.5	8.4	0.11	0.040	80	80	80
8.4	8.3	0.06	0.033	57	89	73
8.3	8.2	0.08	0.029	61	73	67
8.2	8.1	0.07	0.028	55	72	64
8.1	8.0	0.05	0.022	51	59	55
8.0	7.9	0.09	0.033	58	91	74
7.9	7.8	0.08	0.026	49	44	46
7.8	7.7	0.07	0.038	52	47	49
7.7	7.6	0.08	0.021	46	71	59
7.6	7.5	0.08	0.032	58	71	64
7.5	7.4	0.07	0.019	48	63	56
7.4	7.3	0.07	0.023	57	78	68
7.3	7.2	0.05	0.025	47	54	50
7.2	7.1	0.08	0.017	39	56	47
7.1	7.0	0.07	0.018	40	57	49
7.0	6.9	0.07	0.027	40	63	52
6.9	6.8	0.07	0.019	44	71	57
6.8	6.7	0.07	0.020	48	80	64
6.7	6.6	0.07	0.029	53	66	60
6.6	6.5	0.04	0.024	53	63	58
Bridge						
6.3	6.2	0.07	0.019	56	67	61
6.2	6.1	0.06	0.023	63	62	63
6.1	6.0	0.06	0.019	53	59	56
6.0	5.9	0.08	0.027	56	63	59
5.9	5.8	0.08	0.023	58	61	59
5.8	5.7	0.09	0.025	50	57	53
5.7	5.6	0.09	0.024	47	69	58
5.6	5.5	0.11	0.025	42	48	45
5.5	5.4	0.09	0.026	54	59	56
5.4	5.3	0.05	0.019	50	53	51
5.3	5.2	0.06	0.028	53	52	52
5.2	5.1	0.05	0.021	53	51	52
5.1	5.0	0.08	0.023	48	56	52
5.0	4.9	0.04	0.026	51	67	59
4.9	4.8	0.06	0.025	45	79	62
4.8	4.7	0.06	0.024	46	48	47
4.7	4.6	0.07	0.022	47	46	47
4.6	4.5	0.07	0.026	51	47	49
4.5	4.4	0.08	0.032	45	54	50
4.4	4.3	0.07	0.024	47	66	56
4.3	4.2	0.05	0.024	53	70	61
4.2	4.1	0.06	0.022	52	56	54
4.1	4.0	0.06	0.022	46	60	53
4.0	3.9	0.08	0.024	46	54	50
Bridges						
3.6	3.5	0.05	0.021	47	52	49
3.5	3.4	0.05	0.019	41	39	40
3.4	3.3	0.05	0.021	47	54	50
3.3	3.2	0.04	0.021	44	56	50
3.2	3.1	0.06	0.028	55	62	58
3.1	3.0	0.05	0.025	50	67	59
3.0	2.9	0.05	0.021	46	62	54
2.9	2.8	0.06	0.028	52	89	71
2.8	2.7	0.06	0.019	41	55	48
2.7	2.6	0.05	0.019	45	72	58
2.6	2.5	0.06	0.019	57	71	64
2.5	2.4	0.05	0.018	37	46	41
2.4	2.3	0.03	0.018	50	55	53
2.3	2.2	0.03	0.021	51	58	55
Bridges						
1.7	1.6	0.03	0.019	53	54	53
1.6	1.5	0.03	0.020	52	67	60
1.5	1.4	0.03	0.018	47	47	47
1.4	1.3	0.03	0.016	51	54	52
1.3	1.2	0.05	0.030	64	63	63
1.2	1.1	0.07	0.025	53	58	56
1.1	1.0	0.08	0.029	57	54	56
1.0	0.9	0.08	0.029	50	61	55
0.9	0.8	0.05	0.028	55	68	62
0.8	0.7	0.04	0.018	49	52	51
0.7	0.6	0.04	0.021	43	58	50
0.6	0.5	0.07	0.024	59	67	63
0.5	0.4	0.06	0.032	45	60	52
0.4	0.3	0.05	0.031	56	65	60
0.3	0.2	0.07	0.033	50	57	54
0.2	0.1	0.04	0.026	53	60	57
0.1	0.0	0.06	0.028	84	84	84
Averages		**0.07**	**0.024**	**51**	**63**	**57**

Table D-11

Project: 819-02-0012
ICC Profiler Survey: 01/06/2005
Direction: East

FROM miles	TO miles	Rut Avg inches	Rut STD	IRI 1 in/mile	IRI 2 in/mile	Avg IRI in/mile
0.0	0.1	0.08	0.092	117	106	111
0.1	0.2	0.05	0.050	87	93	90
0.2	0.3	0.02	0.031	54	81	67
0.3	0.4	0.01	0.010	54	81	67
0.4	0.5	0.01	0.011	61	78	69
0.5	0.6	0.02	0.012	54	74	64
0.6	0.7	0.02	0.015	67	86	76
0.7	0.8	0.02	0.017	52	73	63
0.8	0.9	0.02	0.013	52	69	61
0.9	1.0	0.02	0.025	53	50	52
1.0	1.1	0.01	0.011	45	63	54
1.1	1.2	0.02	0.012	44	55	50
1.2	1.3	0.02	0.015	57	68	63
1.3	1.4	0.02	0.019	54	67	61
1.4	1.5	0.02	0.015	46	64	55
1.5	1.6	0.03	0.023	48	48	48
1.6	1.7	0.01	0.009	52	62	57
1.7	1.8	0.03	0.019	45	59	52
			Bridges			
2.3	2.4	0.05	0.026	43	71	57
2.4	2.5	0.03	0.021	53	60	57
2.5	2.6	0.04	0.020	42	55	48
2.6	2.7	0.05	0.027	58	114	86
2.7	2.8	0.05	0.022	54	86	70
2.8	2.9	0.03	0.019	43	93	68
2.9	3.0	0.03	0.019	50	97	74
3.0	3.1	0.03	0.019	62	124	93
3.1	3.2	0.03	0.017	60	132	96
3.2	3.3	0.03	0.019	64	121	93
3.3	3.4	0.04	0.027	48	99	74
3.4	3.5	0.05	0.027	47	93	70
3.5	3.6	0.04	0.022	51	97	74
3.6	3.7	0.03	0.017	49	92	71
			Bridge			
4.0	4.1	0.01	0.012	54	89	72
4.1	4.2	0.02	0.015	57	97	77
4.2	4.3	0.04	0.021	53	99	76
4.3	4.4	0.04	0.026	59	68	64
4.4	4.5	0.03	0.019	53	54	54
4.5	4.6	0.02	0.017	53	55	54
4.6	4.7	0.01	0.013	59	67	63
4.7	4.8	0.03	0.021	59	87	73
4.8	4.9	0.02	0.012	51	106	78
4.9	5.0	0.03	0.025	54	94	74
5.0	5.1	0.04	0.025	52	67	59
5.1	5.2	0.04	0.025	50	62	56
5.2	5.3	0.03	0.018	51	59	55
5.3	5.4	0.05	0.026	44	51	48
5.4	5.5	0.04	0.033	46	56	51
5.5	5.6	0.03	0.021	50	66	58
5.6	5.7	0.04	0.021	55	101	78
5.7	5.8	0.02	0.016	56	102	79
5.8	5.9	0.03	0.026	49	87	68
5.9	6.0	0.02	0.013	66	105	85
6.0	6.1	0.03	0.018	58	78	68
6.1	6.2	0.03	0.021	45	49	47
6.2	6.3	0.02	0.013	55	61	58
6.3	6.4	0.04	0.033	65	82	73
			Bridge			
6.6	6.7	0.04	0.023	62	72	67
6.7	6.8	0.02	0.018	63	78	70
6.8	6.9	0.05	0.021	45	60	52
6.9	7.0	0.05	0.023	50	65	57
7.0	7.1	0.03	0.019	49	65	57
7.1	7.2	0.04	0.023	50	64	57
7.2	7.3	0.04	0.022	52	63	57
7.3	7.4	0.04	0.027	44	59	52
7.4	7.5	0.03	0.022	59	66	62
7.5	7.6	0.06	0.030	56	71	64
7.6	7.7	0.04	0.020	43	52	47
7.7	7.8	0.04	0.022	60	75	68
7.8	7.9	0.04	0.018	53	82	68
7.9	8.0	0.03	0.022	54	65	59
8.0	8.1	0.05	0.030	62	99	80
8.1	8.2	0.05	0.027	46	61	53
8.2	8.3	0.06	0.032	68	103	86
8.3	8.4	0.09	0.042	58	77	67
8.4	8.5	0.10	0.039	59	82	70
8.5	8.6	0.10	0.032	48	83	66
8.6	8.7	0.08	0.030	48	51	49
8.7	8.8	0.04	0.019	48	37	42
8.8	8.9	0.03	0.019	57	63	60
8.9	9.0	0.04	0.029	50	60	55
9.0	9.1	0.02	0.015	48	59	54
9.1	9.2	0.04	0.023	75	78	76
9.2	9.3	0.05	0.022	52	59	56
9.3	9.4	0.03	0.020	49	59	54
9.4	9.5	0.04	0.028	47	53	50
9.5	9.6	0.05	0.021	45	70	58
9.6	9.7	0.05	0.026	60	73	67
9.7	9.8	0.05	0.023	51	59	55
9.8	9.9	0.08	0.029	51	64	57
9.9	10.0	0.04	0.023	50	69	59
10.0	10.1	0.03	0.020	44	72	58
10.1	10.2	0.05	0.023	58	72	65
10.2	10.3	0.03	0.018	53	74	63
10.3	10.4	0.06	0.029	44	62	53
10.4	10.5	0.06	0.036	68	92	80
10.5	10.6	0.05	0.034	55	74	64
10.6	10.7	0.05	0.026	55	73	64
10.7	10.8	0.07	0.031	50	68	59
10.8	10.9	0.07	0.029	48	59	54
10.9	11.0	0.08	0.035	51	66	59
11.0	11.1	0.05	0.024	59	68	63
11.1	11.2	0.05	0.026	61	66	64
11.2	11.3	0.06	0.026	52	74	63
11.3	11.4	0.06	0.025	72	68	70
11.4	11.5	0.04	0.026	51	50	51
11.5	11.6	0.03	0.029	59	65	62
11.6	11.7	0.06	0.028	59	69	64
11.7	11.8	0.04	0.024	55	63	59
11.8	11.9	0.02	0.016	62	73	68
11.9	12.0	0.03	0.020	71	88	80
12.0	12.1	0.04	0.028	82	87	84
Averages		0.04	0.023	55	74	64

Table D-12

Project: 819-02-0012
ICC Profiler Survey: 01/06/2005
Direction: West

FROM miles	TO miles	Rut Avg inches	Rut STD	IRI 1 in/mile	IRI 2 in/mile	Avg IRI in/mile
12.1	12.0	0.04	0.021	84	110	97
12.0	11.9	0.06	0.025	60	72	66
11.9	11.8	0.06	0.025	60	72	66
11.8	11.7	0.06	0.023	50	60	55
11.7	11.6	0.08	0.023	46	64	55
11.6	11.5	0.07	0.028	49	60	54
11.5	11.4	0.04	0.028	76	83	79
11.4	11.3	0.04	0.024	46	67	56
11.3	11.2	0.05	0.027	49	61	55
11.2	11.1	0.06	0.024	52	60	56
11.1	11.0	0.07	0.023	46	62	54
11.0	10.9	0.07	0.026	49	68	59
10.9	10.8	0.07	0.026	40	55	48
10.8	10.7	0.06	0.021	48	54	51
10.7	10.6	0.06	0.022	43	64	54
10.6	10.5	0.06	0.024	47	68	58
10.5	10.4	0.06	0.024	51	61	56
10.4	10.3	0.04	0.030	43	74	58
10.3	10.2	0.05	0.024	44	60	52
10.2	10.1	0.06	0.028	54	71	62
10.1	10.0	0.05	0.024	61	74	67
10.0	9.9	0.06	0.020	49	73	61
9.9	9.8	0.06	0.023	45	69	57
9.8	9.7	0.07	0.027	48	62	55
9.7	9.6	0.06	0.024	50	73	61
9.6	9.5	0.06	0.025	61	66	64
9.5	9.4	0.03	0.021	54	61	57
9.4	9.3	0.04	0.023	56	91	74
9.3	9.2	0.03	0.018	56	84	70
9.2	9.1	0.05	0.029	53	85	69
9.1	9.0	0.04	0.020	61	85	73
9.0	8.9	0.04	0.019	48	67	58
8.9	8.8	0.05	0.028	44	49	47
8.8	8.7	0.05	0.021	53	68	60
8.7	8.6	0.04	0.020	49	78	63
8.6	8.5	0.06	0.033	53	72	63
8.5	8.4	0.04	0.030	78	83	81
8.4	8.3	0.04	0.029	61	89	75
8.3	8.2	0.04	0.021	59	71	65
8.2	8.1	0.04	0.022	61	75	68
8.1	8.0	0.03	0.023	50	62	56
8.0	7.9	0.05	0.032	59	91	75
7.9	7.8	0.06	0.029	50	45	48
7.8	7.7	0.05	0.032	55	52	54
7.7	7.6	0.04	0.025	49	74	61
7.6	7.5	0.05	0.038	62	82	72
7.5	7.4	0.03	0.018	49	72	60
7.4	7.3	0.05	0.031	57	86	71
7.3	7.2	0.03	0.017	44	57	50
7.2	7.1	0.05	0.019	41	59	50
7.1	7.0	0.04	0.020	41	61	51
7.0	6.9	0.05	0.027	42	67	54
6.9	6.8	0.03	0.017	51	74	62
6.8	6.7	0.03	0.018	50	78	64
6.7	6.6	0.05	0.026	56	68	62
6.6	6.5	0.04	0.025	55	63	59
Bridge						
6.3	6.2	0.04	0.019	58	69	63
6.2	6.1	0.03	0.020	54	55	54
6.1	6.0	0.03	0.017	39	47	43
6.0	5.9	0.03	0.022	62	63	62
5.9	5.8	0.03	0.020	60	71	65
5.8	5.7	0.06	0.026	48	54	51
5.7	5.6	0.05	0.024	47	69	58
5.6	5.5	0.07	0.025	44	54	49
5.5	5.4	0.04	0.030	44	50	47
5.4	5.3	0.01	0.009	51	61	56
5.3	5.2	0.01	0.009	51	53	52
5.2	5.1	0.01	0.010	50	57	54
5.1	5.0	0.02	0.013	43	60	52
5.0	4.9	0.01	0.010	51	75	63
4.9	4.8	0.03	0.022	48	79	63
4.8	4.7	0.02	0.017	45	49	47
4.7	4.6	0.03	0.020	46	45	46
4.6	4.5	0.02	0.013	48	52	50
4.5	4.4	0.02	0.015	45	64	54
4.4	4.3	0.02	0.012	55	74	65
4.3	4.2	0.02	0.018	58	82	70
4.2	4.1	0.02	0.014	60	58	59
4.1	4.0	0.03	0.023	47	57	52
4.0	3.9	0.03	0.022	44	55	50
Bridge						
3.6	3.5	0.02	0.016	51	56	53
3.5	3.4	0.02	0.015	43	46	45
3.4	3.3	0.02	0.016	46	55	50
3.3	3.2	0.02	0.015	49	58	54
3.2	3.1	0.02	0.019	55	60	57
3.1	3.0	0.02	0.013	55	71	63
3.0	2.9	0.04	0.044	51	82	67
2.9	2.8	0.03	0.036	57	90	74
2.8	2.7	0.01	0.008	42	67	54
2.7	2.6	0.01	0.011	57	82	69
2.6	2.5	0.03	0.041	57	79	68
2.5	2.4	0.02	0.014	41	50	46
2.4	2.3	0.02	0.016	52	61	57
2.3	2.2	0.01	0.012	55	70	63
Bridge						
1.7	1.6	0.01	0.009	52	62	57
1.6	1.5	0.01	0.007	60	85	72
1.5	1.4	0.01	0.010	47	50	48
1.4	1.3	0.01	0.009	48	57	52
1.3	1.2	0.02	0.013	63	65	64
1.2	1.1	0.03	0.022	51	55	53
1.1	1.0	0.04	0.023	57	57	57
1.0	0.9	0.03	0.020	52	65	58
0.9	0.8	0.02	0.014	55	60	57
0.8	0.7	0.02	0.013	46	54	50
0.7	0.6	0.03	0.017	49	60	55
0.6	0.5	0.05	0.027	56	62	59
0.5	0.4	0.04	0.021	46	59	53
0.4	0.3	0.03	0.026	57	61	59
0.3	0.2	0.04	0.030	49	71	60
0.2	0.1	0.01	0.012	59	71	65
0.1	0.0	0.01	0.014	84	92	88
Averages		**0.04**	**0.021**	**52**	**66**	**59**

Table D-13

Project: 819-02-0012
ICC Profiler Survey: 11/09/2005
Direction: East

FROM miles	TO miles	Rut Avg inches	Rut STD	IRI 1 in/mile	IRI 2 in/mile	Avg IRI in/mile
0.0	0.1	0.00	0.052	161	159	160
0.1	0.2	0.06	0.054	97	81	89
0.2	0.3	0.03	0.051	60	63	61
0.3	0.4	-0.03	0.049	75	82	79
0.4	0.5	0.02	0.038	73	79	76
0.5	0.6	0.03	0.033	61	66	63
0.6	0.7	0.04	0.037	71	84	78
0.7	0.8	0.05	0.023	70	73	72
0.8	0.9	0.04	0.032	78	72	75
0.9	1.0	-0.04	0.026	53	48	50
1.0	1.1	0.00	0.040	61	59	60
1.1	1.2	0.04	0.021	47	59	53
1.2	1.3	0.02	0.036	72	72	72
1.3	1.4	0.04	0.024	57	61	59
1.4	1.5	0.06	0.023	58	62	60
1.5	1.6	0.04	0.030	55	50	53
1.6	1.7	0.02	0.026	52	49	50
1.7	1.8	0.00	0.043	52	61	57
Bridges						
2.3	2.4	0.06	0.038	49	77	63
2.4	2.5	0.07	0.032	50	64	57
2.5	2.6	0.06	0.026	45	61	53
2.6	2.7	0.07	0.028	61	113	87
2.7	2.8	0.06	0.025	54	79	67
2.8	2.9	0.08	0.186	53	66	60
2.9	3.0	0.05	0.125	56	84	70
3.0	3.1	0.03	0.032	56	114	85
3.1	3.2	0.05	0.025	53	122	88
3.2	3.3	0.02	0.040	63	119	91
3.3	3.4	0.05	0.039	48	96	72
3.4	3.5	0.08	0.021	45	87	66
3.5	3.6	0.05	0.028	49	97	73
3.6	3.7	0.04	0.023	48	87	67
Bridge						
4.0	4.1	0.04	0.028	55	83	69
4.1	4.2	0.06	0.033	56	91	74
4.2	4.3	0.06	0.038	49	99	74
4.3	4.4	0.06	0.036	48	62	55
4.4	4.5	0.02	0.033	54	59	56
4.5	4.6	-0.01	0.040	50	50	50
4.6	4.7	0.05	0.027	57	65	61
4.7	4.8	0.03	0.038	57	85	71
4.8	4.9	0.03	0.031	54	107	81
4.9	5.0	0.03	0.035	55	95	75
5.0	5.1	0.05	0.023	47	65	56
5.1	5.2	0.07	0.026	39	62	51
5.2	5.3	0.04	0.039	47	54	50
5.3	5.4	0.06	0.035	48	52	50
5.4	5.5	0.06	0.036	52	44	48
5.5	5.6	0.01	0.040	59	64	61
5.6	5.7	0.04	0.026	58	99	79
5.7	5.8	0.03	0.029	60	100	80
5.8	5.9	0.04	0.034	49	87	68
5.9	6.0	0.02	0.023	62	102	82
6.0	6.1	0.02	0.036	60	85	73
6.1	6.2	0.03	0.047	256	207	232
6.2	6.3	0.02	0.034	51	50	50
6.30	6.40	0.05	0.097	56	73	64
Bridges						
6.6	6.7	0.04	0.036	59	65	62
6.7	6.8	0.02	0.030	54	66	60
6.8	6.9	0.04	0.026	40	56	48
6.9	7.0	0.05	0.026	44	62	53
7.0	7.1	0.04	0.022	43	60	51
7.1	7.2	0.04	0.031	63	65	64
7.2	7.3	0.06	0.035	53	70	61
7.3	7.4	0.06	0.032	46	59	52
7.4	7.5	0.03	0.028	51	56	54
7.5	7.6	0.05	0.035	51	69	60
7.6	7.7	0.04	0.019	38	49	44
7.7	7.8	0.06	0.034	60	76	68
7.8	7.9	0.07	0.021	51	65	58
7.9	8.0	0.06	0.026	47	55	51
8.0	8.1	0.06	0.028	54	85	70
8.1	8.2	0.05	0.024	44	57	50
8.2	8.3	0.07	0.037	61	83	72
8.3	8.4	0.10	0.037	52	74	63
8.4	8.5	0.10	0.041	55	79	67
8.5	8.6	0.09	0.036	44	73	58
8.6	8.7	0.08	0.029	44	53	49
8.7	8.8	0.06	0.027	47	48	48
8.8	8.9	0.06	0.041	62	60	61
8.9	9.0	0.05	0.034	46	46	46
9.0	9.1	0.04	0.033	55	57	56
9.1	9.2	0.08	0.048	65	66	66
9.2	9.3	0.07	0.020	47	51	49
9.3	9.4	0.04	0.025	47	60	54
9.4	9.5	0.07	0.025	46	51	49
9.5	9.6	0.06	0.024	40	61	51
9.6	9.7	0.07	0.027	56	70	63
9.7	9.8	0.06	0.025	45	57	51
9.8	9.9	0.08	0.028	54	67	60
9.9	10.0	0.07	0.029	44	65	54
10.0	10.1	0.08	0.031	43	67	55
10.1	10.2	0.06	0.024	52	63	57
10.2	10.3	0.10	0.029	51	70	60
10.3	10.4	0.08	0.031	40	66	53
10.4	10.5	0.05	0.040	63	84	74
10.5	10.6	0.07	0.024	53	69	61
10.6	10.7	0.07	0.025	53	73	63
10.7	10.8	0.09	0.035	47	55	51
10.8	10.9	0.07	0.035	45	60	53
10.9	11.0	0.07	0.041	54	75	65
11.0	11.1	0.04	0.031	61	72	66
11.1	11.2	0.07	0.027	53	61	57
11.2	11.3	0.08	0.024	56	70	63
11.3	11.4	0.08	0.026	69	58	63
11.4	11.5	0.04	0.080	69	66	67
11.5	11.6	0.11	0.162	75	64	70
11.6	11.7	0.07	0.024	52	55	53
11.7	11.8	0.05	0.032	58	64	61
11.8	11.9	0.04	0.029	59	78	69
11.9	12.0	0.07	0.041	83	90	87
12.0	12.1	0.08	0.039	73	97	85
Averages		**0.05**	**0.036**	**57**	**73**	**65**

Table D-14

Project: 819-02-0012
ICC Profiler Survey: 11/09/2005
Direction: West

FROM miles	TO miles	Rut Avg inches	Rut STD	IRI 1 in/mile	IRI 2 in/mile	Avg IRI in/mile
12.2	12.1	0.04	0.027	63	74	69
12.1	12.0	0.05	0.038	54	74	64
12.0	11.9	0.06	0.030	563	301	432
11.9	11.8	0.08	0.024	46	65	55
11.8	11.7	0.04	0.050	766	459	612
11.7	11.6	0.04	0.045	53	61	57
11.6	11.5	0.06	0.033	51	58	55
11.5	11.4	0.07	0.025	54	59	56
11.4	11.3	0.06	0.030	41	59	50
11.3	11.2	0.09	0.037	46	80	63
11.2	11.1	0.09	0.032	45	58	51
11.1	11.0	0.07	0.027	48	59	54
11.0	10.9	0.06	0.025	43	61	52
10.9	10.8	0.07	0.025	51	70	60
10.8	10.7	0.05	0.032	57	59	58
10.7	10.6	0.04	0.029	55	63	59
10.6	10.5	0.04	0.031	51	64	57
10.5	10.4	0.07	0.045	53	94	74
10.4	10.3	0.04	0.027	62	70	66
10.3	10.2	0.06	0.022	52	73	63
10.2	10.1	0.06	0.027	47	69	58
10.1	10.0	0.05	0.029	50	77	63
10.0	9.9	0.06	0.030	56	87	71
9.9	9.8	0.06	0.025	54	60	57
9.8	9.7	0.03	0.030	53	58	55
9.7	9.6	0.05	0.035	59	93	76
9.6	9.5	0.05	0.026	57	77	67
9.5	9.4	0.04	0.037	53	76	65
9.4	9.3	0.06	0.020	56	82	69
9.3	9.2	0.06	0.019	43	64	54
9.2	9.1	0.04	0.036	40	42	41
9.1	9.0	0.05	0.032	51	65	58
9.0	8.9	0.07	0.022	46	69	58
8.9	8.8	0.08	0.029	53	75	64
8.8	8.7	0.01	0.061	75	78	76
8.7	8.6	0.01	0.030	57	91	74
8.6	8.5	0.04	0.025	57	67	62
8.5	8.4	0.02	0.029	54	63	58
8.4	8.3	0.02	0.036	52	61	57
8.3	8.2	0.05	0.038	63	94	78
8.2	8.1	0.05	0.038	50	60	55
8.1	8.0	0.04	0.046	57	57	57
8.0	7.9	0.04	0.026	51	78	64
7.9	7.8	0.04	0.039	53	92	72
7.8	7.7	0.03	0.022	43	63	53
7.7	7.6	0.05	0.039	51	86	68
7.6	7.5	0.02	0.021	43	62	52
7.5	7.4	0.04	0.021	41	59	50
7.4	7.3	0.03	0.027	48	63	55
7.3	7.2	0.03	0.032	42	68	55
7.2	7.1	0.03	0.020	43	68	55
7.1	7.0	0.03	0.021	43	76	60
7.0	6.9	0.01	0.035	59	58	59
6.9	6.8	0.01	0.026	48	58	53
6.8	6.7	0.02	0.038	66	93	80
6.7	6.6	0.01	0.033	78	116	97
Bridge						
6.4	6.3	0.03	0.053	141	187	164
6.3	6.2	0.04	0.034	55	63	59
6.2	6.1	0.04	0.024	52	63	58
6.1	6.0	0.05	0.033	47	62	55
6.0	5.9	0.07	0.034	45	77	61
5.9	5.8	0.07	0.027	50	62	56
5.8	5.7	0.05	0.028	44	50	47
5.7	5.6	0.00	0.025	49	54	52
5.6	5.5	0.02	0.031	52	46	49
5.5	5.4	0.03	0.026	49	52	51
5.4	5.3	0.02	0.028	44	49	47
5.3	5.2	0.00	0.029	45	59	52
5.2	5.1	0.03	0.028	44	71	57
5.1	5.0	0.02	0.025	44	48	46
5.0	4.9	0.03	0.022	46	46	46
4.9	4.8	0.04	0.029	45	48	46
4.8	4.7	0.04	0.028	43	53	48
4.7	4.6	0.04	0.027	51	58	54
4.6	4.5	0.01	0.025	46	69	58
4.5	4.4	0.02	0.027	55	51	53
4.4	4.3	0.02	0.025	44	58	51
4.3	4.2	0.03	0.026	43	59	51
4.2	4.1	0.01	0.027	45	59	52
4.1	4.0	0.02	0.052	71	83	77
Bridges						
3.7	3.6	-0.01	0.022	50	56	53
3.6	3.5	0.01	0.032	49	60	54
3.5	3.4	0.03	0.027	52	63	57
3.4	3.3	0.00	0.028	53	75	64
3.3	3.2	-0.01	0.041	56	103	79
3.2	3.1	-0.01	0.029	48	78	63
3.1	3.0	-0.01	0.024	45	72	58
3.0	2.9	0.01	0.022	55	78	66
2.9	2.8	0.03	0.028	51	66	58
2.8	2.7	0.02	0.026	41	48	45
2.7	2.6	-0.03	0.038	47	52	49
2.6	2.5	-0.03	0.032	61	72	66
2.5	2.4	-0.01	0.026	59	53	56
2.4	2.3	0.00	0.037	76	93	84
Bridges						
1.8	1.7	-0.02	0.026	49	52	50
1.7	1.6	-0.01	0.029	50	48	49
1.6	1.5	0.01	0.032	64	60	62
1.5	1.4	0.03	0.035	53	55	54
1.4	1.3	0.01	0.044	59	61	60
1.3	1.2	0.04	0.035	50	61	56
1.2	1.1	0.02	0.043	51	62	56
1.1	1.0	0.00	0.023	45	48	47
1.0	0.9	0.02	0.031	52	58	55
0.9	0.8	0.06	0.028	49	68	58
0.8	0.7	0.01	0.031	43	58	50
0.7	0.6	0.02	0.031	54	63	59
0.6	0.5	0.03	0.042	47	57	52
0.5	0.4	0.00	0.031	53	63	58
0.4	0.3	0.02	0.032	83	86	84
0.3	0.2	0.01	0.051	98	98	98
0.1	0.0	0.06	0.028	84	84	84
Averages		**0.03**	**0.031**	**64**	**73**	**69**

Table D-15

Project: 819-02-0012
ICC Profiler Survey: 05/11/2006
Direction: East

FROM miles	TO miles	Rut Avg inches	Rut STD	IRI 1 in/mile	IRI 2 in/mile	Avg IRI in/mile
0.0	0.1000	0.04	0.049	97	109	103
0.1	0.2	0.03	0.024	93	95	94
0.2	0.3	0.03	0.017	55	69	62
0.3	0.4	0.01	0.012	49	85	67
0.4	0.5	0.02	0.015	67	78	73
0.5	0.6	0.03	0.018	52	71	61
0.6	0.7	0.03	0.021	70	90	80
0.7	0.8	0.03	0.021	63	79	71
0.8	0.9	0.02	0.018	63	70	67
0.9	1.0	0.00	0.000	50	53	51
1.0	1.1	0.03	0.018	59	69	64
1.1	1.2	0.02	0.015	47	60	53
1.2	1.3	0.02	0.019	57	72	64
1.3	1.4	0.03	0.020	54	65	60
1.4	1.5	0.02	0.017	54	74	64
1.5	1.6	0.01	0.011	52	57	55
1.6	1.7	0.03	0.027	52	63	57
1.7	1.8	0.06	0.026	46	64	55
Bridges						
2.3	2.4	0.04	0.029	63	93	78
2.4	2.5	0.04	0.024	60	65	62
2.5	2.6	0.05	0.027	48	61	55
2.6	2.7	0.08	0.029	56	114	85
2.7	2.8	0.05	0.025	57	86	71
2.8	2.9	0.04	0.020	46	87	66
2.9	3.0	0.04	0.021	58	99	79
3.0	3.1	0.04	0.024	63	122	93
3.1	3.2	0.04	0.020	57	124	91
3.2	3.3	0.04	0.025	61	115	88
3.3	3.4	0.04	0.029	52	97	75
3.4	3.5	0.04	0.027	48	96	72
3.5	3.6	0.04	0.025	55	98	77
3.6	3.7	0.04	0.021	53	89	71
Bridge						
4.0	4.1	0.03	0.019	60	89	75
4.1	4.2	0.04	0.022	63	96	79
4.2	4.3	0.05	0.022	54	98	76
4.3	4.4	0.03	0.023	60	75	68
4.4	4.5	0.02	0.015	59	61	60
4.5	4.6	0.02	0.019	53	54	53
4.6	4.7	0.02	0.013	61	71	66
4.7	4.8	0.01	0.011	67	92	80
4.8	4.9	0.03	0.023	60	110	85
4.9	5.0	0.02	0.018	70	102	86
5.0	5.1	0.02	0.016	64	82	73
5.1	5.2	0.03	0.020	57	67	62
5.2	5.3	0.03	0.022	63	74	69
5.3	5.4	0.04	0.025	47	61	54
5.4	5.5	0.04	0.033	49	59	54
5.5	5.6	0.03	0.024	55	70	62
5.6	5.7	0.04	0.021	65	103	84
5.7	5.8	0.01	0.012	61	106	83
5.8	5.9	0.02	0.016	56	93	74
5.9	6.0	0.02	0.014	69	107	88
6.0	6.1	0.02	0.017	61	80	70
6.1	6.2	0.01	0.012	48	58	53
6.2	6.3	0.02	0.015	56	59	58
6.3	6.4	0.04	0.030	62	80	71
Bridge						
6.6	6.7	0.03	0.017	64	74	69
6.7	6.8	0.03	0.019	66	80	73
6.8	6.9	0.05	0.021	42	56	49
6.9	7.0	0.05	0.021	48	63	56
7.0	7.1	0.03	0.018	48	63	55
7.1	7.2	0.04	0.024	50	65	57
7.2	7.3	0.03	0.019	51	64	57
7.3	7.4	0.05	0.028	47	58	52
7.4	7.5	0.04	0.032	50	60	55
7.5	7.6	0.06	0.032	54	70	62
7.6	7.7	0.05	0.020	42	51	47
7.7	7.8	0.06	0.029	55	79	67
7.8	7.9	0.05	0.025	54	79	67
7.9	8.0	0.04	0.026	53	67	60
8.0	8.1	0.07	0.029	57	94	76
8.1	8.2	0.05	0.025	49	65	57
8.2	8.3	0.05	0.033	69	100	85
8.3	8.4	0.09	0.046	57	77	67
8.4	8.5	0.08	0.036	65	87	76
8.5	8.6	0.09	0.029	50	83	67
8.6	8.7	0.06	0.025	50	56	53
8.7	8.8	0.05	0.029	52	51	52
8.8	8.9	0.05	0.033	56	59	58
8.9	9.0	0.05	0.031	48	59	53
9.0	9.1	0.04	0.023	50	62	56
9.1	9.2	0.06	0.034	73	74	73
9.2	9.3	0.06	0.022	49	58	53
9.3	9.4	0.05	0.031	53	62	58
9.4	9.5	0.05	0.020	49	57	53
9.5	9.6	0.03	0.018	53	74	63
9.6	9.7	0.05	0.028	68	79	73
9.7	9.8	0.05	0.022	52	65	59
9.8	9.9	0.06	0.021	53	68	61
9.9	10.0	0.06	0.028	50	71	61
10.0	10.1	0.01	0.011	51	73	62
10.1	10.2	0.03	0.020	58	76	67
10.2	10.3	0.01	0.010	55	73	64
10.3	10.4	0.06	0.036	45	66	55
10.4	10.5	0.06	0.036	67	95	81
10.5	10.6	0.04	0.032	57	79	68
10.6	10.7	0.04	0.022	59	77	68
10.7	10.8	0.06	0.029	54	66	60
10.8	10.9	0.09	0.023	46	60	53
10.9	11.0	0.08	0.034	53	71	62
11.0	11.1	0.03	0.020	57	68	63
11.1	11.2	0.04	0.023	60	71	65
11.2	11.3	0.04	0.033	54	79	67
11.3	11.4	0.02	0.015	73	72	73
11.4	11.5	0.03	0.018	52	55	53
11.5	11.6	0.06	0.052	72	81	77
11.6	11.7	0.06	0.032	60	66	63
11.7	11.8	0.03	0.021	62	78	70
11.8	11.9	0.04	0.031	65	76	71
11.9	12.0	0.07	0.033	78	91	84
12.0	12.1	0.07	0.036	87	91	89
Averages		**0.04**	**0.024**	**57**	**77**	**67**

Table D-16

Project: 819-02-0012
ICC Profiler Survey: 05/11/2006
Direction: West

FROM miles	TO miles	Rut Avg inches	Rut STD	IRI 1 in/mile	IRI 2 in/mile	Avg IRI in/mile
12.1	12.0	0.03	0.023	86	104	95
12.0	11.9	0.05	0.025	67	81	74
11.9	11.8	0.05	0.039	55	74	65
11.8	11.7	0.07	0.032	52	63	58
11.7	11.6	0.06	0.024	48	64	56
11.6	11.5	0.04	0.029	95	101	98
11.5	11.4	0.04	0.023	61	74	67
11.4	11.3	0.05	0.026	67	76	71
11.3	11.2	0.07	0.022	55	62	59
11.2	11.1	0.05	0.026	48	64	56
11.1	11.0	0.05	0.019	58	77	67
11.0	10.9	0.06	0.029	43	58	50
10.9	10.8	0.05	0.023	49	62	56
10.8	10.7	0.06	0.028	43	65	54
10.7	10.6	0.05	0.034	63	76	69
10.6	10.5	0.03	0.018	50	66	58
10.5	10.4	0.04	0.022	55	70	63
10.4	10.3	0.03	0.016	49	66	57
10.3	10.2	0.05	0.033	66	86	76
10.2	10.1	0.03	0.024	73	85	79
10.1	10.0	0.04	0.020	57	80	68
10.0	9.9	0.04	0.023	46	79	62
9.9	9.8	0.04	0.031	53	94	73
9.8	9.7	0.05	0.029	59	100	80
9.7	9.6	0.04	0.023	64	75	69
9.6	9.5	0.03	0.022	64	68	66
9.5	9.4	0.03	0.026	65	105	85
9.4	9.3	0.03	0.019	62	83	73
9.3	9.2	0.04	0.023	56	86	71
9.2	9.1	0.04	0.021	62	87	74
9.1	9.0	0.05	0.021	45	67	56
9.0	8.9	0.02	0.012	45	50	48
8.9	8.8	0.04	0.018	55	72	64
8.8	8.7	0.05	0.022	53	78	66
8.7	8.6	0.05	0.026	56	78	67
8.6	8.5	0.03	0.026	78	87	82
8.5	8.4	0.03	0.028	76	101	88
8.4	8.3	0.04	0.022	69	82	76
8.3	8.2	0.03	0.022	66	82	74
8.2	8.1	0.03	0.026	61	65	63
8.1	8.0	0.06	0.040	59	90	75
8.0	7.9	0.07	0.042	58	45	52
7.9	7.8	0.05	0.039	68	59	63
7.8	7.7	0.04	0.021	57	80	69
7.7	7.6	0.04	0.034	61	95	78
7.6	7.5	0.04	0.019	53	73	63
7.5	7.4	0.05	0.036	62	94	78
7.4	7.3	0.03	0.019	47	62	54
7.3	7.2	0.03	0.018	49	61	55
7.2	7.1	0.03	0.021	43	63	53
7.1	7.0	0.04	0.025	44	66	55
7.0	6.9	0.03	0.018	51	78	65
6.9	6.8	0.03	0.017	50	80	65
6.8	6.7	0.04	0.029	63	75	69
6.7	6.6	0.05	0.028	53	67	60
6.6	6.5	0.03	0.027	62	89	76
Bridge						
6.3	6.2	0.02	0.019	62	65	63
6.2	6.1	0.03	0.019	54	63	58
6.1	6.0	0.06	0.033	63	68	65
6.0	5.9	0.04	0.024	62	70	66
5.9	5.8	0.06	0.024	52	66	59
5.8	5.7	0.06	0.027	47	77	62
5.7	5.6	0.05	0.028	68	69	68
5.6	5.5	0.04	0.029	58	62	60
5.5	5.4	0.01	0.009	54	63	58
5.4	5.3	0.02	0.012	52	58	55
5.3	5.2	0.02	0.014	54	60	57
5.2	5.1	0.02	0.018	49	64	57
5.1	5.0	0.01	0.011	55	79	67
5.0	4.9	0.03	0.020	54	87	70
4.9	4.8	0.02	0.019	44	54	49
4.8	4.7	0.03	0.023	48	51	49
4.7	4.6	0.02	0.014	50	51	50
4.6	4.5	0.03	0.019	47	64	55
4.5	4.4	0.02	0.017	58	85	71
4.4	4.3	0.02	0.017	59	83	71
4.3	4.2	0.03	0.021	62	60	61
4.2	4.1	0.03	0.021	51	69	60
4.1	4.0	0.03	0.020	49	57	53
4.0	3.9	0.01	0.012	57	84	71
Bridges						
3.6	3.5	0.02	0.016	46	53	49
3.5	3.4	0.02	0.018	58	60	59
3.4	3.3	0.02	0.013	51	64	57
3.3	3.2	0.02	0.012	52	66	59
3.2	3.1	0.02	0.014	60	85	73
3.1	3.0	0.06	0.052	53	103	78
3.0	2.9	0.03	0.019	60	88	74
2.9	2.8	0.03	0.018	52	79	66
2.8	2.7	0.01	0.014	72	101	86
2.7	2.6	0.03	0.046	66	87	77
2.6	2.5	0.02	0.017	47	76	62
2.5	2.4	0.10	0.099	51	125	88
2.4	2.3	0.02	0.016	64	78	71
2.3	2.2	0.01	0.012	66	69	67
Bridges						
1.7	1.6	0.02	0.014	63	86	74
1.6	1.5	0.02	0.013	62	56	59
1.5	1.4	0.01	0.014	57	54	55
1.4	1.3	0.01	0.009	63	66	65
1.3	1.2	0.02	0.013	52	59	56
1.2	1.1	0.02	0.015	59	63	61
1.1	1.0	0.03	0.024	59	63	61
1.0	0.9	0.03	0.028	63	65	64
0.9	0.8	0.02	0.015	51	57	54
0.8	0.7	0.02	0.018	51	65	58
0.7	0.6	0.04	0.029	56	70	63
0.6	0.5	0.03	0.021	43	62	52
0.5	0.4	0.03	0.022	62	63	62
0.4	0.3	0.04	0.025	50	76	63
0.3	0.2	0.02	0.012	58	68	63
0.2	0.1	0.02	0.015	85	93	89
0.1	0.0	0.05	0.045	122	139	131
Averages		**0.04**	**0.023**	**58**	**74**	**66**

Table D-17
Friction Testing Summary

LA 422
East Bound 12/02/02

Ribbed Tire			Smooth Tire		
Log Mile	FN	Speed	Log Mile	FN	Speed
0.7	56.8	40.1	0.8	62.8	41.0
1.3	55.5	38.2	1.2	38.9	40.0
1.8	54.4	43.0	1.8	56.8	40.8
2.2	62.8	37.8	2.3	70.0	39.3
2.7	56.1	40.4	2.7	53.6	43.1
3.2	56.9	39.7	3.2	52.9	42.1
3.6	49.1	40.0	3.7	59.6	40.6
4.1	59.9	38.0	4.2	53.5	42.2
4.6	59.2	39.2	4.7	54.3	40.9
5.1	56.6	39.2	5.2	55.7	40.3
5.7	59.0	37.7	5.8	56.3	40.7
6.2	54.0	41.0	6.2	55.8	40.1
6.7	56.9	37.5	6.7	53.3	42.6
7.1	52.7	39.1	7.2	53.1	41.5
7.6	52.3	37.8	7.7	55.4	41.6
7.8	55.8	39.4	7.8	47.5	41.8
8.3	46.5	40.0	8.3	55.1	39.6
8.8	53.0	39.5	8.8	49.6	41.9
9.2	53.0	38.7	9.3	50.0	41.0
9.7	57.6	37.4	9.8	59.5	40.3
10.2	54.5	39.1	10.3	51.9	41.5
10.8	49.3	39.4	10.8	50.2	41.9
11.2	50.6	38.1	11.3	55.4	41.4
11.8	55.6	40.7	11.8	48.2	40.5
12.0	53.8	38.2	12.1	50.1	39.7
Avg	**54.9**	**39.2**	**Avg**	**54.0**	**41.1**
Max	**62.8**	**43.0**	**Max**	**70.0**	**43.1**
Min	**46.5**	**37.4**	**Min**	**38.9**	**39.3**
SD	**3.67**	**1.31**	**SD**	**5.76**	**0.97**
# Tests	**25**	**25**	**# Tests**	**25**	**25**

LA 422
West Bound 12/02/02

Ribbed Tire			Smooth Tire		
Log Mile	FN	Speed	Log Mile	FN	Speed
0.6	49.0	40.2	0.4	57.3	34.7
0.9	55.7	39.6	0.8	54.8	40.3
1.4	58.0	40.6	1.3	54.1	40.9
1.9	52.9	38.7	1.9	53.8	40.3
2.4	58.5	35.8	2.4	48.9	43.1
2.9	55.5	38.5	2.8	50.0	40.5
3.4	57.8	39.2	3.3	54.9	40.8
4.0	54.5	37.3	3.9	59.8	41.0
4.4	52.9	39.9	4.4	53.4	40.8
5.0	54.6	39.0	4.9	52.6	41.4
5.5	46.0	39.6	5.4	48.1	40.6
6.0	57.0	38.1	6.0	54.2	42.1
6.5	55.2	37.4	6.4	58.3	40.5
6.9	55.8	38.6	6.9	49.0	40.8
7.5	52.9	39.5	7.4	53.6	41.0
7.9	56.0	38.5	7.9	52.7	41.0
8.4	46.6	40.3	8.4	55.3	40.0
9.0	52.1	38.6	8.9	55.4	40.9
9.4	54.8	39.8	9.4	54.8	41.8
10.0	57.7	39.1	9.9	60.3	41.6
10.5	56.2	38.4	10.4	56.1	41.4
11.0	57.5	38.8	11.0	58.7	40.9
11.5	53.7	38.3	11.5	59.2	40.8
12.1	54.3	38.9	12.0	56.9	41.0
Avg	**54.4**	**38.9**	**Avg**	**54.7**	**40.8**
Max	**58.5**	**40.6**	**Max**	**60.3**	**43.1**
Min	**46.0**	**35.8**	**Min**	**48.1**	**34.7**
SD	**3.32**	**1.06**	**SD**	**3.40**	**1.45**
# Tests	**24**	**24**	**# Tests**	**24**	**24**

Table D-18
Friction Testing Summary

LA 422
East Bound 01/08/03

Ribbed Tire			Smooth Tire		
Log Mile	FN	Speed	Log Mile	FN	Speed
0.5	51.0	39.8	0.5	51.9	39.5
1.0	54.1	37.4	0.9	31.2	40.3
1.5	49.6	40.4	1.4	41.8	40.6
2.0	55.0	39.8	1.9	47.0	39.2
2.5	58.0	40.6	2.5	53.0	40.1
3.1	57.3	40.6	3.0	47.6	40.9
3.5	59.9	40.5	3.4	44.2	40.4
4.0	57.0	39.9	3.9	43.2	39.8
4.5	54.5	37.2	4.5	38.5	40.3
5.1	58.1	40.0	5.0	39.4	40.5
5.8	57.7	40.1	5.7	40.7	40.9
6.6	58.5	38.5	6.5	42.9	40.5
7.0	58.1	40.5	6.9	42.6	39.9
7.6	54.2	39.1	7.5	35.0	40.4
8.0	53.4	39.0	7.9	40.1	39.9
8.6	48.2	39.6	8.5	35.1	40.6
8.9	51.8	39.1	8.8	30.2	40.8
9.5	54.9	38.6	9.4	34.5	41.2
10.1	53.2	40.1	9.9	38.5	39.4
10.7	56.7	39.2	10.6	47.4	39.8
11.1	57.5	39.6	11.0	40.4	40.1
11.5	57.1	38.0	11.4	39.1	41.2
12.0	58.3	39.0	11.9	38.2	39.7
Avg	**55.4**	**39.4**	**Avg**	**41.0**	**40.3**
Max	**59.9**	**40.6**	**Max**	**53.0**	**41.2**
Min	**48.2**	**37.2**	**Min**	**30.2**	**39.2**
SD	**3.10**	**0.98**	**SD**	**5.87**	**0.55**
# Tests	**23**	**23**	**# Tests**	**23**	**23**

LA 422
West Bound 01/08/03

Ribbed Tire			Smooth Tire		
Log Mile	FN	Speed	Log Mile	FN	Speed
0.5	53.9	39.5	0.6	34.2	40.8
0.9	60.6	36.4	1.1	43.1	39.9
1.4	59.3	39.2	1.5	42.7	39.6
2.0	58.7	39.6	2.1	44.3	39.8
2.5	58.2	33.3	2.6	36.9	39.4
2.9	59.9	39.7	3.0	43.0	40.7
3.7	55.0	40.4	3.8	44.9	39.3
4.5	55.3	40.4	4.5	42.6	39.8
4.9	56.5	40.0	5.1	40.0	40.7
5.5	49.3	38.6	5.6	37.7	40.4
6.0	51.1	40.0	6.0	41.6	40.1
6.3	56.2	39.8	6.4	42.4	39.9
7.0	57.4	39.9	7.0	45.1	39.8
7.4	56.4	40.0	7.5	40.5	40.7
7.9	54.6	39.7	8.0	39.3	40.1
8.4	54.9	39.2	8.5	44.0	40.3
8.8	58.8	39.9	9.0	42.3	40.1
9.5	60.2	39.0	9.6	44.1	40.1
10.0	57.6	40.4	10.1	41.8	41.0
10.5	57.2	39.3	10.6	44.2	39.7
11.0	57.6	39.8	11.1	39.0	40.2
11.5	51.7	39.4	11.6	36.0	42.5
12.0	56.0	40.1	12.1	39.1	39.9
Avg	**56.4**	**39.3**	**Avg**	**41.3**	**40.2**
Max	**60.6**	**40.4**	**Max**	**45.1**	**42.5**
Min	**49.3**	**33.3**	**Min**	**34.2**	**39.3**
SD	**2.92**	**1.54**	**SD**	**3.01**	**0.67**
# Tests	**23**	**23**	**# Tests**	**23**	**23**

Table D-19
Friction Testing Summary

LA 422
East Bound 05/19/03

Ribbed Tire			Smooth Tire		
Log Mile	FN	Speed	Log Mile	FN	Speed
0.6	51.3	39.3	1.1	36.0	39.8
1.2	53.5	39.5	1.5	37.1	39.7
1.6	54.8	36.8	2.0	40.4	41.8
2.2	53.4	39.4	2.5	40.2	40.4
2.6	55.1	39.3	3.0	42.6	40.9
3.1	54.8	40.2	3.6	45.7	40.6
3.7	55.5	39.0	4.0	47.1	40.2
4.2	57.5	38.2	4.5	30.8	40.1
4.6	55.4	40.0	5.1	39.4	41.1
5.2	53.7	38.3	5.6	41.4	41.3
5.7	55.4	38.8	6.0	41.7	40.6
6.1	56.4	40.2	6.5	47.5	39.7
6.6	56.3	38.9	7.0	35.6	40.2
7.1	56.8	39.3	7.6	31.2	40.0
7.7	55.9	39.5	8.0	28.0	40.6
8.1	49.7	39.8	8.5	27.2	39.9
8.7	52.8	39.0	9.0	31.6	40.4
9.2	52.4	38.5	9.6	30.6	40.5
9.6	53.3	38.9	10.0	34.3	41.1
10.1	51.5	39.8	10.5	39.8	40.7
10.6	50.0	39.8	11.0	35.7	40.8
11.1	52.7	38.9	11.6	37.7	41.2
11.8	54.7	39.1	12.0	28.6	40.0
Avg	**54.0**	**39.2**	**Avg**	**37.0**	**40.5**
Max	**57.5**	**40.2**	**Max**	**47.5**	**41.8**
Min	**49.7**	**36.8**	**Min**	**27.2**	**39.7**
SD	**2.12**	**0.75**	**SD**	**6.02**	**0.56**
# Tests	**23**	**23**	**# Tests**	**23**	**23**

LA 422
West Bound 05/19/03

Ribbed Tire			Smooth Tire		
Log Mile	FN	Speed	Log Mile	FN	Speed
1.0	55.2	38.3	0.6	39.0	39.1
1.4	55.8	39.7	1.0	43.6	40.2
2.0	56.0	39.3	1.6	36.8	40.1
2.5	56.7	30.1	2.1	46.4	40.0
2.9	57.6	39.2	2.6	40.0	39.9
3.5	56.5	39.8	3.0	44.0	39.5
3.8	54.1	41.2	3.6	42.6	40.4
4.4	55.3	40.1	3.9	44.6	39.7
4.9	55.0	39.5	4.6	39.2	40.2
5.4	47.2	39.6	5.0	39.2	40.2
6.0	56.6	39.9	5.6	40.0	40.6
6.5	53.5	39.9	6.0	40.9	40.8
7.0	55.0	39.4	6.6	44.9	39.9
7.4	50.8	39.1	7.0	37.7	40.5
8.0	53.7	39.1	7.6	35.9	41.0
8.4	53.2	33.8	8.1	32.4	40.6
9.0	53.5	39.2	8.5	36.9	40.9
9.5	57.1	38.7	9.1	33.8	40.2
10.0	57.8	39.8	9.6	41.8	40.6
10.5	55.8	39.1	10.0	41.7	40.3
11.0	59.2	39.4	10.6	44.9	39.5
11.4	53.1	40.7	11.0	41.6	39.7
12.1	53.4	39.4	11.4	39.1	40.4
			12.0	59.0	39.8
Avg	**54.9**	**38.9**	**Avg**	**41.1**	**40.2**
Max	**59.2**	**41.2**	**Max**	**59.0**	**41.0**
Min	**47.2**	**30.1**	**Min**	**32.4**	**39.1**
SD	**2.53**	**2.34**	**SD**	**5.23**	**0.48**
# Tests	**23**	**23**	**# Tests**	**24**	**24**

Table D-20
Friction Testing Summary

LA 422
East Bound 11/04/03

Ribbed Tire			Smooth Tire		
Log Mile	FN	Speed	Log Mile	FN	Speed
0.5	52.1	39.2	0.5	33.5	39.7
1.1	53.2	39.9	1.0	34.3	40.0
1.6	51.5	40.6	1.5	35.3	40.1
2.2	51.2	39.4	2.1	37.8	40.9
2.6	56.0	40.2	2.5	35.6	40.0
3.1	54.9	39.2	3.0	40.7	40.5
3.6	50.5	39.7	3.5	38.8	41.0
4.2	49.9	40.7	4.0	41.0	40.2
4.6	52.1	40.6	4.5	41.1	41.0
5.1	50.5	39.9	5.0	34.5	40.8
5.7	52.5	39.9	5.7	40.2	40.0
6.2	51.6	39.8	6.1	36.7	41.5
6.6	54.4	30.1	6.5	41.3	39.6
7.1	53.6	40.3	7.0	37.8	40.6
7.6	53.4	40.4	7.5	40.5	40.1
8.1	45.1	41.3	8.0	28.8	41.4
8.6	48.6	40.5	8.5	32.5	40.0
9.2	48.0	40.5	9.0	29.9	40.7
9.6	51.4	39.7	9.5	30.9	41.0
10.1	50.8	40.2	10.0	26.8	40.9
10.6	44.0	39.3	10.5	29.0	40.6
11.2	48.6	40.7	11.0	30.4	40.8
11.6	50.7	40.6	11.5	35.6	42.3
12.0	45.3	39.9	12.0	28.8	40.3
Avg	50.8	39.7	Avg	35.1	40.6
Max	56.0	41.3	Max	41.3	42.3
Min	44.0	30.1	Min	26.8	39.6
SD	3.04	2.11	SD	4.61	0.63
# Tests	24	24	# Tests	24	24

LA 422
West Bound 11/04/03

Ribbed Tire			Smooth Tire		
Log Mile	FN	Speed	Log Mile	FN	Speed
0.8	50.9	39.0	0.5	33.4	38.4
1.3	51.7	39.6	1.0	34.8	41.6
1.9	52.1	39.4	1.4	38.1	40.9
2.5	53.4	38.4	2.0	38.2	40.4
2.9	53.4	40.1	2.5	38.0	40.9
3.4	51.5	39.9	3.0	42.2	39.6
3.9	55.6	39.6	3.5	39.8	40.3
4.3	51.8	38.6	4.0	40.0	39.5
4.9	48.2	39.9	4.4	34.9	41.3
5.4	39.7	39.9	4.9	33.9	40.6
5.9	53.3	39.7	5.5	32.8	39.9
6.4	53.0	39.5	6.0	36.6	41.5
6.9	50.5	40.0	6.5	37.1	41.4
7.4	49.6	39.3	7.0	38.7	40.8
7.9	52.3	40.0	7.5	32.0	41.9
8.3	51.6	40.1	8.0	38.2	40.1
8.9	49.3	40.3	8.4	32.8	40.7
9.4	49.2	41.2	9.0	30.7	40.8
9.9	53.4	40.4	9.5	38.7	40.6
10.4	50.9	40.6	9.9	40.1	41.1
10.9	52.2	40.2	10.5	38.7	40.0
11.6	51.5	42.4	11.0	37.1	40.8
12.0	49.4	41.3	11.6	34.0	43.0
			12.1	35.8	40.7
Avg	51.1	40.0	Avg	36.5	40.7
Max	55.6	42.4	Max	42.2	43.0
Min	39.7	38.4	Min	30.7	38.4
SD	3.02	0.87	SD	2.98	0.91
# Tests	23	23	# Tests	24	24

Table D-21
Friction Testing Summary

LA 422
East Bound 06/02/04

Ribbed Tire			Smooth Tire		
Log Mile	FN	Speed	Log Mile	FN	Speed
0.6	51.6	41.9	0.5	38.1	39.9
1.1	53.3	40.5	1.1	36.0	40.1
1.7	52.1	41.7	1.6	33.7	40.0
2.3	52.9	39.9	2.2	40.4	40.9
2.7	55.3	41.0	2.6	40.8	40.2
3.2	55.9	40.3	3.1	44.3	40.1
3.7	54.9	39.8	3.7	41.8	40.0
4.0	54.5	40.0	4.1	54.9	39.7
4.6	55.7	40.4	4.7	56.9	39.4
5.2	52.4	39.0	5.1	40.6	39.5
5.7	56.4	39.3	5.6	36.5	41.4
6.3	54.5	41.1	6.2	40.2	41.1
6.8	55.7	39.6	6.6	48.0	38.8
7.2	56.0	40.6	7.1	43.6	39.8
7.7	55.4	38.8	7.7	43.4	39.5
8.2	51.2	40.5	8.1	33.6	41.0
8.7	53.6	39.6	8.6	39.9	40.3
9.3	49.9	40.2	9.1	36.7	40.8
9.7	54.5	40.1	9.6	28.9	41.1
10.2	54.4	40.2	10.1	36.7	41.3
10.7	50.7	39.9	10.6	36.3	40.3
11.3	55.0	39.8	11.2	43.6	40.2
11.7	52.6	41.3	11.7	29.6	40.6
			12.1	32.0	40.5
Avg	**53.8**	**40.2**	**Avg**	**39.9**	**40.3**
Max	**56.4**	**41.9**	**Max**	**56.9**	**41.4**
Min	**49.9**	**38.8**	**Min**	**28.9**	**38.8**
SD	**1.86**	**0.79**	**SD**	**6.84**	**0.66**
# Tests	**23**	**23**	**# Tests**	**24**	**24**

LA 422
West Bound 06/02/04

Ribbed Tire			Smooth Tire		
Log Mile	FN	Speed	Log Mile	FN	Speed
0.5	51.7	38.7	0.6	34.1	40.0
1.0	53.6	39.3	1.0	33.4	39.2
1.4	53.0	39.4	1.5	42.4	39.5
1.9	54.9	38.9	2.0	39.0	39.4
2.3	53.6	39.4	2.4	36.2	41.4
2.9	53.1	39.6	3.0	41.5	39.9
3.4	54.4	39.8	3.5	41.9	40.6
3.8	51.8	39.9	3.9	38.0	40.6
4.4	52.0	40.1	4.5	39.7	40.4
4.9	52.9	39.5	5.0	36.8	40.1
5.3	47.4	40.4	5.4	41.4	38.9
5.9	57.5	39.3	6.0	39.1	40.3
6.4	56.2	39.0	6.4	34.7	39.9
6.9	55.2	40.9	7.0	40.3	40.1
7.3	53.2	40.3	7.4	36.0	41.2
7.9	52.9	39.5	8.0	38.9	39.9
8.4	49.0	40.2	8.5	40.5	40.3
8.8	53.0	40.3	8.9	38.7	40.1
9.4	51.9	39.5	9.4	37.5	39.8
9.9	55.4	39.6	10.0	41.4	40.4
10.4	52.9	40.4	10.5	41.7	40.7
10.9	52.8	39.5	11.0	40.5	40.5
11.4	54.0	38.8	11.5	39.0	38.9
11.9	51.8	39.8	12.0	40.0	39.5
Avg	**53.1**	**39.7**	**Avg**	**38.9**	**40.1**
Max	**57.5**	**40.9**	**Max**	**42.4**	**41.4**
Min	**47.4**	**38.7**	**Min**	**33.4**	**38.9**
SD	**2.11**	**0.56**	**SD**	**2.56**	**0.63**
# Tests	**24**	**24**	**# Tests**	**24**	**24**

Table D-22
Friction Testing Summary

LA 422
East Bound 01/12/05

Ribbed Tire			Smooth Tire		
Log Mile	FN	Speed	Log Mile	FN	Speed
0.6	46.7	40.0	0.5	43.7	39.6
1.1	50.3	39.6	1.0	40.3	40.4
1.6	51.1	39.5	1.5	42.2	39.8
2.1	49.3	39.6	2.0	40.2	40.5
2.6	52.7	40.7	2.5	44.3	40.9
3.1	52.1	39.8	3.1	43.7	40.5
3.6	52.6	39.7	3.6	39.8	41.0
4.2	51.3	39.4	4.0	41.8	40.3
4.6	48.5	40.9	4.6	38.7	40.8
5.2	46.4	40.1	5.1	41.3	40.8
5.8	49.0	40.2	5.7	39.4	40.5
6.5	55.2	38.3	6.3	43.1	39.9
7.1	54.3	39.6	7.0	45.7	40.8
7.6	51.4	38.7	7.6	40.4	42.3
8.1	47.6	39.7	8.0	38.1	41.0
8.5	43.9	40.0	8.6	45.6	40.1
9.1	48.5	40.1	9.0	34.8	41.1
9.6	46.5	40.3	9.5	35.0	40.0
10.1	46.8	40.4	10.0	34.1	41.7
10.7	48.1	39.8	10.6	39.3	40.5
11.2	48.7	37.7	11.0	36.0	40.2
11.6	47.1	42.1	11.6	35.7	40.5
12.1	43.5	40.0	12.0	33.6	40.4
Avg	**49.2**	**39.8**	**Avg**	**39.9**	**40.6**
Max	**55.2**	**42.1**	**Max**	**45.7**	**42.3**
Min	**43.5**	**37.7**	**Min**	**33.6**	**39.6**
SD	**3.06**	**0.87**	**SD**	**3.68**	**0.60**
# Tests	**23**	**23**	**# Tests**	**23**	**23**

LA 422
West Bound 01/12/05

Ribbed Tire			Smooth Tire		
Log Mile	FN	Speed	Log Mile	FN	Speed
0.2	45.6	40.0	0.4	36.5	39.2
0.7	48.9	39.1	0.9	37.8	41.4
1.3	48.7	40.4	1.4	40.6	40.3
1.8	48.5	39.3	1.8	39.9	40.8
2.2	49.0	39.4	2.4	38.7	41.6
2.8	51.1	39.2	2.9	43.3	39.9
3.2	49.3	40.3	3.3	38.2	41.0
3.7	49.5	40.0	3.7	37.6	40.6
4.2	46.2	39.8	4.3	34.9	41.8
4.8	45.1	40.8	4.8	36.9	40.6
5.3	43.8	40.2	5.3	33.9	40.0
5.8	49.3	40.0	5.8	40.8	41.1
6.1	50.7	39.4	6.3	40.4	40.1
6.8	44.7	39.8	6.9	37.7	41.1
7.3	47.3	39.7	7.3	38.1	41.2
7.8	46.9	40.1	7.9	37.5	40.3
8.2	46.9	39.6	8.3	35.5	40.6
8.8	47.0	39.7	8.9	33.9	40.9
9.3	46.3	40.9	9.3	42.6	40.5
9.8	50.3	39.4	9.9	40.5	41.5
10.3	49.0	39.9	10.3	40.7	40.8
10.8	47.9	40.6	10.9	38.7	40.3
11.3	45.7	41.4	11.3	34.8	40.9
11.9	43.2	39.9	12.0	37.6	40.6
Avg	**47.5**	**40.0**	**Avg**	**38.2**	**40.7**
Max	**51.1**	**41.4**	**Max**	**43.3**	**41.8**
Min	**43.2**	**39.1**	**Min**	**33.9**	**39.2**
SD	**2.16**	**0.57**	**SD**	**2.56**	**0.60**
# Tests	**24**	**24**	**# Tests**	**24**	**24**

Table D-23
Friction Testing Summary

LA 422
East Bound 05/11/06

Ribbed Tire			Smooth Tire		
Log Mile	FN	Speed	Log Mile	FN	Speed
0.6	49.2	39.3	0.5	36.8	38.7
1.5	54.3	39.0	1.4	37.3	40.4
2.4	49.7	39.0	2.3	41.8	38.7
3.4	53.7	38.5	3.3	35.7	40.3
4.4	44.2	39.7	4.3	35.6	39.1
5.4	47.3	38.5	5.3	33.0	42.9
6.5	55.2	38.3	6.4	37.0	39.5
7.4	51.5	40.9	7.4	37.8	39.5
8.4	41.1	39.5	8.4	37.6	40.5
9.4	47.6	38.7	9.3	28.7	41.5
10.4	45.1	39.8	10.3	32.9	40.3
11.4	49.8	40.0	11.3	33.9	40.9
11.6	44.8	39.3	11.6	34.1	41.5
Avg	**48.7**	**39.3**	**Avg**	**35.6**	**40.3**
Max	**55.2**	**40.9**	**Max**	**41.8**	**42.9**
Min	**41.1**	**38.3**	**Min**	**28.7**	**38.7**
SD	**4.26**	**0.73**	**SD**	**3.17**	**1.22**
# Tests	**13**	**13**	**# Tests**	**13**	**13**

LA 422
West Bound 05/11/06

Ribbed Tire			Smooth Tire		
Log Mile	FN	Speed	Log Mile	FN	Speed
0.8	46.4	39.1	0.8	40.2	40.3
1.3	51.4	39.6	1.4	39.3	39.9
2.1	52.7	40.1	2.2	38.5	40.0
3.2	53.5	40.0	3.2	39.2	41.2
3.9	54.9	38.6	4.1	40.5	38.9
4.9	52.2	41.0	5.0	36.9	40.6
6.0	52.6	38.8	6.0	37.8	40.8
6.9	54.0	42.0	7.0	37.6	40.3
7.9	53.7	40.7	8.0	38.3	39.5
8.9	51.4	40.2	9.0	33.2	40.5
9.9	48.3	40.1	10.0	38.2	39.9
10.9	51.6	39.0	11.0	35.2	42.4
12.0	49.7	38.8	12.1	37.4	39.3
Avg	**51.7**	**39.8**	**Avg**	**37.9**	**40.3**
Max	**54.9**	**42.0**	**Max**	**40.5**	**42.4**
Min	**46.4**	**38.6**	**Min**	**33.2**	**38.9**
SD	**2.39**	**1.00**	**SD**	**1.98**	**0.89**
# Tests	**13**	**13**	**# Tests**	**13**	**13**

APPENDIX E

I-10: Detailed Summary of ARAN Based Profiler and Rut Survey

Table E-0
Summary of Profiler and Rut Testing Conducted by ARAN on I-10

	Age (yrs)	Mean	Standard Error	Median	Mode	Standard Deviation	Sample Variance	Kurtosis	Skewness	Range	Min	Max	Segment Count	95th Percentile	Mean + 95%
Average IRI	0.723	45.6	0.500	44	40	7.05	49.7	5.24	1.78	49	33	82	199	0.986	46.6
	2.73	45.8	0.625	44	40	8.79	77.3	33	4.34	91	33	124	198	1.23	47.1
Average IRI standard deviation	0.723	10.2	0.278	9	8	3.93	15.4	8.28	2.17	28	5	33	199	0.549	10.7
	2.73	10.8	0.630	9	9	8.86	78.5	123	10.0	116	5	121	198	1.24	12.0
Left IRI standard deviation	0.723	9.67	0.276	9	10	3.89	15.1	9.35	2.10	32	3	35	199	0.544	10.2
	2.73	10.3	0.665	9	10	9.36	87.6	133	10.6	126	3	129	198	1.31	11.6
Left wheelpath IRI	0.723	48.2	0.559	47	48	7.89	62.2	1.25	0.978	45	33	78	199	1.10	49.3
	2.73	48.6	0.723	47	48	10.2	104	21.1	3.36	96	33	129	198	1.43	50.1
Right IRI standard deviation	0.723	8.95	0.339	8	7	4.78	22.8	14.6	2.85	41	2	43	199	0.668	9.62
	2.73	9.63	0.715	8	7	10.1	101	113	9.54	130	2	132	198	1.41	11.0
Right wheelpath IRI	0.723	43.0	0.553	42	37	7.80	60.9	12.2	2.70	61	33	94	199	1.09	44.1
	2.73	43.0	0.605	42	37	8.51	72.5	32.6	4.29	86	33	119	198	1.19	44.2
Rutting left standard deviation	0.723	0.0234	0.000658	0.02	0.02	0.00928	8.61E-05	1.16	0.813	0.05	0.01	0.06	199	0.00130	0.0247
	2.73	0.0234	0.000658	0.02	0.02	0.00925	8.56E-05	1.18	0.817	0.05	0.01	0.06	198	0.00130	0.0247
Rutting right standard deviation	0.723	0.0287	0.000790	0.03	0.03	0.0111	0.000124	2.19	1.09	0.06	0.01	0.07	199	0.00156	0.0303
	2.73	0.0288	0.000796	0.03	0.03	0.0112	0.000125	2.10	1.07	0.06	0.01	0.07	198	0.00157	0.0304
Total Average rutting (inches)	0.723	0.135	0.00151	0.13	0.13	0.0213	0.000454	-0.788	0.203	0.1	0.09	0.19	200	0.00297	0.138
	2.73	0.135	0.00153	0.13	0.13	0.0216	0.000466	-0.852	0.185	0.1	0.09	0.19	198	0.00302	0.138
Total Average rutting standard deviation	0.723	0.0343	0.000835	0.03	0.03	0.0118	0.000139	2.68	1.14	0.08	0.01	0.09	199	0.00165	0.0359
	2.73	0.0344	0.000843	0.03	0.03	0.0119	0.000141	2.51	1.09	0.08	0.01	0.09	198	0.00166	0.0361
Average Rutting in left wheelpath (inches)	0.723	0.117	0.00218	0.12	0.12	0.0309	0.000952	-0.776	0.143	0.15	0.05	0.2	200	0.00430	0.121
	2.73	0.117	0.00220	0.12	0.12	0.0310	0.000962	-0.800	0.138	0.15	0.05	0.2	198	0.00435	0.121
Average Rutting in right wheelpath (inches)	0.723	0.148	0.00169	0.14	0.14	0.0238	0.000566	0.435	0.758	0.13	0.1	0.23	199	0.00333	0.151
	2.73	0.148	0.00171	0.14	0.14	0.0241	0.000580	0.334	0.727	0.13	0.1	0.23	198	0.00338	0.152
Maximum Rutting (inches)	0.723	0.202	0.00267	0.2	0.2	0.0377	0.00142	2.22	1.04	0.23	0.13	0.36	200	0.00526	0.207
	2.73	0.203	0.00270	0.2	0.2	0.0380	0.00145	2.06	1.00	0.23	0.13	0.36	198	0.00533	0.208

3-Year Projected Distress	Mean	Standard Error	Median	Mode	Standard Deviation	Sample Variance	Kurtosis	Skewness	95th Percentile	Mean + 95%
Average IRI	45.8	0.642	44	40	9.03	81.0	36.3	4.69	1.27	47.1
Average IRI standard deviation	10.9	0.678	9	9.14	9.54	87.1	138	11.1	1.34	12.2
Left IRI standard deviation	10.4	0.718	9	10	10.1	97.5	149	11.7	1.42	11.8
Left wheelpath IRI	48.7	0.746	47	48	10.5	109	23.9	3.69	1.47	50.2
Right IRI standard deviation	9.72	0.766	8	7	10.8	112	126	10.5	1.51	11.2
Right wheelpath IRI	42.98	0.612	42	37	8.61	74.0	35.4	4.51	1.21	44.2
Rutting left standard deviation	0.0234	0.000700	0.02	0.02	0.00927	0.0000894	1.19	0.818	0.0013	0.0247
Rutting right standard deviation	0.0288	0.000809	0.03	0.03	0.0112	0.000102	2.09	1.07	0.00162	0.0304
Total Average rutting (inches)	0.135	0.00153	0.13	0.13	0.0215	0.000518	-0.860	0.182	0.00309	0.138
Total Average rutting standard deviation	0.0345	0.000812	0.03	0.03	0.0119	0.000103	2.48	1.09	0.00162	0.0361
Average Rutting in left wheelpath (inches)	0.117	0.00223	0.12	0.12	0.0310	0.000915	-0.804	0.138	0.00436	0.122
Average Rutting in right wheelpath (inches)	0.148	0.00173	0.14	0.14	0.024	0.000621	0.321	0.723	0.00336	0.152
Maximum Rutting (inches)	0.203	0.00276	0.2	0.2	0.0382	0.00143	2.04	0.999	0.00532	0.208

Table E-1

Project: 450-03-0037

ARAN Rutting Survey: 2/25/2003

(Note: there are 50 evaluations per 1/10th mile segment)

Mile	Maximum Rutting (inches)	Total Average rutting (inches)	Average Rutting in left wheelpath (inches)	Average Rutting in right wheelpath (inches)	Total Average rutting standard deviation	Rutting left standard deviation	Rutting right standard deviation
0.1	0.19	0.14	0.11	0.16	0.03	0.02	0.03
0.2	0.17	0.14	0.14	0.13	0.02	0.02	0.03
0.3	0.18	0.12	0.12	0.11	0.03	0.02	0.04
0.4	0.32	0.16	0.15	0.15	0.05	0.03	0.07
0.5	0.24	0.17	0.15	0.19	0.04	0.02	0.04
0.6	0.18	0.13	0.14	0.11	0.03	0.02	0.03
Bridge							
1.1	0.25	0.17	0.14	0.18	0.04	0.02	0.05
1.2	0.24	0.15	0.1	0.19	0.05	0.02	0.02
1.3	0.21	0.14	0.12	0.16	0.03	0.02	0.03
1.4	0.28	0.16	0.14	0.17	0.04	0.05	0.03
1.5	0.16	0.13	0.12	0.14	0.02	0.02	0.02
1.6	0.16	0.12	0.11	0.12	0.03	0.03	0.03
1.7	0.21	0.13	0.12	0.14	0.03	0.02	0.04
1.8	0.22	0.14	0.11	0.16	0.04	0.02	0.03
1.9	0.24	0.16	0.11	0.2	0.05	0.02	0.03
2	0.23	0.16	0.14	0.17	0.03	0.02	0.04
2.1	0.26	0.16	0.13	0.19	0.05	0.02	0.05
2.2	0.22	0.14	0.13	0.15	0.03	0.02	0.04
2.3	0.18	0.13	0.14	0.11	0.02	0.02	0.02
2.4	0.19	0.15	0.14	0.15	0.02	0.03	0.01
2.5	0.24	0.16	0.13	0.18	0.04	0.01	0.04
2.6	0.15	0.13	0.13	0.13	0.01	0.01	0.01
2.7	0.28	0.13	0.12	0.14	0.04	0.02	0.06
2.8	0.2	0.13	0.11	0.15	0.03	0.02	0.03
2.9	0.18	0.14	0.13	0.14	0.02	0.02	0.02
3	0.2	0.14	0.12	0.15	0.03	0.03	0.03
3.1	0.18	0.13	0.12	0.13	0.03	0.03	0.03
3.2	0.15	0.13	0.12	0.13	0.02	0.02	0.02
3.3	0.17	0.13	0.12	0.13	0.02	0.02	0.02
3.4	0.19	0.14	0.11	0.15	0.03	0.01	0.02
3.5	0.19	0.13	0.12	0.14	0.02	0.01	0.02
3.6	0.18	0.13	0.12	0.13	0.03	0.02	0.03
3.7	0.19	0.14	0.15	0.13	0.03	0.03	0.03
3.8	0.24	0.15	0.13	0.17	0.04	0.01	0.05
3.9	0.2	0.13	0.12	0.12	0.03	0.02	0.03
4	0.18	0.13	0.12	0.14	0.03	0.02	0.03
4.1	0.18	0.12	0.09	0.15	0.04	0.02	0.02
4.2	0.22	0.14	0.12	0.15	0.03	0.03	0.03
4.3	0.19	0.13	0.11	0.15	0.03	0.02	0.02
4.4	0.14	0.11	0.09	0.12	0.02	0.02	0.01
4.5	0.23	0.12	0.11	0.14	0.04	0.02	0.05
4.6	0.25	0.17	0.12	0.22	0.05	0.02	0.02
4.7	0.27	0.16	0.13	0.19	0.05	0.02	0.06
4.8	0.2	0.14	0.15	0.12	0.03	0.03	0.02
4.9	0.29	0.17	0.14	0.19	0.04	0.02	0.04
5	0.2	0.13	0.12	0.14	0.03	0.02	0.04
Bridge							
5.3	0.2	0.13	0.12	0.13	0.03	0.03	0.03
5.4	0.22	0.16	0.17	0.14	0.03	0.04	0.02
5.5	0.26	0.18	0.17	0.19	0.03	0.02	0.04
5.6	0.21	0.16	0.17	0.15	0.02	0.02	0.02
5.7	0.26	0.18	0.17	0.18	0.04	0.04	0.04
5.8	0.26	0.17	0.13	0.2	0.05	0.03	0.03
5.9	0.22	0.16	0.16	0.16	0.03	0.02	0.04
6	0.2	0.16	0.16	0.16	0.02	0.02	0.03
6.1	0.2	0.16	0.15	0.17	0.02	0.02	0.02
6.2	0.24	0.16	0.12	0.2	0.05	0.02	0.03
6.3	0.2	0.15	0.13	0.16	0.03	0.02	0.03
6.4	0.23	0.15	0.14	0.17	0.03	0.02	0.04
6.5	0.24	0.14	0.14	0.14	0.03	0.03	0.04
6.6	0.23	0.16	0.16	0.15	0.03	0.02	0.03
6.7	0.22	0.16	0.16	0.17	0.03	0.02	0.03
6.8	0.19	0.15	0.15	0.15	0.03	0.01	0.03
6.9	0.19	0.14	0.15	0.14	0.02	0.03	0.02
7	0.23	0.16	0.14	0.17	0.03	0.02	0.03
7.1	0.2	0.14	0.14	0.13	0.03	0.03	0.04
7.2	0.25	0.17	0.15	0.19	0.04	0.04	0.03
7.3	0.19	0.15	0.14	0.14	0.02	0.03	0.02
7.4	0.36	0.17	0.13	0.2	0.06	0.03	0.07
7.5	0.24	0.17	0.14	0.2	0.04	0.03	0.03
7.6	0.24	0.16	0.12	0.18	0.05	0.03	0.04
7.7	0.21	0.15	0.13	0.17	0.03	0.02	0.03
7.8	0.21	0.15	0.16	0.14	0.04	0.03	0.04
7.9	0.18	0.14	0.15	0.13	0.03	0.03	0.03
8	0.19	0.16	0.16	0.15	0.02	0.01	0.03
8.1	0.23	0.18	0.18	0.18	0.03	0.03	0.02
8.2	0.22	0.17	0.17	0.16	0.03	0.03	0.03
8.3	0.22	0.16	0.16	0.16	0.03	0.02	0.03
8.4	0.19	0.15	0.15	0.15	0.03	0.03	0.02
8.5	0.21	0.16	0.15	0.16	0.02	0.03	0.02
8.6	0.23	0.17	0.17	0.16	0.03	0.03	0.03
8.7	0.24	0.19	0.18	0.18	0.03	0.02	0.03
8.8	0.21	0.17	0.17	0.17	0.02	0.02	0.02
8.9	0.22	0.16	0.17	0.16	0.02	0.02	0.02
9	0.21	0.16	0.16	0.15	0.02	0.02	0.02
9.1	0.21	0.17	0.17	0.17	0.03	0.03	0.03
9.2	0.19	0.15	0.16	0.13	0.03	0.03	0.02
9.3	0.2	0.16	0.16	0.16	0.02	0.02	0.03
9.4	0.21	0.15	0.16	0.14	0.03	0.03	0.02
9.5	0.23	0.18	0.2	0.16	0.03	0.02	0.02
9.6	0.2	0.16	0.15	0.15	0.02	0.02	0.03
9.7	0.21	0.16	0.17	0.15	0.03	0.02	0.02
9.8	0.2	0.17	0.17	0.15	0.02	0.01	0.01
9.9	0.19	0.14	0.14	0.13	0.02	0.03	0.02
Bridge							
10.2	0.19	0.13	0.1	0.15	0.03	0.01	0.03
10.3	0.19	0.14	0.14	0.14	0.03	0.02	0.03
10.4	0.24	0.16	0.12	0.2	0.05	0.02	0.03
10.5	0.2	0.14	0.11	0.16	0.03	0.01	0.02

Mile	Maximum Rutting (inches)	Total Average rutting (inches)	Average Rutting in left wheelpath (inches)	Average Rutting in right wheelpath (inches)	Total Average rutting standard deviation	Rutting left standard deviation	Rutting right standard deviation
0.1	0.2	0.12	0.09	0.14	0.04	0.02	0.03
0.2	0.19	0.13	0.1	0.14	0.04	0.03	0.03
0.3	0.29	0.13	0.07	0.18	0.07	0.02	0.06
0.4	0.32	0.15	0.07	0.23	0.09	0.02	0.05
0.5	0.24	0.14	0.11	0.18	0.05	0.04	0.04
0.6	0.22	0.14	0.14	0.14	0.04	0.04	0.04
Bridge							
1.1	0.19	0.12	0.1	0.13	0.04	0.04	0.02
1.2	0.19	0.13	0.1	0.15	0.04	0.04	0.02
1.3	0.2	0.14	0.1	0.16	0.04	0.02	0.03
1.4	0.22	0.15	0.12	0.18	0.04	0.02	0.04
1.5	0.21	0.15	0.14	0.16	0.04	0.05	0.03
1.6	0.2	0.14	0.12	0.16	0.04	0.03	0.03
1.7	0.18	0.14	0.13	0.14	0.03	0.03	0.02
1.8	0.2	0.14	0.15	0.13	0.04	0.04	0.05
1.9	0.16	0.12	0.11	0.13	0.03	0.04	0.03
2	0.17	0.12	0.1	0.14	0.03	0.03	0.02
2.1	0.23	0.15	0.15	0.14	0.04	0.05	0.03
2.2	0.19	0.15	0.16	0.14	0.02	0.03	0.02
2.3	0.2	0.14	0.14	0.14	0.03	0.03	0.03
2.4	0.2	0.12	0.09	0.15	0.04	0.02	0.02
2.5	0.2	0.12	0.09	0.14	0.04	0.02	0.04
2.6	0.2	0.12	0.1	0.13	0.04	0.03	0.04
2.7	0.18	0.12	0.11	0.13	0.03	0.02	0.03
2.8	0.17	0.12	0.1	0.13	0.03	0.02	0.02
2.9	0.16	0.12	0.12	0.12	0.02	0.03	0.02
3	0.13	0.11	0.1	0.11	0.01	0.01	0.02
3.1	0.17	0.13	0.11	0.14	0.03	0.03	0.02
3.2	0.21	0.13	0.1	0.14	0.03	0.01	0.03
3.3	0.21	0.13	0.08	0.17	0.05	0.03	0.03
3.4	0.18	0.12	0.09	0.15	0.04	0.03	0.03
3.5	0.24	0.14	0.07	0.2	0.07	0.01	0.02
3.6	0.24	0.14	0.07	0.21	0.07	0.01	0.02
3.7	0.24	0.13	0.1	0.15	0.04	0.02	0.04
3.8	0.21	0.1	0.07	0.13	0.04	0.02	0.04
3.9	0.18	0.12	0.12	0.12	0.03	0.02	0.03
4	0.2	0.13	0.11	0.14	0.03	0.03	0.03
4.1	0.19	0.13	0.11	0.15	0.04	0.03	0.03
4.2	0.24	0.14	0.1	0.16	0.04	0.02	0.04
4.3	0.2	0.13	0.1	0.15	0.04	0.04	0.02
4.4	0.23	0.15	0.15	0.14	0.04	0.04	0.05
4.5	0.24	0.16	0.15	0.16	0.04	0.03	0.05
4.6	0.19	0.15	0.15	0.14	0.02	0.02	0.03
4.7	0.21	0.15	0.14	0.16	0.04	0.04	0.03
4.8	0.21	0.13	0.08	0.17	0.05	0.02	0.03
4.9	0.21	0.13	0.08	0.17	0.05	0.02	0.03
5	0.21	0.13	0.11	0.14	0.05	0.04	0.04
Bridge							
5.3	0.16	0.11	0.09	0.12	0.03	0.02	0.03
5.4	0.14	0.1	0.08	0.11	0.02	0.02	0.02
5.5	0.15	0.1	0.08	0.12	0.03	0.02	0.02
5.6	0.15	0.1	0.09	0.11	0.02	0.01	0.02
5.7	0.16	0.12	0.1	0.13	0.03	0.03	0.02
5.8	0.14	0.11	0.08	0.12	0.02	0.01	0.01
5.9	0.17	0.11	0.1	0.12	0.03	0.02	0.02
6	0.19	0.11	0.07	0.14	0.04	0.02	0.03
6.1	0.17	0.12	0.1	0.13	0.03	0.03	0.03
6.2	0.16	0.12	0.1	0.13	0.03	0.03	0.03
6.3	0.2	0.11	0.08	0.14	0.04	0.01	0.04
6.4	0.2	0.11	0.08	0.14	0.05	0.02	0.04
6.5	0.17	0.1	0.08	0.12	0.03	0.03	0.03
6.6	0.14	0.11	0.09	0.12	0.02	0.02	0.02
6.7	0.18	0.11	0.09	0.13	0.03	0.01	0.02
6.8	0.15	0.09	0.06	0.13	0.04	0.01	0.01
6.9	0.16	0.1	0.07	0.12	0.03	0.01	0.02
7	0.18	0.1	0.06	0.14	0.05	0.02	0.03
7.1	0.16	0.11	0.09	0.13	0.03	0.03	0.03
7.2	0.16	0.11	0.09	0.12	0.03	0.03	0.02
7.3	0.14	0.1	0.09	0.11	0.02	0.01	0.02
7.4	0.21	0.11	0.07	0.15	0.05	0.02	0.03
7.5	0.14	0.11	0.08	0.13	0.03	0.01	0.01
7.6	0.3	0.13	0.12	0.13	0.05	0.06	0.03
7.7	0.2	0.11	0.08	0.14	0.04	0.01	0.03
7.8	0.16	0.12	0.1	0.14	0.03	0.02	0.01
7.9	0.2	0.12	0.08	0.16	0.05	0.02	0.03
8	0.15	0.11	0.08	0.12	0.03	0.01	0.02
8.1	0.15	0.11	0.1	0.11	0.02	0.02	0.02
8.2	0.19	0.11	0.07	0.14	0.04	0.02	0.02
8.3	0.21	0.11	0.08	0.14	0.04	0.02	0.03
8.4	0.16	0.11	0.08	0.13	0.03	0.01	0.02
8.5	0.17	0.11	0.09	0.14	0.03	0.03	0.01
8.6	0.2	0.11	0.07	0.15	0.04	0.02	0.02
8.7	0.17	0.11	0.09	0.13	0.04	0.03	0.03
8.8	0.17	0.13	0.11	0.14	0.02	0.02	0.02
8.9	0.14	0.11	0.11	0.11	0.02	0.02	0.01
9	0.16	0.1	0.07	0.13	0.04	0.01	0.02
9.1	0.17	0.11	0.1	0.13	0.03	0.03	0.03
9.2	0.22	0.12	0.05	0.18	0.07	0.01	0.03
9.3	0.21	0.13	0.07	0.18	0.06	0.01	0.01
9.4	0.18	0.12	0.09	0.14	0.03	0.02	0.02
9.5	0.15	0.12	0.11	0.13	0.02	0.02	0.01
9.6	0.18	0.12	0.09	0.14	0.03	0.02	0.02
9.7	0.19	0.11	0.07	0.16	0.05	0.01	0.02
9.8	0.17	0.11	0.08	0.13	0.03	0.02	0.02
9.9	0.19	0.1	0.06	0.14	0.05	0.01	0.03
Bridge							
10.2	0.21	0.1	0.07	0.12	0.04	0.02	0.04
10.3	0.34	0.11	0.08	0.14	0.06	0.03	0.07
10.4	0.16	0.11	0.12	0.1	0.02	0.02	0.02
10.5	0.16	0.11	0.09	0.12	0.04	0.05	0.02
Average	0.17	0.13	0.13	0.09	0.03	0.03	0.03

Table E-2

Project: 450-03-0037
ARAN IRI Survey: 2/25/2003
(Note: there are 50 evaluations per 1/10th mile segment)

Mile	Left wheelpath IRI	Right wheelpath IRI	Average IRI	Left IRI standard deviation	Right IRI standard deviation	Average IRI standard deviation
0.1	78	75	76	35	32	33
0.2	64	45	55	14	7	14
0.3	56	47	52	11	4	9
0.4	70	62	66	18	16	17
0.5	51	46	48	5	9	7
0.6	70	60	65	17	12	16
			Bridge			
1.1	43	46	44	11	9	10
1.2	47	48	48	9	12	10
1.3	40	38	39	6	7	7
1.4	43	45	44	8	6	7
1.5	48	46	47	10	11	10
1.6	48	49	48	12	11	11
1.7	58	43	50	22	7	18
1.8	40	40	40	12	8	10
1.9	33	34	33	6	6	6
2	38	38	38	6	7	7
2.1	39	41	40	9	7	8
2.2	43	37	40	9	5	8
2.3	40	39	39	5	5	5
2.4	41	42	42	7	7	7
2.5	37	43	40	5	8	7
2.6	38	38	38	9	10	9
2.7	42	42	42	8	5	7
2.8	38	39	38	9	10	10
2.9	38	42	40	3	7	6
3	44	36	40	7	6	7
3.1	44	37	41	7	3	6
3.2	47	40	44	8	9	9
3.3	43	46	44	6	12	9
3.4	39	37	38	5	6	6
3.5	40	35	37	7	7	7
3.6	41	43	42	7	8	7
3.7	54	48	51	15	15	15
3.8	49	37	43	6	6	8
3.9	48	41	45	6	7	7
4	47	48	48	8	8	8
4.1	53	47	50	18	19	19
4.2	49	42	46	10	7	9
4.3	44	44	44	11	9	10
4.4	49	55	52	16	13	14
4.5	51	44	48	15	11	13
4.6	39	41	40	7	4	5
4.7	42	43	42	7	9	8
4.8	45	41	43	11	8	10
4.9	52	52	52	11	19	15
5	54	47	50	14	14	14
			Bridge			
5.3	60	49	55	13	10	12
5.4	50	46	48	11	15	13
5.5	47	43	45	8	11	10
5.6	45	43	44	9	9	9
5.7	48	44	46	13	11	12
5.8	44	42	43	9	7	8
5.9	54	45	50	11	6	10
6	50	42	46	8	8	9
6.1	47	35	41	14	10	13
6.2	37	42	39	7	8	8
6.3	42	33	37	5	6	7
6.4	38	36	37	7	9	8
6.5	38	33	36	6	4	6
6.6	46	45	45	11	7	9
6.7	52	42	47	8	7	9
6.8	47	34	40	11	7	11
6.9	50	40	45	7	4	8
7	39	41	40	6	9	8
7.1	57	51	54	17	14	15
7.2	61	50	56	11	6	10
7.3	45	40	42	8	5	7
7.4	48	41	44	10	10	10
7.5	46	38	42	9	8	9
7.6	41	37	39	10	8	9
7.7	37	33	35	7	4	6
7.8	46	37	42	11	5	9
7.9	51	45	48	10	20	16
8	48	42	45	10	10	10
8.1	56	52	54	16	19	18
8.2	57	44	50	11	9	12
8.3	47	42	45	9	8	9
8.4	44	39	42	7	12	10
8.5	46	41	43	12	7	10
8.6	46	36	41	5	4	6
8.7	48	42	45	8	8	8
8.8	45	44	45	7	9	8
8.9	50	37	44	11	6	11
9	52	43	47	6	9	9
9.1	53	48	51	12	9	11
9.2	49	37	43	15	4	12
9.3	44	39	41	7	5	7
9.4	44	37	40	11	7	10
9.5	44	45	44	9	14	11
9.6	53	46	49	9	8	9
9.7	59	46	53	17	12	15
9.8	52	45	48	12	9	11
9.9	57	42	50	12	9	13
			Bridge			
10.2	45	43	44	10	9	9
10.3	50	47	49	8	6	7
10.4	46	49	48	12	13	12
10.5	64	58	61	12	14	13

Mile	Left wheelpath IRI	Right wheelpath IRI	Average IRI	Left IRI standard deviation	Right IRI standard deviation	Average IRI standard deviation
0.1	54	54	54	13	17	14
0.2	54	39	46	8	5	10
0.3	46	48	47	10	15	13
0.4	40	60	50	7	20	17
0.5	41	39	40	10	12	11
0.6	43	40	41	10	14	12
			Bridge			
1.1	55	40	47	12	8	12
1.2	45	40	42	8	7	8
1.3	43	37	40	11	6	9
1.4	42	39	41	5	5	5
1.5	39	39	39	7	5	6
1.6	44	44	44	8	7	7
1.7	34	37	36	4	5	5
1.8	41	42	42	10	8	9
1.9	40	34	37	5	5	6
2	37	33	35	3	8	6
2.1	38	39	39	8	5	7
2.2	40	37	38	5	4	5
2.3	43	36	39	7	8	8
2.4	40	40	40	7	7	6
2.5	45	38	41	10	6	9
2.6	41	39	40	5	11	8
2.7	41	40	41	7	6	7
2.8	40	39	39	6	6	6
2.9	46	37	41	8	5	8
3	47	39	43	5	9	8
3.1	43	34	39	7	5	8
3.2	50	38	44	12	5	11
3.3	45	42	44	8	18	13
3.4	55	37	46	10	5	12
3.5	36	34	35	9	5	7
3.6	48	40	44	9	8	9
3.7	51	42	47	9	11	10
3.8	37	45	41	6	13	11
3.9	46	40	43	8	10	9
4	44	44	44	9	8	8
4.1	53	52	53	13	15	14
4.2	64	61	63	18	17	17
4.3	67	52	59	12	15	15
4.4	50	45	48	10	16	13
4.5	51	47	49	9	7	8
4.6	61	41	51	9	5	12
4.7	56	46	51	8	12	11
4.8	58	46	52	13	5	11
4.9	62	46	54	13	8	13
5	76	49	62	17	12	20
			Bridge			
5.3	63	53	58	11	15	14
5.4	58	39	48	12	7	14
5.5	57	33	45	10	9	15
5.6	61	45	53	10	7	11
5.7	46	39	42	9	8	9
5.8	52	42	47	8	7	9
5.9	57	41	49	13	6	13
6	51	43	47	10	4	9
6.1	48	36	42	11	6	11
6.2	53	43	48	10	8	10
6.3	47	44	46	5	6	5
6.4	60	44	52	18	9	16
6.5	45	40	43	6	7	7
6.6	48	37	42	8	6	9
6.7	49	37	43	10	4	9
6.8	41	38	40	7	6	6
6.9	49	36	43	10	5	10
7	41	37	39	8	7	8
7.1	48	39	44	12	10	12
7.2	52	38	45	12	11	13
7.3	46	46	46	11	9	10
7.4	46	46	46	8	14	11
7.5	54	38	46	9	4	10
7.6	46	34	40	12	7	11
7.7	54	38	46	10	5	11
7.8	42	35	38	7	4	6
7.9	46	35	40	8	3	8
8	48	37	43	6	2	7
8.1	52	40	46	12	10	13
8.2	50	35	43	7	6	10
8.3	43	41	42	6	6	6
8.4	54	45	49	10	6	9
8.5	48	37	43	9	4	8
8.6	41	42	42	6	7	6
8.7	44	39	42	10	7	8
8.8	41	39	40	4	6	5
8.9	48	40	44	5	9	8
9	42	39	41	7	9	8
9.1	44	47	46	7	11	9
9.2	42	40	41	8	7	7
9.3	48	42	45	10	11	10
9.4	44	42	43	10	5	8
9.5	41	36	39	8	6	7
9.6	45	41	43	11	8	10
9.7	53	45	49	9	9	10
9.8	48	39	43	11	9	11
9.9	44	48	46	10	10	10
			Bridge			
10.2	60	56	58	24	21	22
10.3	43	57	50	5	43	30
10.4	48	46	47	7	9	8
10.5	59	52	56	10	10	10
Average	48	43	46	10	9	10

Table E-3

Project: 450-03-0037
ARAN Rutting Survey: 2/25/2005
(Note: there are 50 evaluations per 1/10th mile segment)

Mile	Maximum Rutting (inches)	Total Average rutting (inches)	Average Rutting in left wheelpath (inches)	Average Rutting in right wheelpath (inches)	Total Average rutting standard deviation	Rutting left standard deviation	Rutting right standard deviation
0.10	0.19	0.14	0.11	0.16	0.03	0.02	0.03
0.20	0.17	0.14	0.14	0.13	0.02	0.02	0.03
0.30	0.18	0.12	0.12	0.11	0.03	0.02	0.04
0.40	0.32	0.16	0.15	0.15	0.05	0.03	0.07
0.50	0.24	0.17	0.15	0.19	0.04	0.02	0.04
0.60	0.18	0.13	0.14	0.11	0.03	0.02	0.03
0.70	0.18	0.12	0.13	0.11	0.03	0.03	0.02
Bridge							
1.00	0.27	0.16	0.12	0.19	0.05	0.02	0.04
1.10	0.25	0.17	0.14	0.18	0.04	0.02	0.05
1.20	0.24	0.15	0.10	0.19	0.05	0.02	0.02
1.30	0.21	0.14	0.12	0.16	0.03	0.02	0.03
1.40	0.28	0.16	0.14	0.17	0.04	0.05	0.03
1.50	0.16	0.13	0.12	0.14	0.02	0.02	0.02
1.60	0.16	0.12	0.11	0.12	0.03	0.03	0.03
1.70	0.21	0.13	0.12	0.14	0.03	0.02	0.04
1.80	0.22	0.14	0.11	0.16	0.04	0.02	0.03
1.90	0.24	0.16	0.11	0.20	0.05	0.02	0.03
2.00	0.23	0.16	0.14	0.17	0.03	0.02	0.04
2.10	0.26	0.16	0.13	0.19	0.05	0.02	0.05
2.20	0.22	0.14	0.13	0.15	0.03	0.02	0.04
2.30	0.18	0.13	0.14	0.11	0.02	0.02	0.02
2.40	0.19	0.15	0.14	0.15	0.02	0.03	0.01
2.50	0.24	0.16	0.13	0.18	0.04	0.01	0.04
2.60	0.15	0.13	0.13	0.13	0.01	0.01	0.01
2.70	0.28	0.13	0.12	0.14	0.04	0.02	0.06
2.80	0.20	0.13	0.11	0.15	0.03	0.02	0.03
2.90	0.18	0.14	0.13	0.14	0.02	0.02	0.02
3.00	0.20	0.14	0.12	0.15	0.03	0.03	0.03
3.10	0.18	0.13	0.12	0.13	0.03	0.03	0.03
3.20	0.15	0.13	0.12	0.13	0.02	0.02	0.02
3.30	0.17	0.13	0.12	0.13	0.02	0.02	0.02
3.40	0.19	0.14	0.11	0.15	0.03	0.01	0.02
3.50	0.19	0.13	0.12	0.14	0.02	0.01	0.02
3.60	0.18	0.13	0.12	0.13	0.03	0.02	0.03
3.70	0.19	0.14	0.15	0.13	0.03	0.03	0.03
3.80	0.24	0.15	0.13	0.17	0.04	0.01	0.05
3.90	0.20	0.13	0.12	0.12	0.03	0.02	0.03
4.00	0.18	0.13	0.12	0.14	0.03	0.02	0.03
4.10	0.18	0.12	0.09	0.15	0.04	0.02	0.02
4.20	0.22	0.14	0.12	0.15	0.03	0.03	0.03
4.30	0.19	0.13	0.11	0.15	0.03	0.02	0.02
4.40	0.14	0.11	0.09	0.12	0.02	0.02	0.01
4.50	0.23	0.12	0.11	0.14	0.04	0.02	0.05
4.60	0.25	0.17	0.12	0.22	0.05	0.02	0.02
4.70	0.27	0.16	0.13	0.19	0.05	0.02	0.06
4.80	0.20	0.14	0.15	0.12	0.03	0.03	0.02
4.90	0.29	0.17	0.14	0.19	0.04	0.02	0.04
5.00	0.20	0.13	0.12	0.14	0.03	0.02	0.04
Bridge							
5.30	0.20	0.13	0.12	0.13	0.03	0.03	0.03
5.40	0.22	0.16	0.17	0.14	0.03	0.04	0.02
5.50	0.26	0.18	0.17	0.19	0.03	0.02	0.04
5.60	0.21	0.16	0.17	0.15	0.02	0.02	0.02
5.70	0.26	0.18	0.17	0.18	0.04	0.04	0.04
5.80	0.26	0.17	0.13	0.20	0.05	0.03	0.03
5.90	0.22	0.16	0.16	0.16	0.03	0.02	0.04
6.00	0.20	0.16	0.16	0.16	0.02	0.02	0.03
6.10	0.20	0.16	0.15	0.17	0.02	0.02	0.02
6.20	0.24	0.16	0.12	0.20	0.05	0.02	0.03
6.30	0.20	0.15	0.13	0.16	0.03	0.02	0.03
6.40	0.23	0.15	0.14	0.17	0.03	0.02	0.04
6.50	0.24	0.14	0.14	0.14	0.03	0.03	0.04
6.60	0.23	0.16	0.16	0.15	0.03	0.02	0.03
6.70	0.22	0.16	0.16	0.17	0.03	0.02	0.03
6.80	0.19	0.15	0.15	0.15	0.03	0.01	0.03
6.90	0.19	0.14	0.15	0.14	0.02	0.03	0.02
7.00	0.23	0.16	0.14	0.17	0.03	0.02	0.03
7.10	0.20	0.14	0.14	0.13	0.03	0.03	0.04
7.20	0.25	0.17	0.15	0.19	0.04	0.04	0.03
7.30	0.19	0.15	0.14	0.14	0.02	0.03	0.02
7.40	0.36	0.17	0.13	0.20	0.06	0.03	0.07
7.50	0.24	0.17	0.14	0.20	0.04	0.03	0.03
7.60	0.24	0.16	0.12	0.18	0.05	0.03	0.04
7.70	0.21	0.15	0.13	0.17	0.03	0.02	0.03
7.80	0.21	0.15	0.16	0.14	0.04	0.03	0.04
7.90	0.18	0.14	0.15	0.13	0.03	0.03	0.03
8.00	0.19	0.16	0.16	0.15	0.02	0.01	0.03
8.10	0.23	0.18	0.18	0.18	0.03	0.03	0.02
8.20	0.22	0.17	0.17	0.16	0.03	0.03	0.03
8.30	0.22	0.16	0.16	0.16	0.03	0.02	0.03
8.40	0.19	0.15	0.15	0.15	0.03	0.03	0.02
8.50	0.21	0.16	0.15	0.16	0.02	0.03	0.02
8.60	0.23	0.17	0.17	0.16	0.03	0.03	0.03
8.70	0.24	0.19	0.18	0.18	0.03	0.02	0.03
8.80	0.21	0.17	0.17	0.17	0.02	0.02	0.02
8.90	0.22	0.16	0.17	0.16	0.02	0.02	0.02
9.00	0.21	0.16	0.16	0.15	0.02	0.02	0.02
9.10	0.21	0.17	0.17	0.17	0.03	0.03	0.03
9.20	0.19	0.15	0.16	0.13	0.03	0.03	0.02
9.30	0.20	0.16	0.16	0.16	0.02	0.02	0.03
9.40	0.21	0.15	0.16	0.14	0.03	0.03	0.02
9.50	0.23	0.18	0.20	0.16	0.03	0.02	0.02
9.60	0.20	0.16	0.15	0.15	0.02	0.02	0.03
9.70	0.21	0.16	0.17	0.15	0.03	0.02	0.02
9.80	0.20	0.17	0.17	0.15	0.02	0.01	0.01
9.90	0.19	0.14	0.14	0.13	0.02	0.03	0.02
Bridge							
10.20	0.19	0.13	0.10	0.15	0.03	0.01	0.03
10.30	0.19	0.14	0.14	0.14	0.03	0.02	0.03
10.40	0.24	0.16	0.12	0.20	0.05	0.02	0.03
10.50	0.20	0.14	0.11	0.16	0.03	0.01	0.02

Mile	Maximum Rutting (inches)	Total Average rutting (inches)	Average Rutting in left wheelpath (inches)	Average Rutting in right wheelpath (inches)	Total Average rutting standard deviation	Rutting left standard deviation	Rutting right standard deviation
10.50	0.16	0.11	0.09	0.12	0.04	0.05	0.02
10.40	0.16	0.11	0.12	0.10	0.02	0.02	0.02
10.30	0.34	0.11	0.08	0.14	0.06	0.03	0.07
10.20	0.21	0.10	0.07	0.12	0.04	0.02	0.04
Bridge							
9.90	0.19	0.10	0.06	0.14	0.05	0.01	0.03
9.80	0.17	0.11	0.08	0.13	0.03	0.02	0.02
9.70	0.19	0.11	0.07	0.16	0.05	0.01	0.02
9.60	0.18	0.12	0.09	0.14	0.03	0.02	0.02
9.50	0.15	0.12	0.11	0.13	0.02	0.02	0.01
9.40	0.18	0.12	0.09	0.14	0.03	0.02	0.02
9.30	0.21	0.13	0.07	0.18	0.06	0.01	0.01
9.20	0.22	0.12	0.05	0.18	0.07	0.01	0.03
9.10	0.17	0.11	0.10	0.13	0.03	0.03	0.03
9.00	0.16	0.10	0.07	0.13	0.04	0.01	0.02
8.90	0.14	0.11	0.11	0.11	0.02	0.02	0.01
8.80	0.17	0.13	0.11	0.14	0.02	0.02	0.02
8.70	0.17	0.11	0.09	0.13	0.04	0.03	0.03
8.60	0.20	0.11	0.07	0.15	0.04	0.02	0.02
8.50	0.17	0.11	0.09	0.14	0.03	0.03	0.01
8.40	0.16	0.11	0.08	0.13	0.03	0.01	0.02
8.30	0.21	0.11	0.08	0.14	0.04	0.02	0.03
8.20	0.19	0.11	0.07	0.14	0.04	0.02	0.02
8.10	0.15	0.11	0.10	0.11	0.02	0.02	0.02
8.00	0.15	0.11	0.08	0.12	0.03	0.01	0.02
7.90	0.20	0.12	0.08	0.16	0.05	0.02	0.03
7.80	0.16	0.12	0.10	0.14	0.03	0.02	0.01
7.70	0.20	0.11	0.08	0.14	0.04	0.01	0.03
7.60	0.30	0.13	0.12	0.13	0.05	0.06	0.03
7.50	0.14	0.11	0.08	0.13	0.03	0.01	0.01
7.40	0.21	0.11	0.07	0.15	0.05	0.02	0.03
7.30	0.14	0.10	0.09	0.11	0.02	0.01	0.02
7.20	0.16	0.11	0.09	0.12	0.03	0.03	0.02
7.10	0.16	0.11	0.09	0.13	0.03	0.03	0.03
7.00	0.18	0.10	0.06	0.14	0.05	0.02	0.03
6.90	0.16	0.10	0.07	0.12	0.03	0.01	0.02
6.80	0.15	0.09	0.06	0.13	0.04	0.01	0.01
6.70	0.18	0.11	0.09	0.13	0.03	0.01	0.02
6.60	0.14	0.11	0.09	0.12	0.02	0.02	0.02
6.50	0.17	0.10	0.08	0.12	0.03	0.03	0.03
6.40	0.20	0.11	0.08	0.14	0.05	0.02	0.04
6.30	0.20	0.11	0.08	0.14	0.04	0.01	0.04
6.20	0.16	0.12	0.10	0.13	0.03	0.03	0.03
6.10	0.17	0.12	0.10	0.13	0.03	0.03	0.03
6.00	0.19	0.11	0.07	0.14	0.04	0.02	0.03
5.90	0.17	0.11	0.10	0.12	0.03	0.02	0.02
5.80	0.14	0.11	0.08	0.12	0.02	0.01	0.01
5.70	0.16	0.12	0.10	0.13	0.03	0.03	0.02
5.60	0.15	0.10	0.09	0.11	0.02	0.01	0.02
5.50	0.15	0.10	0.08	0.12	0.03	0.02	0.02
5.40	0.14	0.10	0.08	0.11	0.02	0.02	0.02
5.30	0.16	0.11	0.09	0.12	0.03	0.02	0.03
Bridge							
5.00	0.21	0.13	0.11	0.14	0.05	0.04	0.04
4.90	0.21	0.13	0.08	0.17	0.05	0.02	0.03
4.80	0.21	0.13	0.08	0.17	0.05	0.02	0.03
4.70	0.21	0.15	0.14	0.16	0.04	0.04	0.03
4.60	0.19	0.15	0.15	0.14	0.02	0.02	0.03
4.50	0.24	0.16	0.15	0.16	0.04	0.03	0.05
4.40	0.23	0.15	0.15	0.14	0.04	0.04	0.05
4.30	0.20	0.13	0.10	0.15	0.04	0.04	0.02
4.20	0.24	0.14	0.10	0.16	0.04	0.02	0.04
4.10	0.19	0.13	0.11	0.15	0.04	0.03	0.03
4.00	0.20	0.13	0.11	0.14	0.03	0.03	0.03
3.90	0.18	0.12	0.12	0.12	0.03	0.02	0.03
3.80	0.21	0.10	0.07	0.13	0.04	0.02	0.04
3.70	0.24	0.13	0.10	0.15	0.04	0.02	0.04
3.60	0.24	0.14	0.07	0.21	0.07	0.01	0.02
3.50	0.24	0.14	0.07	0.20	0.07	0.01	0.02
3.40	0.18	0.12	0.09	0.15	0.04	0.03	0.03
3.30	0.21	0.13	0.08	0.17	0.05	0.03	0.03
3.20	0.21	0.13	0.10	0.14	0.03	0.01	0.03
3.10	0.17	0.13	0.11	0.14	0.03	0.03	0.02
3.00	0.13	0.11	0.10	0.11	0.01	0.01	0.02
2.90	0.16	0.12	0.12	0.12	0.02	0.03	0.02
2.80	0.17	0.12	0.10	0.13	0.03	0.02	0.02
2.70	0.18	0.12	0.11	0.13	0.03	0.02	0.03
2.60	0.20	0.12	0.10	0.13	0.04	0.03	0.04
2.50	0.20	0.12	0.09	0.14	0.04	0.02	0.04
2.40	0.20	0.12	0.09	0.15	0.04	0.02	0.02
2.30	0.20	0.14	0.14	0.14	0.03	0.03	0.03
2.20	0.19	0.15	0.16	0.14	0.02	0.03	0.02
2.10	0.23	0.15	0.15	0.14	0.04	0.05	0.03
2.00	0.17	0.12	0.10	0.14	0.03	0.03	0.02
1.90	0.16	0.12	0.11	0.13	0.03	0.04	0.03
1.80	0.20	0.14	0.15	0.13	0.04	0.04	0.05
1.70	0.18	0.14	0.13	0.14	0.03	0.03	0.02
1.60	0.20	0.14	0.12	0.16	0.04	0.03	0.03
1.50	0.21	0.15	0.14	0.16	0.04	0.05	0.03
1.40	0.22	0.15	0.12	0.18	0.04	0.02	0.04
1.30	0.20	0.14	0.10	0.16	0.04	0.02	0.03
1.20	0.19	0.13	0.10	0.15	0.04	0.04	0.02
1.10	0.19	0.12	0.10	0.13	0.04	0.04	0.02
1.00	0.19	0.11	0.09	0.14	0.04	0.04	0.03
Bridge							
0.70	0.25	0.14	0.09	0.18	0.05	0.03	0.03
0.60	0.22	0.14	0.14	0.14	0.04	0.04	0.04
0.50	0.24	0.14	0.11	0.18	0.05	0.04	0.04
0.40	0.32	0.15	0.07	0.23	0.09	0.02	0.05
0.30	0.29	0.13	0.07	0.18	0.07	0.02	0.06
0.20	0.19	0.13	0.10	0.14	0.04	0.03	0.03
0.10	0.20	0.11	0.09	0.14	0.04	0.02	0.03
Average	0.17	0.13	0.13	0.09	0.03	0.03	0.03

Table E-4

Project: 450-03-0037
ARAN IRI Survey: 2/25/2005
(Note: there are 50 evaluations per 1/10th mile segment)

Mile	Left wheelpath IRI	Right wheelpath IRI	Average IRI	Left IRI standard deviation	Right IRI standard deviation	Average IRI standard deviation
0.1	78	75	76	35	32	33
0.2	64	45	55	14	7	14
0.3	56	47	52	11	4	9
0.4	70	62	66	18	16	17
0.5	51	46	48	5	9	7
0.6	70	60	65	17	12	16
0.7	96	67	81	14	17	21
			Bridge			
1.0	57	47	52	18	14	16
1.1	43	46	44	11	9	10
1.2	47	48	48	9	12	10
1.3	40	38	39	6	7	7
1.4	43	45	44	8	6	7
1.5	48	46	47	10	11	10
1.6	48	49	48	12	11	11
1.7	58	43	50	22	7	18
1.8	40	40	40	12	8	10
1.9	33	34	33	6	6	6
2.0	38	38	38	6	7	7
2.1	39	41	40	9	7	8
2.2	43	37	40	9	5	8
2.3	40	39	39	5	5	5
2.4	41	42	42	7	7	7
2.5	37	43	40	5	8	7
2.6	38	38	38	9	10	9
2.7	42	42	42	8	5	7
2.8	38	39	38	9	10	10
2.9	38	42	40	3	7	6
3.0	44	36	40	7	6	7
3.1	44	37	41	7	3	6
3.2	47	40	44	8	9	9
3.3	43	46	44	6	12	9
3.4	39	37	38	5	6	6
3.5	40	35	37	7	7	7
3.6	41	43	42	7	8	7
3.7	54	48	51	15	15	15
3.8	49	37	43	6	6	8
3.9	48	41	45	6	7	7
4.0	47	48	48	8	8	8
4.1	53	47	50	18	19	19
4.2	49	42	46	10	7	9
4.3	44	44	44	11	9	10
4.4	49	55	52	16	13	14
4.5	51	44	48	15	11	13
4.6	39	41	40	7	4	5
4.7	42	43	42	7	9	8
4.8	45	41	43	11	8	10
4.9	52	52	52	11	19	15
5.0	54	47	50	14	14	14
			Bridge			
5.3	60	49	55	13	10	12
5.4	50	46	48	11	15	13
5.5	47	43	45	8	11	10
5.6	45	43	44	9	9	9
5.7	48	44	46	13	11	12
5.8	44	42	43	9	7	8
5.9	54	45	50	11	6	10
6.0	50	42	46	8	8	9
6.1	47	35	41	14	10	13
6.2	37	42	39	7	8	8
6.3	42	33	37	5	6	7
6.4	38	36	37	7	9	8
6.5	38	33	36	6	4	6
6.6	46	45	45	11	7	9
6.7	52	42	47	8	7	9
6.8	47	34	40	11	7	11
6.9	50	40	45	7	4	8
7.0	39	41	40	6	9	8
7.1	57	51	54	17	14	15
7.2	61	50	56	11	6	10
7.3	45	40	42	8	5	7
7.4	48	41	44	10	10	10
7.5	46	38	42	9	8	9
7.6	41	37	39	10	8	9
7.7	37	33	35	7	4	6
7.8	46	37	42	11	5	9
7.9	51	45	48	10	20	16
8.0	48	42	45	10	10	10
8.1	56	52	54	16	19	18
8.2	57	44	50	11	9	12
8.3	47	42	45	9	8	9
8.4	44	39	42	7	12	10
8.5	46	41	43	12	7	10
8.6	46	36	41	5	4	6
8.7	48	42	45	8	8	8
8.8	45	44	45	7	9	8
8.9	50	37	44	11	6	11
9.0	52	43	47	6	9	9
9.1	53	48	51	12	9	11
9.2	49	37	43	15	4	12
9.3	44	39	41	7	5	7
9.4	44	37	40	11	7	10
9.5	44	45	44	9	14	11
9.6	53	46	49	9	8	9
9.7	59	46	53	17	12	15
9.8	52	45	48	12	9	11
9.9	57	42	50	12	9	13
			Bridge			
10.2	45	43	44	10	9	9
10.3	50	47	49	8	6	7
10.4	46	49	48	12	13	12
10.5	64	58	61	12	14	13

Mile	Left wheelpath IRI	Right wheelpath IRI	Average IRI	Left IRI standard deviation	Right IRI standard deviation	Average IRI standard deviation
10.5	59	52	56	10	10	10
10.4	48	46	47	7	9	8
10.3	43	57	50	5	43	30
10.2	60	56	58	24	21	22
			Bridge			
9.9	44	48	46	10	10	10
9.8	48	39	43	11	9	11
9.7	53	45	49	9	9	10
9.6	45	41	43	11	8	10
9.5	41	36	39	8	6	7
9.4	44	42	43	10	5	8
9.3	48	42	45	10	11	10
9.2	42	40	41	8	7	7
9.1	44	47	46	7	11	9
9	42	39	41	7	9	8
8.9	48	40	44	5	9	8
8.8	41	39	40	4	6	5
8.7	44	39	42	10	7	8
8.6	41	42	42	6	7	6
8.5	48	37	43	9	4	8
8.4	54	45	49	10	6	9
8.3	43	41	42	6	6	6
8.2	50	35	43	7	6	10
8.1	52	40	46	12	10	13
8	48	37	43	6	2	7
7.9	46	35	40	8	3	8
7.8	42	35	38	7	4	6
7.7	54	38	46	10	5	11
7.6	46	34	40	12	7	11
7.5	54	38	46	9	4	10
7.4	46	46	46	8	14	11
7.3	46	46	46	11	9	10
7.2	52	38	45	12	11	13
7.1	48	39	44	12	10	12
7	41	37	39	8	7	8
6.9	49	36	43	10	5	10
6.8	41	38	40	7	6	6
6.7	49	37	43	10	4	9
6.6	48	37	42	8	6	9
6.5	45	40	43	6	7	7
6.4	60	44	52	18	9	16
6.3	47	44	46	5	6	5
6.2	53	43	48	10	8	10
6.1	48	36	42	11	6	11
6	51	43	47	10	4	9
5.9	57	41	49	13	6	13
5.8	52	42	47	8	7	9
5.7	46	39	42	9	8	9
5.6	61	45	53	10	7	11
5.5	57	33	45	10	9	15
5.4	58	39	48	12	7	14
5.3	63	53	58	11	15	14
			Bridge			
5	76	49	62	17	12	20
4.9	62	46	54	13	8	13
4.8	58	46	52	13	5	11
4.7	56	46	51	8	12	11
4.6	61	41	51	9	5	12
4.5	51	47	49	9	7	8
4.4	50	45	48	10	16	13
4.3	67	52	59	12	15	15
4.2	64	61	63	18	17	17
4.1	53	52	53	13	15	14
4	44	44	44	9	8	8
3.9	46	40	43	8	10	9
3.8	37	45	41	6	13	11
3.7	51	42	47	9	11	10
3.6	48	40	44	9	8	9
3.5	36	34	35	9	5	7
3.4	55	37	46	10	5	12
3.3	45	42	44	8	18	13
3.2	50	38	44	12	5	11
3.1	43	34	39	7	5	8
3	47	39	43	5	9	8
2.9	46	37	41	8	5	8
2.8	40	39	39	6	6	6
2.7	41	40	41	7	6	7
2.6	41	39	40	5	11	8
2.5	45	38	41	10	6	9
2.4	40	40	40	7	7	6
2.3	43	36	39	7	8	8
2.2	40	37	38	5	4	5
2.1	38	39	39	8	5	7
2	37	33	35	3	8	6
1.9	40	34	37	5	5	6
1.8	41	42	42	10	8	9
1.7	34	37	36	4	5	5
1.6	44	44	44	8	7	7
1.5	39	39	39	7	5	6
1.4	42	39	41	5	5	5
1.3	43	37	40	11	6	9
1.2	45	40	42	8	7	8
1.1	55	40	47	12	8	12
1	129	119	124	129	132	121
			Bridge			
0.7	57	59	58	15	15	15
0.6	43	40	41	10	14	12
0.5	41	39	40	10	12	11
0.4	40	60	50	7	20	17
0.3	46	48	47	10	15	13
0.2	54	39	46	8	5	10
0.1	60	62	61	22	30	26
Average	49	43	46	10	10	11

APPENDIX F

LA 422: Detailed Summary of ARAN Based Profiler and Rut Survey

Table F-0
Summary of Profiler and Rut Testing Conducted by ARAN on LA 422

	Age (yrs)	Mean	Standard Error	Median	Mode	Standard Deviation	Sample Variance	Kurtosis	Skewness	Range	Min	Max	Segment Count	95th Percentile	Mean + 95%
Average IRI	0.573	64.0	1.10	63	55	11.4	131	0.0250	0.606	52	44	96	109	2.17	66.2
	2.38	32.6	2.28	23.1	0.06	33.4	1115	-1.80	0.142	94.0	0.04	94	214	4.50	37.1
Average IRI standard deviation	0.573	21.9	0.857	21	25	8.95	80.1	1.54	1.08	48	8	56	109	1.70	23.6
	2.38	10.8	0.819	5.03	0.01	12.0	144	-0.890	0.606	45.0	0.01	45	214	1.61	12.4
Left IRI standard deviation	0.573	15.1	0.698	14	13	7.29	53.1	17.8	3.10	59	5	64	109	1.38	16.5
	2.38	7.50	0.601	3.08	0.07	8.79	77.3	1.05	1.09	42.0	0.02	42	214	1.18	8.68
Left wheelpath IRI	0.573	53.6	0.789	52	47	8.24	67.8	4.52	1.44	56	38	94	109	1.56	55.1
	2.38	27.6	1.93	19.6	0.1	28.2	795	-1.72	0.168	88.9	0.07	89	214	3.80	31.4
Right IRI standard deviation	0.573	20.5	0.834	19	18	8.71	75.9	3.92	1.59	47	7	54	109	1.65	22.1
	2.38	9.97	0.758	4.6	0.02	11.1	123	-0.645	0.644	43.0	0.01	43	214	1.49	11.5
Right wheelpath IRI	0.573	74.6	1.78	69	81	18.6	347	0.254	0.798	86	45	131	109	3.54	78.1
	2.38	37.8	2.70	25.1	0.07	39.5	1560	-1.55	0.274	124	0.04	124	214	5.32	43.1
Rutting left standard deviation	2.378	0.0142	0.000881	0.01	0.01	0.00912	8.31E-05	8.11	2.56	0.06	0	0.06	107	0.00175	0.0160
Rutting right standard deviation	2.378	0.0233	0.00111	0.02	0.02	0.0115	0.000132	4.68	1.73	0.06	0.01	0.07	107	0.00220	0.0255
Total Average rutting (inches)	0.573	0.103	0.000566	0.1	0.1	0.00591	0.0000349	5.29	2.31	0.03	0.1	0.13	109	0.00112	0.104
	2.38	0.0736	0.00158	0.07	0.07	0.0164	0.000268	0.447	0.669	0.09	0.04	0.13	107	0.00314	0.0767
Total Average rutting standard deviation	0.573	0.00697	0.00132	0	0	0.0138	0.000190	0.816	1.58	0.05	0	0.05	109	0.00262	0.00959
	2.38	0.0229	0.000920	0.02	0.02	0.00952	0.0000906	3.01	1.26	0.05	0.01	0.06	107	0.00182	0.0247
Average Rutting in left wheelpath (inches)	2.378	0.0646	0.00131	0.06	0.06	0.0135	0.000184	0.0359	0.670	0.06	0.04	0.1	107	0.00260	0.0672
Average Rutting in right wheelpath (inches)	2.378	0.0781	0.00223	0.07	0.07	0.0231	0.000532	0.0254	0.636	0.11	0.04	0.15	107	0.00442	0.0826
Maximum Rutting (inches)	0.573	0.121	0.00393	0.1	0.1	0.0410	0.00168	0.0640	1.44	0.1	0.1	0.2	109	0.00778	0.129
	2.38	0.074	0.00431	0.07	0.02	0.0631	0.00398	1.062	0.954	0.34	0.01	0.35	214	0.00850	0.0829

3-Year Projected Distress	Mean	Standard Error	Median	Mode	Standard Deviation	Sample Variance	Kurtosis	Skewness	95th Percentile	Mean + 95%
Average IRI	21.80	2.69	9.30	-18.9	41.0	1454	-2.43	-0.0181	5.30	27.1
Average IRI standard deviation	6.93	0.806	-0.471	-8.60	13.0	165	-1.73	0.442	1.59	8.52
Left IRI standard deviation	4.86	0.568	-0.682	-4.38	9.31	85.7	-4.72	0.394	1.12	5.98
Left wheelpath IRI	18.6	2.32	8.41	-16.1	35.1	1045	-3.87	-0.269	4.57	23.2
Right IRI standard deviation	6.35	0.731	-0.327	-6.17	11.9	139	-2.22	0.319	1.44	7.78
Right wheelpath IRI	25.1	3.02	9.93	-27.8	46.7	1978	-2.18	0.0942	5.94	31.0
Rutting left standard deviation	0.0142	0.000881	0.01	0.01	0.00912	8.31E-05	8.11	2.56	0.00175	0.0160
Rutting right standard deviation	0.0233	0.00111	0.02	0.02	0.0115	0.000132	4.68	1.73	0.00220	0.0255
Total Average rutting (inches)	0.0634	0.002	0.0597	0.0597	0.02	0.00026	-1.22	0.104	0.00380	0.0672
Total Average rutting standard deviation	0.0283	0.0008	0.027	0.027	0.0079	0.00005	3.76	1.1489	0.0017	0.03
Average Rutting in left wheelpath (inches)	0.0646	0.00131	0.06	0.06	0.0135	0.000184	0.0359	0.670	0.00260	0.0672
Average Rutting in right wheelpath (inches)	0.0781	0.00223	0.07	0.07	0.0231	0.000532	0.0254	0.636	0.00442	0.0826
Maximum Rutting (inches)	0.0585	0.0044	0.0597	-0.0075	0.0706	0.0049	1.41	0.788	0.0088	0.0673

Table F-1

Project: 819-02-0012
ARAN IRI Survey: 12/01/2002
(Note: there are 50 evaluations per 1/10th mile segment)

Mile	Left wheelpath IRI	Right wheelpath IRI	Average IRI	Left IRI standard deviation	Right IRI standard deviation	Average IRI standard deviation
0.1	94	99	96	28	18	23
0.2	58	77	67	20	27	25
0.3	51	101	76	11	35	36
0.4	62	82	72	15	24	22
0.5	54	70	62	24	24	25
0.6	62	81	71	24	22	24
0.7	46	72	59	8	20	20
0.8	45	64	55	14	32	26
0.9	47	54	50	11	11	12
1	47	68	58	15	27	24
1.1	42	56	49	13	9	13
1.2	47	62	55	10	11	13
1.3	58	67	63	24	20	22
1.4	48	63	56	14	17	17
1.5	45	48	47	13	19	16
1.6	59	76	67	18	27	24
1.7	45	60	53	9	20	17
Bridge						
2.3	38	50	44	8	7	9
2.4	54	61	58	16	19	17
2.5	43	47	45	12	11	11
2.6	51	111	81	13	23	35
2.7	54	84	69	16	26	26
2.8	41	95	68	10	22	32
2.9	50	95	73	16	21	29
3	55	122	89	14	23	39
3.1	57	131	94	12	30	44
3.2	60	127	93	13	25	39
3.3	47	98	73	12	17	30
3.4	43	93	68	8	22	30
3.5	47	102	75	15	27	35
3.6	47	93	70	8	25	30
Bridge						
4	49	87	68	9	23	25
4.1	53	91	72	16	17	25
4.2	50	98	74	11	19	29
4.3	55	70	63	10	20	17
4.4	50	46	48	8	7	8
4.5	52	57	54	13	21	17
4.6	59	69	64	20	22	21
4.7	58	85	71	16	27	25
4.8	45	108	76	5	16	34
4.9	47	91	69	6	17	25
5	52	68	60	13	32	26
5.1	45	62	53	8	18	16
5.2	52	58	55	15	20	18
5.3	43	53	48	5	12	10
5.4	48	67	57	14	21	20
5.5	51	58	55	16	26	21
5.6	54	98	76	19	29	33
5.7	50	102	76	7	24	32
5.8	53	85	69	13	22	24
5.9	65	105	85	18	22	28
6	65	85	75	19	17	20
6.1	47	49	48	9	8	8
6.2	53	58	55	12	11	11
6.3	67	93	80	29	51	43
Bridge						
6.6	56	74	65	10	28	23
6.7	65	74	70	27	24	25
6.8	45	63	54	13	19	18
6.9	48	65	56	13	13	15
7	45	62	53	14	13	16
7.1	53	65	59	14	13	14
7.2	55	59	57	16	19	17
7.3	46	66	56	12	25	22
7.4	51	69	60	12	25	21
7.5	61	75	68	20	23	22
7.6	44	52	48	9	8	9
7.7	56	73	65	19	18	20
7.8	59	92	75	16	47	38
7.9	55	59	57	9	18	14
8	63	113	88	18	45	42
8.1	51	67	59	16	14	17
8.2	68	110	89	25	54	46
8.3	63	80	71	24	26	26
8.4	61	81	71	19	21	22
8.5	57	86	71	11	18	20
8.6	49	62	56	10	17	15
8.7	54	50	52	10	11	11
8.8	52	45	49	14	11	13
8.9	52	64	58	14	26	21
9	49	54	52	9	12	11
9.1	72	81	76	30	17	24
9.2	50	57	54	19	11	15
9.3	50	58	54	16	13	15
9.4	44	51	48	9	12	11
9.5	48	76	62	9	28	25
9.6	60	81	70	18	20	21
9.7	61	68	64	24	21	23
9.8	48	62	55	11	16	15
9.9	56	76	66	15	18	19
10	44	68	56	8	21	20
10.1	56	80	68	21	18	22
10.2	54	77	65	24	28	28
10.3	47	63	55	10	15	14
10.4	61	99	80	18	15	25
10.5	63	81	72	22	18	21
10.6	57	72	64	12	20	18
10.7	49	60	54	18	17	18
10.8	50	54	52	15	17	15
10.9	50	66	58	13	8	13
11	59	69	64	13	12	13
11.1	58	68	63	8	15	13
11.2	59	80	69	20	19	22
11.3	71	67	69	17	11	14
11.4	51	56	53	13	14	14
11.5	50	55	53	13	18	15
11.6	76	78	77	64	50	56
11.7	51	61	56	12	15	14
11.8	59	67	63	19	15	17
11.9	66	84	75	31	21	27
Averages	**54**	**75**	**64**	**15**	**20**	**22**

Table F-2

Project: 819-02-0012 Eastbound
ARAN IRI Survey: 9/20/2004
(Note: there are 50 evaluations per 1/10th mile segment)

Mile	Left wheelpath IRI	Right wheelpath IRI	Average IRI	Left IRI standard deviation	Right IRI standard deviation	Average IRI standard deviation
0.1	89	92	90	34	18	26
0.2	56	72	64	21	23	23
0.3	52	93	73	9	28	29
0.4	58	83	71	15	22	22
0.5	58	75	66	22	24	24
0.6	60	83	72	19	25	25
0.7	46	75	61	10	21	22
0.9	48	52	50	11	12	11
1	50	67	58	16	22	21
1.1	38	56	47	14	9	15
1.2	51	66	59	11	12	14
1.3	56	65	61	21	20	21
1.4	47	66	56	13	14	17
1.5	46	50	48	16	20	18
1.6	56	71	63	10	23	19
1.7	47	60	53	10	19	16
Bridge						
2.3	41	71	56	8	13	18
2.4	53	67	60	17	24	21
2.5	47	57	52	13	12	13
2.6	52	111	82	11	24	35
2.7	56	83	69	14	22	22
2.8	43	93	68	9	24	31
2.9	47	93	70	12	19	28
3	56	113	84	14	20	34
3.1	47	124	85	7	33	45
3.2	54	116	85	13	24	36
3.3	47	95	71	10	15	27
3.4	49	101	75	7	19	30
3.5	48	96	72	11	25	31
3.6	46	91	69	11	23	29
Bridge						
4	47	85	66	11	19	24
4.1	50	94	72	16	18	28
4.2	48	96	72	10	21	29
4.3	58	76	67	10	19	17
4.4	57	58	57	9	11	10
4.5	53	61	57	13	19	17
4.6	58	70	64	18	17	18
4.7	62	87	75	21	23	24
4.8	45	105	75	6	23	35
4.9	47	94	70	10	14	27
5	53	75	64	9	26	22
5.1	45	64	54	6	16	15
5.2	54	64	59	11	19	16
5.3	42	50	46	9	13	12
5.4	55	68	61	15	14	16
5.5	49	62	56	14	22	19
5.6	53	99	76	14	25	30
5.7	49	103	76	9	20	31
5.8	52	92	72	12	19	25
5.9	66	108	87	16	27	31
6	67	86	76	22	22	23
6.1	47	50	49	9	12	10
6.2	54	66	60	8	13	12
6.3	71	80	75	28	34	31
Bridge						
6.6	57	75	66	16	24	22
6.7	70	75	73	26	34	29
6.8	43	65	54	8	14	16
6.9	48	62	55	10	16	15
7	50	64	57	12	14	15
7.2	57	66	61	13	15	14
7.3	45	60	53	11	21	18
7.4	54	67	61	14	25	21
7.5	60	77	69	22	28	26
7.6	44	58	51	7	11	11
7.7	58	82	70	15	26	24
7.8	60	82	71	21	39	33
7.9	61	56	59	10	18	14
8	61	109	85	20	38	38
8.1	62	64	63	28	10	21
8.2	80	108	94	20	43	36
8.3	65	78	71	21	19	21
8.4	59	80	70	13	13	17
8.5	52	83	67	10	17	21
8.6	56	61	59	12	18	15
8.7	54	60	57	8	17	13
8.8	60	63	61	19	28	23
8.9	53	64	58	15	26	21
9	54	57	55	16	9	13
9.1	76	77	76	29	18	24
9.2	53	57	55	17	14	15
9.3	56	60	58	17	16	16
9.4	52	52	52	13	11	12
9.5	45	74	60	11	30	27
9.6	70	82	76	32	25	29
9.7	57	64	60	16	18	17
9.8	54	63	58	15	15	15
9.9	57	71	64	16	15	17
10	47	69	58	8	16	16
10.1	61	76	68	21	20	21
10.2	61	75	68	21	33	28
10.3	44	62	53	6	15	14
10.4	67	98	82	22	19	25
10.5	61	76	69	14	14	16
10.6	58	73	66	22	16	20
10.7	49	69	59	13	16	17
10.8	52	62	57	14	14	14
10.9	50	67	58	15	16	17
11	59	71	65	15	13	15
11.1	60	71	65	12	21	17
11.2	53	73	63	12	14	16
11.3	78	68	73	15	13	15
11.4	51	56	53	13	10	12
11.5	54	59	56	14	20	17
11.6	65	73	69	40	41	40
11.7	58	70	64	13	17	16
11.8	59	71	65	16	21	19
11.9	85	88	87	42	22	33
Averages	**55**	**75**	**65**	**15**	**20**	**21**

Table F-3

Project: 819-02-0012

ARAN Rutting Survey: 12/01/2002

(Note: there are 50 evaluations per 1/10th mile segment)

Mile	Maximum Rutting (inches)	Total Average rutting (inches)	Total Average rutting standard deviation
0.1	0.20	0.11	0.03
0.2	0.10	0.10	0.00
0.3	0.10	0.10	0.00
0.4	0.10	0.10	0.00
0.5	0.10	0.10	0.00
0.6	0.10	0.10	0.00
0.7	0.10	0.10	0.00
0.8	0.10	0.10	0.00
0.9	0.10	0.10	0.00
1	0.10	0.10	0.00
1.1	0.10	0.10	0.00
1.2	0.10	0.10	0.00
1.3	0.20	0.11	0.03
1.4	0.10	0.10	0.00
1.5	0.10	0.10	0.00
1.6	0.10	0.10	0.00
1.7	0.10	0.10	0.00
2 Bridges			
2.3	0.20	0.12	0.04
2.4	0.10	0.10	0.00
2.5	0.20	0.11	0.03
2.6	0.20	0.12	0.04
2.7	0.10	0.10	0.00
2.8	0.10	0.10	0.00
2.9	0.10	0.10	0.00
3	0.10	0.10	0.00
3.1	0.10	0.10	0.00
3.2	0.10	0.10	0.00
3.3	0.10	0.10	0.00
3.4	0.10	0.10	0.00
3.5	0.10	0.10	0.00
3.6	0.10	0.10	0.00
Bridge			
4	0.10	0.10	0.00
4.1	0.10	0.10	0.00
4.2	0.10	0.10	0.00
4.3	0.10	0.10	0.00
4.4	0.10	0.10	0.00
4.5	0.10	0.10	0.00
4.6	0.10	0.10	0.00
4.7	0.10	0.10	0.00
4.8	0.10	0.10	0.00
4.9	0.10	0.10	0.00
5	0.10	0.10	0.00
5.1	0.10	0.10	0.00
5.2	0.10	0.10	0.00
5.3	0.10	0.10	0.00
5.4	0.10	0.10	0.00
5.5	0.10	0.10	0.00
5.6	0.10	0.10	0.00
5.7	0.10	0.10	0.00
5.8	0.10	0.10	0.00
5.9	0.10	0.10	0.00
6	0.10	0.10	0.00
6.1	0.10	0.10	0.00
6.2	0.10	0.10	0.00
6.3	0.10	0.10	0.00
Bridge			
6.6	0.10	0.10	0.00
6.7	0.10	0.10	0.00
6.8	0.10	0.10	0.00
6.9	0.10	0.10	0.00
7	0.10	0.10	0.00
7.1	0.10	0.10	0.00
7.2	0.20	0.11	0.03
7.3	0.10	0.10	0.00
7.4	0.10	0.10	0.00
7.5	0.10	0.10	0.00
7.6	0.10	0.10	0.00
7.7	0.10	0.10	0.00
7.8	0.20	0.12	0.04
7.9	0.10	0.10	0.00
8	0.20	0.11	0.03
8.1	0.20	0.11	0.03
8.2	0.20	0.11	0.03
8.3	0.20	0.12	0.04
8.4	0.20	0.13	0.05
8.5	0.20	0.11	0.03
8.6	0.10	0.10	0.00
8.7	0.10	0.10	0.00
8.8	0.10	0.10	0.00
8.9	0.10	0.10	0.00
9	0.10	0.10	0.00
9.1	0.10	0.10	0.00
9.2	0.10	0.10	0.00
9.3	0.10	0.10	0.00
9.4	0.10	0.10	0.00
9.5	0.10	0.10	0.00
9.6	0.10	0.10	0.00
9.7	0.10	0.10	0.00
9.8	0.20	0.11	0.03
9.9	0.20	0.11	0.03
10	0.10	0.10	0.00
10.1	0.10	0.10	0.00
10.2	0.10	0.10	0.00
10.3	0.10	0.10	0.00
10.4	0.10	0.10	0.00
10.5	0.20	0.11	0.03
10.6	0.10	0.10	0.00
10.7	0.20	0.11	0.03
10.8	0.20	0.11	0.03
10.9	0.20	0.11	0.03
11	0.20	0.11	0.03
11.1	0.10	0.10	0.00
11.2	0.20	0.11	0.03
11.3	0.10	0.10	0.00
11.4	0.10	0.10	0.00
11.5	0.10	0.10	0.00
11.6	0.10	0.10	0.00
11.7	0.10	0.10	0.00
11.8	0.20	0.11	0.03
11.9	0.20	0.12	0.04
Averages	**0.12**	**0.10**	**0.01**

Table F-4

Project: 819-02-0012 Eastbound
ARAN Rutting Survey: 9/20/2004
(Note: there are 50 evaluations per 1/10th mile segment)

Mile	Maximum Rutting (inches)	Total Average rutting (inches)	Average Rutting in left wheelpath (inches)	Average Rutting in right wheelpath (inches)	Total Average rutting standard deviation	Rutting left standard deviation	Rutting right standard deviation
0.1	0.14	0.09	0.07	0.11	0.02	0.01	0.02
0.2	0.12	0.10	0.09	0.11	0.02	0.02	0.01
0.3	0.28	0.13	0.10	0.15	0.06	0.03	0.07
0.4	0.15	0.09	0.10	0.07	0.03	0.03	0.02
0.5	0.16	0.09	0.09	0.09	0.04	0.04	0.03
0.6	0.17	0.10	0.08	0.11	0.03	0.02	0.03
0.7	0.15	0.10	0.08	0.13	0.03	0.01	0.01
0.9	0.13	0.09	0.08	0.10	0.02	0.02	0.02
1	0.13	0.10	0.08	0.11	0.02	0.01	0.01
1.1	0.14	0.10	0.09	0.11	0.02	0.03	0.01
1.2	0.13	0.10	0.09	0.10	0.02	0.03	0.01
1.3	0.14	0.09	0.07	0.11	0.03	0.01	0.02
1.4	0.14	0.09	0.07	0.11	0.03	0.01	0.02
1.5	0.11	0.06	0.06	0.06	0.02	0.01	0.03
1.6	0.14	0.08	0.06	0.09	0.03	0.01	0.03
1.7	0.15	0.08	0.05	0.09	0.03	0.01	0.03
Bridge							
2.3	0.14	0.10	0.07	0.12	0.03	0.01	0.01
2.4	0.19	0.10	0.07	0.13	0.03	0.01	0.03
2.5	0.14	0.11	0.10	0.12	0.02	0.02	0.01
2.6	0.14	0.11	0.09	0.12	0.02	0.02	0.01
2.7	0.10	0.06	0.05	0.07	0.02	0.01	0.02
2.8	0.08	0.05	0.05	0.06	0.02	0.01	0.02
2.9	0.11	0.06	0.06	0.06	0.02	0.01	0.02
3	0.14	0.07	0.05	0.07	0.02	0.01	0.03
3.1	0.11	0.07	0.06	0.07	0.02	0.01	0.02
3.2	0.09	0.06	0.05	0.06	0.02	0.01	0.02
3.3	0.11	0.07	0.06	0.08	0.02	0.02	0.02
3.4	0.15	0.09	0.06	0.12	0.04	0.01	0.03
3.5	0.11	0.07	0.06	0.07	0.02	0.01	0.03
3.6	0.09	0.06	0.06	0.06	0.01	0.01	0.02
Bridge							
4	0.10	0.06	0.06	0.06	0.02	0.02	0.02
4.1	0.09	0.06	0.05	0.06	0.01	0.01	0.02
4.2	0.11	0.07	0.05	0.07	0.02	0.02	0.01
4.3	0.13	0.07	0.06	0.08	0.02	0.01	0.03
4.4	0.23	0.08	0.06	0.10	0.04	0.01	0.06
4.5	0.17	0.09	0.06	0.10	0.04	0.01	0.04
4.6	0.13	0.07	0.06	0.08	0.02	0.01	0.02
4.7	0.11	0.07	0.06	0.08	0.02	0.01	0.02
4.8	0.11	0.07	0.06	0.08	0.02	0.01	0.02
4.9	0.12	0.07	0.06	0.09	0.02	0.01	0.02
5	0.16	0.10	0.08	0.12	0.03	0.01	0.02
5.1	0.14	0.10	0.07	0.12	0.03	0.01	0.02
5.2	0.14	0.10	0.08	0.11	0.03	0.01	0.03
5.3	0.07	0.05	0.05	0.04	0.01	0.01	0.01
5.4	0.13	0.07	0.06	0.07	0.02	0.01	0.03
5.5	0.11	0.05	0.05	0.05	0.02	0.01	0.03
5.6	0.11	0.08	0.07	0.09	0.02	0.01	0.02
5.7	0.08	0.06	0.06	0.05	0.01	0.00	0.02
5.8	0.09	0.05	0.05	0.05	0.02	0.01	0.02
5.9	0.15	0.06	0.04	0.08	0.03	0.01	0.03
6	0.15	0.07	0.06	0.07	0.02	0.01	0.03
6.1	0.15	0.06	0.05	0.06	0.03	0.01	0.04
6.2	0.14	0.07	0.06	0.07	0.02	0.02	0.03
6.3	0.09	0.06	0.06	0.06	0.01	0.01	0.02
Bridge							
6.6	0.08	0.05	0.05	0.04	0.01	0.01	0.02
6.7	0.19	0.07	0.05	0.08	0.03	0.01	0.04
6.8	0.07	0.05	0.05	0.04	0.01	0.01	0.01
6.9	0.07	0.04	0.05	0.04	0.02	0.01	0.02
7	0.09	0.05	0.04	0.05	0.02	0.01	0.02
7.2	0.08	0.05	0.06	0.04	0.02	0.01	0.02
7.3	0.07	0.05	0.05	0.05	0.01	0.01	0.02
7.4	0.27	0.07	0.05	0.09	0.06	0.01	0.07
7.5	0.15	0.06	0.04	0.07	0.03	0.00	0.03
7.6	0.08	0.05	0.05	0.05	0.01	0.01	0.01
7.7	0.15	0.06	0.05	0.06	0.03	0.01	0.04
7.8	0.10	0.07	0.07	0.07	0.02	0.02	0.02
7.9	0.10	0.07	0.06	0.08	0.01	0.01	0.01
8	0.09	0.06	0.05	0.07	0.02	0.01	0.02
8.1	0.13	0.08	0.06	0.09	0.03	0.02	0.02
8.2	0.13	0.08	0.07	0.09	0.02	0.02	0.03
8.3	0.09	0.07	0.07	0.06	0.01	0.01	0.01
8.4	0.19	0.06	0.06	0.07	0.04	0.02	0.05
8.5	0.19	0.08	0.08	0.08	0.04	0.05	0.02
8.6	0.09	0.07	0.08	0.06	0.02	0.01	0.03
8.7	0.09	0.06	0.07	0.05	0.02	0.01	0.02
8.8	0.09	0.06	0.06	0.05	0.01	0.01	0.01
8.9	0.12	0.06	0.06	0.06	0.02	0.02	0.02
9	0.10	0.07	0.07	0.06	0.02	0.02	0.01
9.1	0.11	0.08	0.08	0.07	0.02	0.02	0.02
9.2	0.12	0.08	0.07	0.08	0.02	0.01	0.02
9.3	0.12	0.08	0.07	0.09	0.03	0.01	0.03
9.4	0.10	0.07	0.07	0.07	0.02	0.01	0.02
9.5	0.10	0.07	0.05	0.08	0.02	0.01	0.01
9.6	0.10	0.07	0.07	0.06	0.02	0.01	0.02
9.7	0.09	0.07	0.06	0.07	0.01	0.01	0.01
9.8	0.11	0.08	0.07	0.08	0.02	0.01	0.02
9.9	0.12	0.07	0.07	0.07	0.02	0.02	0.02
10	0.12	0.08	0.07	0.09	0.02	0.02	0.03
10.1	0.10	0.08	0.07	0.08	0.01	0.01	0.01
10.2	0.12	0.10	0.09	0.10	0.02	0.02	0.02
10.3	0.10	0.07	0.07	0.06	0.02	0.01	0.02
10.4	0.16	0.07	0.08	0.06	0.03	0.04	0.02
10.5	0.24	0.08	0.09	0.07	0.04	0.06	0.02
10.6	0.16	0.08	0.07	0.10	0.04	0.02	0.04
10.7	0.11	0.07	0.06	0.07	0.02	0.01	0.02
10.8	0.12	0.07	0.06	0.08	0.03	0.01	0.03
10.9	0.12	0.07	0.06	0.07	0.02	0.01	0.03
11	0.08	0.06	0.05	0.06	0.01	0.01	0.02
11.1	0.15	0.06	0.05	0.07	0.02	0.01	0.03
11.2	0.09	0.07	0.06	0.07	0.02	0.01	0.02
11.3	0.13	0.07	0.08	0.05	0.02	0.02	0.01
11.4	0.10	0.05	0.05	0.05	0.01	0.01	0.02
11.5	0.09	0.07	0.06	0.07	0.01	0.01	0.01
11.6	0.15	0.07	0.06	0.08	0.03	0.01	0.05
11.7	0.18	0.08	0.08	0.08	0.03	0.04	0.02
11.8	0.16	0.07	0.06	0.09	0.03	0.01	0.03
11.9	0.13	0.08	0.06	0.09	0.02	0.01	0.03
Averages	**0.13**	**0.07**	**0.06**	**0.08**	**0.02**	**0.01**	**0.02**

Table F-5

Project: 819-02-0012 Westbound
ARAN Rutting Survey: 9/20/2004
(Note: there are 50 evaluations per 1/10th mile segment)

Mile	Maximum Rutting (inches)	Total Average rutting (inches)	Average Rutting in left wheelpath (inches)	Average Rutting in right wheelpath (inches)	Total Average rutting standard deviation	Rutting left standard deviation	Rutting right standard deviation
11.9	0.14	0.09	0.08	0.10	0.02	0.01	0.02
11.8	0.12	0.08	0.07	0.08	0.02	0.01	0.03
11.7	0.13	0.09	0.08	0.09	0.02	0.02	0.02
11.6	0.15	0.09	0.08	0.09	0.03	0.03	0.02
11.5	0.08	0.06	0.06	0.05	0.02	0.01	0.02
11.4	0.11	0.07	0.07	0.06	0.02	0.02	0.01
11.3	0.10	0.08	0.08	0.07	0.02	0.01	0.02
11.1	0.08	0.07	0.07	0.07	0.01	0.01	0.01
11	0.16	0.10	0.08	0.11	0.03	0.03	0.03
10.9	0.15	0.09	0.09	0.07	0.03	0.03	0.02
10.8	0.11	0.08	0.08	0.07	0.02	0.02	0.02
10.7	0.10	0.08	0.08	0.08	0.01	0.01	0.02
10.6	0.12	0.09	0.08	0.09	0.02	0.01	0.02
10.5	0.12	0.07	0.06	0.08	0.02	0.01	0.03
10.4	0.10	0.07	0.06	0.07	0.02	0.01	0.02
10.3	0.10	0.07	0.07	0.07	0.02	0.01	0.02
10.2	0.12	0.10	0.09	0.10	0.01	0.02	0.01
10.1	0.13	0.09	0.06	0.10	0.02	0.01	0.02
10	0.12	0.09	0.07	0.10	0.02	0.01	0.02
9.9	0.09	0.06	0.06	0.06	0.02	0.01	0.02
9.8	0.07	0.06	0.05	0.05	0.01	0.01	0.01
9.7	0.09	0.06	0.06	0.06	0.01	0.01	0.02
9.6	0.13	0.07	0.08	0.05	0.03	0.02	0.02
9.5	0.09	0.06	0.07	0.05	0.02	0.02	0.02
9.4	0.07	0.05	0.05	0.04	0.01	0.01	0.02
9.3	0.07	0.06	0.06	0.05	0.01	0.01	0.02
9.2	0.07	0.05	0.04	0.05	0.01	0.01	0.01
9.1	0.09	0.05	0.04	0.06	0.01	0.01	0.02
9	0.11	0.07	0.07	0.06	0.02	0.02	0.02
8.9	0.13	0.07	0.08	0.05	0.03	0.03	0.02
8.8	0.15	0.08	0.09	0.07	0.04	0.04	0.03
8.7	0.10	0.06	0.06	0.06	0.01	0.01	0.02
8.6	0.31	0.08	0.07	0.08	0.06	0.01	0.08
8.5	0.21	0.09	0.09	0.07	0.04	0.05	0.02
8.4	0.16	0.09	0.08	0.11	0.03	0.01	0.03
8.3	0.11	0.09	0.08	0.09	0.02	0.02	0.01
8.2	0.13	0.08	0.09	0.07	0.02	0.02	0.02
8.1	0.13	0.07	0.10	0.04	0.03	0.03	0.02
8	0.13	0.06	0.08	0.04	0.03	0.03	0.01
7.9	0.14	0.08	0.10	0.05	0.03	0.02	0.01
7.8	0.15	0.08	0.11	0.04	0.04	0.03	0.01
7.7	0.10	0.05	0.07	0.03	0.03	0.02	0.02
7.6	0.09	0.04	0.06	0.02	0.03	0.02	0.01
7.5	0.08	0.05	0.05	0.04	0.02	0.01	0.02
7.4	0.08	0.05	0.06	0.04	0.01	0.01	0.01
7.3	0.09	0.05	0.06	0.04	0.02	0.01	0.01
7.2	1.16	0.11	0.05	0.16	0.25	0.01	0.35
7.1	0.10	0.05	0.06	0.05	0.02	0.02	0.02
7	0.08	0.06	0.06	0.05	0.01	0.01	0.01
6.9	0.12	0.06	0.06	0.05	0.02	0.01	0.03
6.8	0.10	0.06	0.06	0.06	0.02	0.02	0.02
6.7	0.10	0.06	0.07	0.03	0.03	0.02	0.02
6.6	0.09	0.06	0.07	0.06	0.02	0.01	0.03
Bridge							
6.3	0.12	0.08	0.08	0.07	0.02	0.02	0.01

Mile	Maximum Rutting (inches)	Total Average rutting (inches)	Average Rutting in left wheelpath (inches)	Average Rutting in right wheelpath (inches)	Total Average rutting standard deviation	Rutting left standard deviation	Rutting right standard deviation
6.2	0.14	0.06	0.08	0.04	0.03	0.04	0.01
6.1	0.19	0.08	0.09	0.07	0.04	0.05	0.03
6	0.12	0.07	0.07	0.07	0.02	0.01	0.03
5.9	0.14	0.07	0.09	0.05	0.03	0.03	0.01
5.8	0.08	0.05	0.06	0.04	0.01	0.01	0.01
5.7	0.10	0.06	0.07	0.04	0.02	0.02	0.01
5.6	0.09	0.07	0.07	0.06	0.01	0.01	0.01
5.4	0.21	0.08	0.09	0.07	0.04	0.05	0.01
5.3	0.13	0.08	0.08	0.07	0.02	0.03	0.02
5.2	0.19	0.10	0.12	0.06	0.05	0.06	0.01
5.1	0.12	0.07	0.07	0.07	0.02	0.02	0.01
5	0.09	0.07	0.06	0.07	0.01	0.01	0.01
4.9	0.12	0.07	0.06	0.08	0.02	0.01	0.02
4.8	0.11	0.07	0.06	0.07	0.01	0.01	0.02
4.7	0.13	0.07	0.05	0.09	0.03	0.01	0.03
4.6	0.09	0.07	0.05	0.08	0.02	0.01	0.02
4.5	0.10	0.08	0.06	0.08	0.02	0.01	0.01
4.4	0.10	0.07	0.06	0.07	0.02	0.01	0.02
4.3	0.12	0.08	0.06	0.08	0.02	0.01	0.02
4.2	0.12	0.08	0.06	0.09	0.02	0.01	0.02
4.1	0.09	0.06	0.05	0.06	0.02	0.01	0.02
4	0.10	0.07	0.05	0.08	0.02	0.01	0.01
Bridge							
3.6	0.09	0.07	0.06	0.07	0.01	0.01	0.01
3.5	0.11	0.08	0.06	0.09	0.02	0.01	0.02
3.4	0.16	0.07	0.07	0.07	0.03	0.04	0.01
3.3	0.14	0.07	0.05	0.09	0.02	0.01	0.02
3.2	0.15	0.07	0.05	0.09	0.03	0.01	0.03
3.1	0.15	0.09	0.07	0.10	0.02	0.01	0.02
3	0.22	0.09	0.08	0.10	0.04	0.01	0.05
2.9	0.21	0.09	0.07	0.11	0.04	0.01	0.05
2.8	0.21	0.10	0.06	0.13	0.05	0.02	0.04
2.7	0.17	0.10	0.08	0.12	0.03	0.01	0.03
2.6	0.17	0.09	0.06	0.13	0.04	0.01	0.02
2.5	0.21	0.11	0.07	0.14	0.04	0.01	0.03
2.4	0.17	0.11	0.09	0.13	0.02	0.01	0.02
2.3	0.17	0.12	0.10	0.13	0.02	0.01	0.03
Bridge							
1.7	0.15	0.11	0.09	0.12	0.02	0.02	0.02
1.6	0.13	0.10	0.09	0.11	0.01	0.01	0.01
1.5	0.14	0.10	0.11	0.09	0.02	0.02	0.02
1.4	0.15	0.11	0.09	0.12	0.02	0.02	0.02
1.3	0.17	0.11	0.10	0.12	0.03	0.03	0.01
1.2	0.16	0.11	0.09	0.13	0.02	0.01	0.02
1.1	0.14	0.11	0.07	0.13	0.03	0.01	0.01
1	0.16	0.10	0.08	0.12	0.03	0.02	0.02
0.9	0.16	0.11	0.09	0.12	0.02	0.01	0.02
0.8	0.13	0.10	0.09	0.11	0.02	0.01	0.01
0.7	0.14	0.11	0.08	0.12	0.03	0.02	0.02
0.6	0.16	0.11	0.10	0.11	0.02	0.02	0.02
0.5	0.11	0.08	0.08	0.08	0.02	0.02	0.02
0.4	0.14	0.09	0.06	0.10	0.03	0.01	0.02
0.3	0.17	0.11	0.10	0.12	0.02	0.02	0.02
0.2	0.17	0.11	0.09	0.13	0.03	0.01	0.02
0.1	0.24	0.13	0.12	0.13	0.04	0.05	0.03
Averages	**0.14**	**0.08**	**0.07**	**0.08**	**0.03**	**0.02**	**0.02**

APPENDIX G

Detailed Summary of LTRC and ARAN Crack Surveys

Table G-0
Summary of Crack Development on I-10 and LA 422

		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
Summary of Cracking on I-10 and LA 422		Age (yrs)	Mean	Standard Error	Median	Mode	Standard Deviation	Sample Variance	Kurtosis	Skewness	Range	Min	Max	Sum	Segment Count	95th Percentile	Mean + 95%
I-10	LTRC	Low Transverse Cracking (linear ft)	0.901	0.735	0.116	0	0	1.66	2.76	5.32	2.40	8	0	8	150	204	0.229	0.965
		Low Longitudinal Cracking (linear ft)	0.901	0.529	0.0991	0	0	1.42	2.00	12.2	3.29	9	0	9	108	204	0.195	0.725
		Low Transverse Cracking (linear ft)	1.41	1.62	0.182	0	0	2.61	6.79	2.87	1.72	14	0	14	331	204	0.360	1.98
		Low Longitudinal Cracking (linear ft)	1.41	1.50	0.162	0	0	2.31	5.33	4.09	1.88	13	0	13	305	204	0.319	1.81
		Low Fatigue Cracking (sq. ft)	1.41	0.172	0.0390	0	0	0.557	0.310	10.4	3.33	3	0	3	35	204	0.0769	0.248
		Low Transverse Cracking (linear ft)	1.99	2.90	0.272	0	0	3.89	15.1	2.36	1.53	18	0	18	591	204	0.537	3.43
		Low Longitudinal Cracking (linear ft)	1.99	2.85	0.231	2	0	3.30	10.9	3.30	1.51	18	0	18	582	204	0.456	3.31
		Low Fatigue Cracking (sq. ft)	1.99	0.485	0.0800	0	0	1.14	1.31	4.14	2.29	5	0	5	99	204	0.158	0.643
	ARAN	Low Transverse Cracking (linear ft)	2.73	4.61	0.392	1.5	0	5.61	31.4	0.919	1.15	24	0	24	941	204	0.774	5.39
		Low Longitudinal Cracking (linear ft)	2.73	2.05	0.282	0	0	4.03	16.2	9.17	2.82	23	0	23	419	204	0.556	2.61
		Med Longitudinal Cracking (linear ft)	2.73	0.00980	0.010	0	0	0.140	0.0	204	14.3	2	0	2	2	204	0.019	0.03
		Low Fatigue Cracking (sq. ft)	2.73	2.69	0.199	2	0	2.84	8.07	-0.931	0.616	9	0	9	548	204	0.392	3.08
LA 422	LTRC	Low Longitudinal Cracking (linear ft)	0.99	2.52	0.728	0	0	5.82	33.9	10.2	3.02	30	0	30	161	64	1.45	3.97
		Low Longitudinal Cracking (linear ft)	1.49	6.28	1.84	0	0	14.7	216	15.9	3.70	85	0	85	402	64	3.67	9.95
		Low Longitudinal Cracking (linear ft)	1.99	16.4	4.51	0	0	36.0	1299	9.80	3.01	185	0	185	1047	64	9.00	25.4
		Low Transverse Cracking (linear ft)	1.99	0.391	0.144	0	0	1.15	1.32	5.88	2.74	4	0	4	25	64	0.287	0.678
	ARAN	Low Longitudinal Cracking (linear ft)	2.55	2.73	1.12	0	0	9.00	81.0	11.1	3.46	40	0	40	175	64	2.25	4.98
		Med Longitudinal Cracking (linear ft)	2.55	2.16	2.16	0	0	17.3	298	64.0	8.00	138	0	138	138	64	4.31	6.47
		Low Transverse Cracking (linear ft)	2.55	0.516	0.186	0	0	1.49	2.22	10.7	3.17	8	0	8	33	64	0.372	0.888
		Low Fatigue Cracking (sq. ft)	2.55	19.2	4.80	0	0	38.4	1473	4.78	2.35	160	0	160	1228	64	9.59	28.8

I-10

Data Collection Method	Mean (see Column B)					Mean plus 95th % (see Column P)			
	Age (yrs)	low trans. (linear ft)	low long. (linear ft)	medium long. (linear ft)	low fatigue (ft^2)	low trans. (linear ft)	low long. (linear ft)	medium long. (linear ft)	low fatigue (ft^2)
$LTRC_1$	0.901	0.735	0.529	0.000	0.000	0.965	0.725	0.000	0.000
$LTRC_1$	1.41	1.62	1.50	0.00	0.172	1.98	1.81	0.00	0.248
$LTRC_1$	1.99	2.90	2.85	0.00	0.485	3.43	3.31	0.00	0.643
$ARAN_1$	2.73	4.61	2.05	0.01	2.69	5.39	2.61	0.03	3.08
3-Year Projected Distress $_2$: (LTRC)	***3.00***	***4.88***	***4.98***	***0.00***	***0.92***	***5.70***	***5.68***	***0.00***	***1.23***
R^2 Error		*0.9963*	*0.997*	-	*0.9844*	*0.9965*	*0.9977*	-	*0.9922*
3-Year Projected Distress $_2$: (LTRC & ARAN)	***3.00***	***5.12***	***2.86***	***0.01***	***2.62***	***5.96***	***3.48***	***0.03***	***3.04***
R^2 Error		*0.9970*	*0.5332*	*0.6822*	*0.8192*	*0.9971*	*0.6137*	*0.6822*	*0.8398*

LA 422

Mean (see Column B)						Mean plus 95th % (see Column P)			
Age (yrs)	low trans. (linear ft)	low long. (linear ft)	medium long. (linear ft)	low fatigue (ft^2)	low trans. (linear ft)	low long. (linear ft)	medium long. (linear ft)	low fatigue (ft^2)
0.986	0.000	2.52	0.000	0.000	0.000	3.97	0.000	0.000
1.49	0.00	6.28	0.00	0.00	0.00	9.95	0.00	0.00
1.99	0.39	16.4	0.00	0.00	0.68	25.4	0.00	0.00
2.55	0.52	2.16	2.16	19.2	0.89	6.47	6.47	28.8
3.00	***0.72***	***29.23***	***0.00***	***0.00***	***1.25***	***45.32***	***0.00***	***0.00***
	0.7473	*0.9336*	-	-	*0.7473*	*0.9376*	-	-
3.00	***0.693***	***8.69***	***2.13***	***19.0***	***1.20***	***16.5***	***6.38***	***28.4***
	0.8785	*0.0227*	*0.6248*	*0.6248*	*0.8770*	*0.0805*	*0.6248*	*0.6248*

Note 1: The reason some distress assessment figures seem inconsistant (for example, the low longitudinal cracking estimate on I-10 at 1.99 years appears to be higher than the estimate for 2.73 years) has to do with the differences in the data collection method used (LTRC versus ARAN). LTRC assessments were done in the field by clipboard survey. ARAN assessments were done in-office using photographic records (ARAN) estimates were impacted by image quality and resolution).

Note 2: All projected distress figures were arrived at through linear regression analysis.

Table G-1
Project: I-10
LTRC Cracking Survey: May 2003

(Low Fatigue cracking < 10 $ft^2/10^{th}$ mile segment,
Longitudinal Cracking < 200 linear ft. $/10^{th}$ mile segment,
Transverse Cracking < 200 linear ft. $/10^{th}$ mile segment)

Mile		Low Fatigue Cracking (Sqare Feet) (assuming a 1 ft nominal width)		Low Transverse Cracking (Linear Feet)		Low Longitudinal Cracking (Linear Feet)	
From	To	Westbound	Eastbound	Westbound	Eastbound	Westbound	Eastbound
0.0	0.1	-	-	3	1	-	-
0.1	0.2	-	-	-	-	-	-
0.2	0.3	-	-	-	-	-	-
0.3	0.4	-	-	-	-	-	1
0.4	0.5	-	-	-	-	-	-
0.5	0.6	-	-	-	-	-	-
0.6	0.7	-	-	-	2	-	-
0.7	0.8	-	-	4	5	-	-
0.8	0.9	-	-	-	-	-	-
0.9	1.0	-	-	-	-	-	-
1.0	1.1	-	-	-	-	-	-
1.1	1.2	-	-	-	-	-	-
1.2	1.3	-	-	-	-	-	-
1.3	1.4	-	-	-	-	-	-
1.4	1.5	-	-	-	-	-	3
1.5	1.6	-	-	3	3	1	3
1.6	1.7	-	-	4	4	-	-
1.7	1.8	-	-	-	-	-	-
1.8	1.9	-	-	3	-	-	-
1.9	2.0	-	-	-	-	-	2
2.0	2.1	-	-	-	-	-	-
2.1	2.2	-	-	-	-	-	4
2.2	2.3	-	-	-	-	5	-
2.3	2.4	-	-	-	-	-	-
2.4	2.5	-	-	-	-	-	-
2.5	2.6	-	-	-	-	-	-
2.6	2.7	-	-	-	-	-	-
2.7	2.8	-	-	3	5	-	-
2.8	2.9	-	-	-	7	2	-
2.9	3.0	-	-	-	2	-	-
3.0	3.1	-	-	-	-	-	-
3.1	3.2	-	-	-	-	-	-
3.2	3.3	-	-	-	-	-	-
3.3	3.4	-	-	-	-	-	3
3.4	3.5	-	-	-	-	-	2
3.5	3.6	-	-	-	-	-	-
3.6	3.7	-	-	-	-	-	-
3.7	3.8	-	-	-	-	-	1
3.8	3.9	-	-	-	-	-	2
3.9	4.0	-	-	4	-	3	-
4.0	4.1	-	-	1	-	-	-
4.1	4.2	-	-	4	-	-	-
4.2	4.3	-	-	-	-	-	-
4.3	4.4	-	-	-	-	-	-
4.4	4.5	-	-	-	-	-	-
4.5	4.6	-	-	-	-	-	-
4.6	4.7	-	-	-	-	-	-
4.7	4.8	-	-	-	-	-	-
4.8	4.9	-	-	-	-	-	-
4.9	5.0	-	-	-	-	-	-
5.0	5.1	-	-	2	-	3	-
5.1	5.2	Bridge					

Mile		Low Fatigue Cracking (Sqare Feet) (assuming a 1 ft nominal width)		Low Transverse Cracking (Linear Feet)		Low Longitudinal Cracking (Linear Feet)	
		Westbound	Eastbound	Westbound	Eastbound	Westbound	Eastbound
5.2	5.3	-	-	-	-	-	-
5.3	5.4	-	-	5	-	-	3
5.4	5.5	-	-	2	-	-	3
5.5	5.6	-	-	-	-	-	-
5.6	5.7	-	-	-	-	-	-
5.7	5.8	-	-	-	-	-	-
5.8	5.9	-	-	-	-	-	-
5.9	6.0	-	-	1	-	-	2
6.0	6.1	-	-	-	-	-	4
6.1	6.2	-	-	3	-	-	3
6.2	6.3	-	-	-	-	-	4
6.3	6.4	-	-	4	-	-	9
6.4	6.5	-	-	-	-	-	-
6.5	6.6	-	-	-	-	-	4
6.6	6.7	-	-	-	-	-	-
6.7	6.8	-	-	-	-	-	-
6.8	6.9	-	-	-	-	-	-
6.9	7.0	-	-	-	2	-	4
7.0	7.1	-	-	-	2	-	-
7.1	7.2	-	-	-	-	7	-
7.2	7.3	-	-	-	-	-	-
7.3	7.4	-	-	-	-	8	-
7.4	7.5	-	-	-	-	-	-
7.5	7.6	-	-	-	3	-	1
7.6	7.7	-	-	-	-	-	-
7.7	7.8	-	-	-	-	2	-
7.8	7.9	-	-	-	-	-	-
7.9	8.0	-	-	-	-	-	2
8.0	8.1	-	-	4	-	-	3
8.1	8.2	-	-	-	-	-	5
8.2	8.3	-	-	-	-	-	-
8.3	8.4	-	-	3	-	-	-
8.4	8.5	-	-	-	-	1	-
8.5	8.6	-	-	4	-	-	-
8.6	8.7	-	-	-	6	-	-
8.7	8.8	-	-	7	1	-	-
8.8	8.9	-	-	-	-	-	-
8.9	9.0	-	-	8	-	-	4
9.0	9.1	-	-	-	-	-	-
9.1	9.2	-	-	-	1	-	-
9.2	9.3	-	-	3	3	-	-
9.3	9.4	-	-	-	-	-	-
9.4	9.5	-	-	4	-	-	-
9.5	9.6	-	-	-	-	-	-
9.6	9.7	-	-	-	-	-	-
9.7	9.8	-	-	8	5	-	-
9.8	9.9	-	-	-	-	1	-
9.9	10.1	Bridge					
10.1	10.2	-	-	-	-	3	-
10.2	10.3	-	-	5	-	-	-
10.3	10.4	-	-	2	4	-	-
10.4	10.5	-	-	-	-	-	-

Note:
All "Low Fatigue Cracking" recorded as part of this survey generally took a linear form (a "linear foot" measurement better described the distresses observed). But, since the SHRP Distress Manual stipulates that such distresses should be recorded in "square feet", an assumption was made that a one foot nominal width would be applied to all "low fatigue cracks" observed.

Table G-2
Project: I-10
LTRC Cracking Survey: November 2003

(Low Fatigue cracking < 10 $ft^2/10^{th}$ mile segment,
Longitudinal Cracking < 200 linear ft. $/10^{th}$ mile segment,
Transverse Cracking < 200 linear ft. $/10^{th}$ mile segment)

Mile		Low Fatigue Cracking (Sqare Feet) (assuming a 1 ft nominal width)		Low Transverse Cracking (Linear Feet)		Low Longitudinal Cracking (Linear Feet)	
From	To	Westbound	Eastbound	Westbound	Eastbound	Westbound	Eastbound
0.0	0.1	2	-	6	3	-	-
0.1	0.2	-	1	-	1	-	-
0.2	0.3	-	-	-	3	-	1
0.3	0.4	-	-	-	-	-	4
0.4	0.5	-	-	-	3	-	-
0.5	0.6	-	-	-	2	-	-
0.6	0.7	-	2	-	5	-	2
0.7	0.8	-	2	6	9	-	-
0.8	0.9	-	-	-	-	-	-
0.9	1.0	-	-	2	1	-	-
1.0	1.1	-	-	-	-	1	3
1.1	1.2	-	-	-	2	3	4
1.2	1.3	-	-	3	-	-	-
1.3	1.4	-	-	3	-	-	3
1.4	1.5	-	-	-	-	2	7
1.5	1.6	-	-	5	5	4	5
1.6	1.7	1	1	7	6	-	-
1.7	1.8	-	-	-	-	-	-
1.8	1.9	-	-	5	-	3	-
1.9	2.0	-	-	-	-	-	5
2.0	2.1	-	-	-	-	-	-
2.1	2.2	-	-	-	-	-	6
2.2	2.3	-	-	-	-	7	-
2.3	2.4	-	-	-	-	-	-
2.4	2.5	-	-	-	-	-	-
2.5	2.6	-	-	-	-	-	-
2.6	2.7	-	-	-	-	-	-
2.7	2.8	-	1	5	7	-	-
2.8	2.9	-	2	-	9	5	-
2.9	3.0	-	-	-	5	-	-
3.0	3.1	-	-	-	-	-	3
3.1	3.2	-	-	-	-	-	2
3.2	3.3	-	-	-	-	-	-
3.3	3.4	-	-	3	-	1	6
3.4	3.5	-	-	-	-	-	5
3.5	3.6	-	-	3	2	3	2
3.6	3.7	-	-	2	3	2	-
3.7	3.8	-	-	-	-	-	4
3.8	3.9	-	-	-	3	-	5
3.9	4.0	2	-	6	-	5	-
4.0	4.1	1	-	4	-	2	2
4.1	4.2	2	-	7	-	3	-
4.2	4.3	-	-	-	-	-	-
4.3	4.4	-	-	3	-	-	-
4.4	4.5	-	-	-	1	2	-
4.5	4.6	-	-	-	2	-	-
4.6	4.7	-	-	-	2	1	-
4.7	4.8	-	-	-	-	3	-
4.8	4.9	-	-	-	-	-	2
4.9	5.0	-	-	-	2	-	-
5.0	5.1	-	-	4	-	7	-
5.1	5.2	Bridge					

Mile		Low Fatigue Cracking (Sqare Feet) (assuming a 1 ft nominal width)		Low Transverse Cracking (Linear Feet)		Low Longitudinal Cracking (Linear Feet)	
		Westbound	Eastbound	Westbound	Eastbound	Westbound	Eastbound
5.2	5.3	-	-	-	-	1	-
5.3	5.4	-	1	7	2	-	4
5.4	5.5	-	-	5	3	3	6
5.5	5.6	-	-	-	-	-	-
5.6	5.7	-	-	-	-	-	-
5.7	5.8	-	-	-	-	-	-
5.8	5.9	-	-	-	-	-	-
5.9	6.0	-	-	4	-	2	4
6.0	6.1	-	-	-	-	-	6
6.1	6.2	-	-	6	-	-	5
6.2	6.3	-	-	-	-	-	5
6.3	6.4	2	-	6	-	3	13
6.4	6.5	-	-	2	-	-	1
6.5	6.6	-	2	-	2	-	6
6.6	6.7	-	-	-	-	-	-
6.7	6.8	-	-	1	-	-	-
6.8	6.9	-	-	-	-	3	3
6.9	7.0	-	-	-	5	-	7
7.0	7.1	-	2	-	4	-	-
7.1	7.2	-	-	-	-	9	-
7.2	7.3	-	-	-	-	-	4
7.3	7.4	-	-	-	-	11	3
7.4	7.5	-	-	-	-	-	-
7.5	7.6	-	-	-	5	2	4
7.6	7.7	-	-	-	-	-	-
7.7	7.8	-	-	-	-	4	2
7.8	7.9	-	-	-	-	-	3
7.9	8.0	-	-	2	-	1	5
8.0	8.1	-	-	6	-	-	5
8.1	8.2	-	-	-	-	-	8
8.2	8.3	-	-	-	-	2	3
8.3	8.4	-	-	5	2	1	-
8.4	8.5	-	-	2	2	3	-
8.5	8.6	-	-	6	-	1	-
8.6	8.7	-	2	-	8	-	-
8.7	8.8	3	-	9	5	-	-
8.8	8.9	-	-	-	-	-	3
8.9	9.0	3	-	14	-	1	7
9.0	9.1	-	-	-	-	-	2
9.1	9.2	-	-	-	4	-	-
9.2	9.3	-	-	6	6	-	-
9.3	9.4	-	-	-	3	-	-
9.4	9.5	2	-	6	-	2	1
9.5	9.6	-	-	-	-	-	-
9.6	9.7	-	-	-	-	-	-
9.7	9.8	1	-	11	7	2	-
9.8	9.9	-	-	-	2	1	2
9.9	10.1	Bridge					
10.1	10.2	-	-	3	-	5	1
10.2	10.3	-	-	7	-	2	3
10.3	10.4	-	-	4	6	-	2
10.4	10.5	-	-	3	-	-	3

Note:
All "Low Fatigue Cracking" recorded as part of this survey generally took a linear form (a "linear foot" measurement better described the distresses observed). But, since the SHRP Distress Manual stipulates that such distresses should be recorded in "square feet", an assumption was made that a one foot nominal width would be applied to all "low fatigue cracks" observed.

Table G-3
Project: I-10
LTRC Cracking Survey: June 2004

(Low Fatigue cracking < 10 ft^2/10^{th} mile segment,
Longitudinal Cracking < 200 linear ft. /10^{th} mile segment,
Transverse Cracking < 200 linear ft. /10^{th} mile segment)

Mile		Low Fatigue Cracking (Sqare Feet) (assuming a 1 ft nominal width)		Low Transverse Cracking (Linear Feet)		Low Longitudinal Cracking (Linear Feet)	
From	To	Westbound	Eastbound	Westbound	Eastbound	Westbound	Eastbound
0.0	0.1	4	-	13	5	-	3
0.1	0.2	-	1	2	4	-	1
0.2	0.3	-	-	-	6	-	4
0.3	0.4	-	-	-	3	2	11
0.4	0.5	-	-	-	6	-	-
0.5	0.6	-	-	-	2	3	-
0.6	0.7	-	4	-	11	-	6
0.7	0.8	3	4	9	18	-	2
0.8	0.9	-	-	-	-	-	-
0.9	1.0	-	-	4	4	3	-
1.0	1.1	-	-	-	-	3	5
1.1	1.2	-	-	3	4	4	6
1.2	1.3	-	-	4	-	-	-
1.3	1.4	-	-	4	2	-	5
1.4	1.5	-	-	-	-	4	9
1.5	1.6	2	3	6	8	7	8
1.6	1.7	3	3	8	8	-	2
1.7	1.8	-	-	-	-	-	-
1.8	1.9	2	-	9	-	5	-
1.9	2.0	-	-	-	-	-	7
2.0	2.1	-	-	-	-	-	3
2.1	2.2	-	-	2	-	-	9
2.2	2.3	-	-	-	-	12	-
2.3	2.4	-	-	-	2	-	-
2.4	2.5	-	-	1	-	-	-
2.5	2.6	-	-	-	3	-	3
2.6	2.7	-	-	3	-	-	-
2.7	2.8	4	3	8	11	-	-
2.8	2.9	-	2	-	17	7	-
2.9	3.0	-	1	-	7	-	3
3.0	3.1	-	-	-	-	-	7
3.1	3.2	-	-	3	3	3	4
3.2	3.3	-	-	-	-	-	-
3.3	3.4	3	-	5	-	3	10
3.4	3.5	-	-	-	-	-	10
3.5	3.6	-	-	5	4	5	6
3.6	3.7	-	-	5	4	4	-
3.7	3.8	-	-	-	3	-	5
3.8	3.9	-	-	-	5	2	6
3.9	4.0	5	-	10	-	8	-
4.0	4.1	3	-	8	-	4	4
4.1	4.2	3	-	12	3	5	-
4.2	4.3	-	-	-	-	-	3
4.3	4.4	-	-	7	3	-	-
4.4	4.5	-	-	4	3	4	-
4.5	4.6	-	-	-	4	-	2
4.6	4.7	-	-	-	5	3	3
4.7	4.8	-	-	-	2	5	1
4.8	4.9	-	-	-	-	-	4
4.9	5.0	-	-	-	4	-	2
5.0	5.1	1	-	7	2	9	-
5.1	5.2	Bridge					

Mile		Low Fatigue Cracking (Sqare Feet) (assuming a 1 ft nominal width)		Low Transverse Cracking (Linear Feet)		Low Longitudinal Cracking (Linear Feet)	
		Westbound	Eastbound	Westbound	Eastbound	Westbound	Eastbound
5.2	5.3	-	-	-	-	4	-
5.3	5.4	5	1	9	4	-	6
5.4	5.5	2	-	8	4	5	7
5.5	5.6	-	-	-	-	2	1
5.6	5.7	-	-	-	-	-	-
5.7	5.8	-	-	-	-	-	2
5.8	5.9	-	-	-	-	1	2
5.9	6.0	-	-	4	-	4	6
6.0	6.1	-	-	-	-	-	7
6.1	6.2	2	-	8	-	1	7
6.2	6.3	-	-	-	-	-	8
6.3	6.4	4	-	8	-	4	18
6.4	6.5	-	-	5	-	-	3
6.5	6.6	-	2	-	4	-	9
6.6	6.7	-	-	-	-	2	6
6.7	6.8	-	-	4	-	-	4
6.8	6.9	-	-	-	2	4	6
6.9	7.0	-	-	-	7	-	9
7.0	7.1	-	2	-	5	-	2
7.1	7.2	-	-	-	-	10	-
7.2	7.3	-	-	-	-	-	6
7.3	7.4	-	-	-	3	18	5
7.4	7.5	-	-	-	2	2	-
7.5	7.6	-	-	-	7	4	5
7.6	7.7	-	-	-	-	-	-
7.7	7.8	-	-	2	-	7	4
7.8	7.9	-	-	-	-	1	5
7.9	8.0	-	-	4	-	3	6
8.0	8.1	2	-	9	-	2	8
8.1	8.2	-	-	-	-	-	10
8.2	8.3	-	-	-	3	4	3
8.3	8.4	3	-	7	5	3	-
8.4	8.5	-	-	4	4	4	-
8.5	8.6	3	-	8	-	4	-
8.6	8.7	-	3	-	8	-	2
8.7	8.8	4	-	12	6	-	-
8.8	8.9	-	-	-	-	-	5
8.9	9.0	4	-	16	-	3	10
9.0	9.1	-	-	-	-	-	5
9.1	9.2	-	-	-	5	-	3
9.2	9.3	-	-	7	7	-	-
9.3	9.4	-	-	-	7	-	-
9.4	9.5	2	-	8	-	3	3
9.5	9.6	-	-	3	-	-	-
9.6	9.7	-	-	5	-	2	2
9.7	9.8	2	-	18	10	3	2
9.8	9.9	-	-	-	8	2	4
9.9	10.1	Bridge					
10.1	10.2	-	-	5	-	6	4
10.2	10.3	2	-	12	-	4	5
10.3	10.4	-	2	4	9	2	5
10.4	10.5	-	-	3	-	-	4

Note:
All "Low Fatigue Cracking" recorded as part of this survey generally took a linear form (a "linear foot" measurement better described the distresses observed). But, since the SHRP Distress Manual stipulates that such distresses should be recorded in "square feet", an assumption was made that a one foot nominal width would be applied to all "low fatigue cracks" observed.

Table G-4
Project: I-10
"Raw" ARAN Cracking Survey: February 2005

(Low Fatigue cracking < 10 $ft^2/10^{th}$ mile segment,
Longitudinal Cracking < 200 linear ft. $/10^{th}$ mile segment,
Transverse Cracking < 200 linear ft. $/10^{th}$ mile segment)

Mile		Low Fatigue Cracking (Sqare Feet) (assuming a 1 ft nominal width)		Low Transverse Cracking (Linear Feet)		Low Longitudinal Cracking (Linear Feet)	
From	To	Westbound	Eastbound	Westbound	Eastbound	Westbound	Eastbound
0.0	0.1	6	5	22	8	-	-
0.1	0.2	-	4	5	6	-	-
0.2	0.3	-	5	-	8	-	-
0.3	0.4	5	4	-	5	-	11
0.4	0.5	-	-	-	6	-	-
0.5	0.6	8	-	3	5	-	-
0.6	0.7	2	8	-	15	-	2
0.7	0.8	-	3	13	24	-	-
0.8	0.9	3	-	-	-	-	-
0.9	1.0	8	-	6	7	-	-
1.0	1.1	4	3	-	-	-	3
1.1	1.2	7	6	8	6	-	2
1.2	1.3	-	-	6	-	-	-
1.3	1.4	5	7	7	5	-	4
1.4	1.5	7	7	-	-	-	7
1.5	1.6	7	8	9	15	-	3
1.6	1.7	-	-	12	12	-	4
1.7	1.8	9	-	-	-	-	-
1.8	1.9	9	2	9	-	-	-
1.9	2.0	1	9	-	-	-	1
2.0	2.1	-	-	-	-	-	7
2.1	2.2	-	15	5	-	2	-
2.2	2.3	21	-	-	-	10	1
2.3	2.4	-	-	-	6	-	2
2.4	2.5	-	3	5	-	-	-
2.5	2.6	-	4	-	6	-	-
2.6	2.7	2	-	5	-	-	-
2.7	2.8	3	-	13	15	-	-
2.8	2.9	14	-	-	21	-	-
2.9	3.0	-	5	-	10	-	-
3.0	3.1	-	9	-	-	-	-
3.1	3.2	9	3	4	5	-	2
3.2	3.3	2	-	-	-	-	2
3.3	3.4	7	9	12	-	-	7
3.4	3.5	-	15	-	-	-	2
3.5	3.6	10	12	8	6	-	-
3.6	3.7	6	-	8	7	-	-
3.7	3.8	3	4	-	6	-	-
3.8	3.9	3	3	-	7	-	2
3.9	4.0	18	-	8	-	4	-
4.0	4.1	9	3	9	-	-	4
4.1	4.2	15	-	8	7	-	-
4.2	4.3	3	6	-	-	-	-
4.3	4.4	-	-	10	6	-	-
4.4	4.5	7	-	6	6	-	-
4.5	4.6	-	4	-	6	-	-
4.6	4.7	6	7	-	8	-	-
4.7	4.8	14	-	-	6	-	3
4.8	4.9	3	4	-	-	-	3
4.9	5.0	2	4	-	6	-	-
5.0	5.1	7	-	9	5	12	-
5.1	5.2	Bridge					

Mile		Low Fatigue Cracking (Sqare Feet) (assuming a 1 ft nominal width)		Low Transverse Cracking (Linear Feet)		Low Longitudinal Cracking (Linear Feet)	
		Westbound	Eastbound	Westbound	Eastbound	Westbound	Eastbound
5.2	5.3	7	-	-	-	-	-
5.3	5.4	3	7	15	7	-	-
5.4	5.5	3	7	11	6	2	2
5.5	5.6	3	-	-	-	-	2 (Med)
5.6	5.7	-	-	-	-	-	-
5.7	5.8	-	3	-	-	-	-
5.8	5.9	3	4	-	-	-	-
5.9	6.0	3	9	5	-	4	-
6.0	6.1	-	8	-	-	2	-
6.1	6.2	3	5	11	-	-	4
6.2	6.3	-	8	-	-	-	-
6.3	6.4	7	18	14	-	-	2
6.4	6.5	-	3	7	-	2	-
6.5	6.6	2	5	-	11	-	5
6.6	6.7	4	4	-	-	-	4
6.7	6.8	-	5	6	-	-	-
6.8	6.9	9	9	-	6	-	-
6.9	7.0	-	5	-	10	-	6
7.0	7.1	-	-	-	11	-	4
7.1	7.2	8	-	-	-	4	-
7.2	7.3	-	4	-	-	-	3
7.3	7.4	25	6	-	7	-	-
7.4	7.5	-	-	-	5	2	-
7.5	7.6	7	8	-	8	-	-
7.6	7.7	-	-	-	-	-	-
7.7	7.8	13	7	4	-	-	-
7.8	7.9	-	4	-	-	3	3
7.9	8.0	5	9	7	-	-	-
8.0	8.1	4	4	12	5	-	6
8.1	8.2	3	9	-	-	-	8
8.2	8.3	6	-	-	7	-	5
8.3	8.4	7	-	10	8	-	3
8.4	8.5	8	-	8	7	-	-
8.5	8.6	6	2	14	-	-	-
8.6	8.7	-	18	-	-	-	-
8.7	8.8	4	3	15	8	-	-
8.8	8.9	3	7	-	-	-	-
8.9	9.0	4	4	21	-	-	11
9.0	9.1	1	8	-	-	-	-
9.1	9.2	-	6	-	8	-	-
9.2	9.3	-	3	14	9	-	-
9.3	9.4	3	-	-	9	-	-
9.4	9.5	5	9	17	-	-	-
9.5	9.6	-	-	6	-	-	-
9.6	9.7	3	3	8	-	-	-
9.7	9.8	5	5	23	10	-	-
9.8	9.9	-	9	4	11	2	-
9.9	10.1	Bridge					
10.1	10.2	-	-	9	-	6	4
10.2	10.3	6	8	13	-	-	-
10.3	10.4	4	4	7	15	-	-
10.4	10.5	-	3	5	-	-	2

Note:
Figures highlighted in grey show problem areas found to be in excess of allowable warranty limits according to ARAN. On closer inspection of ARAN video logs, indications were that a number of areas considered by ARAN to be fatigue cracks were actually longitudinal cracks or were overestimates. All indications were that the pavement shows no sign of cracking that were in violation of warranty requirements.

Note:
All "Low Fatigue Cracking" recorded as part of this survey generally took a linear form (a "linear foot" measurement better described the distresses observed). But, since the SHRP Distress Manual stipulates that such distresses should be recorded in "square feet", an assumption was made that a one foot nominal width would be applied to all "low fatigue cracks" observed.

Table G-5
Project: I-10
"Corrected" ARAN Cracking Survey: February 2005

(Low Fatigue cracking < 10 $ft^2/10^{th}$ mile segment,
Longitudinal Cracking < 200 linear ft. $/10^{th}$ mile segment,
Transverse Cracking < 200 linear ft. $/10^{th}$ mile segment)

Mile		Low Fatigue Cracking (Sqare Feet) (assuming a 1 ft nominal width)		Low Transverse Cracking (Linear Feet)		Low Longitucinal Cracking (Linear Feet)	
From	To	Westbound	Eastbound	Westbound	Eastbound	Westbound	Eastbound
0.0	0.1	5	5	23	8	-	-
0.1	0.2	-	4	5	6	-	-
0.2	0.3	-	5	-	8	-	-
0.3	0.4	5	4	-	5	-	11
0.4	0.5	-	-	-	6	-	-
0.5	0.6	8	-	3	5	-	-
0.6	0.7	2	8	-	15	-	2
0.7	0.8	-	3	13	24	-	-
0.8	0.9	3	-	-	-	-	-
0.9	1.0	8	-	6	7	-	-
1.0	1.1	4	3	-	-	-	3
1.1	1.2	7	6	8	6	-	2
1.2	1.3	-	-	6	-	-	-
1.3	1.4	5	7	7	5	-	4
1.4	1.5	7	7	-	-	-	7
1.5	1.6	7	8	9	15	-	3
1.6	1.7	-	-	12	12	-	4
1.7	1.8	6	-	-	-	-	-
1.8	1.9	7	-	11	-	-	2
1.9	2.0	-	-	-	-	1	9
2.0	2.1	-	-	-	-	-	7
2.1	2.2	-	-	5	-	2	13
2.2	2.3	-	-	-	-	23	1
2.3	2.4	-	-	-	6	-	2
2.4	2.5	-	3	5	-	-	-
2.5	2.6	-	4	-	6	-	-
2.6	2.7	2	-	5	-	-	-
2.7	2.8	3	-	13	15	-	-
2.8	2.9	8	-	-	21	-	-
2.9	3.0	-	5	-	10	-	-
3.0	3.1	-	9	-	-	-	-
3.1	3.2	5	3	6	5	-	2
3.2	3.3	2	-	-	-	-	2
3.3	3.4	7	-	12	-	-	14
3.4	3.5	-	-	-	-	-	16
3.5	3.6	7	-	8	6	1	12
3.6	3.7	6	-	8	7	-	-
3.7	3.8	3	4	-	6	-	4
3.8	3.9	3	3	-	7	1	5
3.9	4.0	6	-	17	-	6	-
4.0	4.1	7	3	10	-	2	4
4.1	4.2	7	-	16	7	-	-
4.2	4.3	3	6	-	-	1	-
4.3	4.4	-	-	10	6	-	-
4.4	4.5	7	-	6	6	-	-
4.5	4.6	-	4	-	6	-	-
4.6	4.7	4	7	-	8	-	-
4.7	4.8	8	-	-	6	-	3
4.8	4.9	1	-	-	-	-	7
4.9	5.0	-	-	-	6	-	4
5.0	5.1	7	-	9	5	12	-
5.1	5.2	Bridge					

Mile		Low Fatigue Cracking (Sqare Feet) (assuming a 1 ft nominal width)		Low Transverse Cracking (Linear Feet)		Low Longitudinal Cracking (Linear Feet)	
		Westbound	Eastbound	Westbound	Eastbound	Westbound	Eastbound
5.2	5.3	7	-	-	-	-	-
5.3	5.4	3	7	15	7	-	-
5.4	5.5	4	7	11	6	2	1
5.5	5.6	3	-	-	-	-	2 (Med)
5.6	5.7	-	-	-	-	-	-
5.7	5.8	-	3	-	-	-	-
5.8	5.9	3	4	-	-	-	-
5.9	6.0	3	9	5	-	4	-
6.0	6.1	-	4	-	-	2	4
6.1	6.2	3	-	11	-	-	9
6.2	6.3	-	-	-	-	-	8
6.3	6.4	7	-	14	-	-	20
6.4	6.5	-	-	7	-	2	3
6.5	6.6	2	2	-	11	-	8
6.6	6.7	4	4	-	-	-	4
6.7	6.8	-	5	6	-	-	-
6.8	6.9	9	9	-	6	-	-
6.9	7.0	-	5	-	10	-	6
7.0	7.1	-	-	-	11	-	4
7.1	7.2	2	-	-	-	12	-
7.2	7.3	-	4	-	-	-	3
7.3	7.4	1	6	-	7	23	-
7.4	7.5	1	-	-	5	2	-
7.5	7.6	-	8	-	8	6	-
7.6	7.7	-	-	-	-	-	-
7.7	7.8	-	7	4	-	10	-
7.8	7.9	-	4	-	-	3	3
7.9	8.0	5	2	7	-	-	7
8.0	8.1	4	2	12	5	-	8
8.1	8.2	3	1	-	-	-	12
8.2	8.3	6	-	-	7	-	5
8.3	8.4	7	-	10	8	-	3
8.4	8.5	1	-	8	7	7	-
8.5	8.6	3	2	14	-	3	-
8.6	8.7	-	5	-	12	-	-
8.7	8.8	1	3	15	8	2	-
8.8	8.9	2	7	-	-	1	-
8.9	9.0	4	4	21	-	-	11
9.0	9.1	1	3	-	-	-	5
9.1	9.2	-	1	-	8	-	4
9.2	9.3	-	-	14	9	-	2
9.3	9.4	3	-	-	9	-	-
9.4	9.5	5	3	17	-	-	2
9.5	9.6	-	-	6	-	-	-
9.6	9.7	3	3	8	-	-	-
9.7	9.8	5	5	23	10	-	-
9.8	9.9	-	9	4	11	2	-
9.9	10.1	Bridge					
10.1	10.2	-	-	9	-	6	4
10.2	10.3	5	8	16	-	-	-
10.3	10.4	4	4	7	13	-	2
10.4	10.5	-	3	5	-	-	2

Note:
All "Low Fatigue Cracking" recorded as part of this survey generally took a linear form (a "linear foot" measurement better described the distresses observed). But, since the SHRP Distress Manual stipulates that such distresses should be recorded in "square feet", an assumption was made that a one foot nominal width would be applied to all "low fatigue cracks" observed.

Table G-6
Project: LA 422
LTRC Cracking Survey: May 2003
(Fatigue cracking < 10 $ft^2/10^{th}$ mile segment,
"Low-Severity" Longitudinal and Transverse Cracking < 200 linear ft. /10th mile segment)

Mile		Low Transverse Cracking (Linear Feet)		Low Longitudinal Cracking (Linear Feet)	
From	To	Westbound	Eastbound	Westbound	Eastbound
0.2	0.3	-	-	-	-
0.3	0.4	-	-	-	-
0.4	0.5	-	-	-	-
0.5	0.6	-	-	-	-
0.6	1.5	Bridge or Other			
1.5	1.6	-	-	-	-
1.6	2.4	Bridge or Other			
2.4	2.5	-	-	-	-
2.5	2.6	-	-	-	-
2.6	2.7	-	-	-	-
2.7	2.8	-	-	-	-
2.8	4.2	Bridge or Other			
4.2	4.3	-	-	-	-
4.3	4.7	Bridge or Other			
4.7	4.8	-	-	-	-
4.8	4.9	-	-	-	-
4.9	5.0	-	-	-	-
5.0	5.1	-	-	9	-
5.1	5.2	-	-	4	-
5.2	5.3	-	-	3	2
5.3	5.4	-	-	10	10
5.4	5.5	-	-	13	-
5.5	5.6	-	-	-	-
5.6	5.7	-	-	-	-
5.7	5.8	-	-	-	4
5.8	5.9	-	-	9	6
5.9	6.0	-	-	11	-
6.0	6.1	-	-	-	30
6.1	6.2	Bridge or Other			
6.2	6.3	-	-	-	-
6.3	6.8	Bridge or Other			
6.8	6.9	-	-	-	-
7.1	7.2	Bridge or Other			
7.2	7.3	-	-	2	-
7.3	7.4	-	-	-	-
7.4	7.5	Bridge or Other			
7.5	7.6	-	-	25	-
7.7	7.8	Bridge or Other			
7.8	7.9	-	-	14	-
7.9	8.0	-	-	9	-
8.0	10.6	Bridge or Other			
10.6	10.7	-	-	-	-

Note 1:
All cracks recorded as part of this survey were generally found in the wheel path. But, because they remained linear throughout development ("alligator" pattern did not emerge) it was assumed that cracks were longitudinal.

Table G-7
Project: LA 422
LTRC Cracking Survey: November 2003
("Low-Severity" Longitudinal and Transverse Cracking < 200 linear ft. /10th mile segment)

Mile		Low Transverse Cracking (Linear Feet)		Low Longitudinal Cracking (Linear Feet)	
From	To	Westbound	Eastbound	Westbound	Eastbound
0.2	0.3	-	-	-	-
0.3	0.4	-	-	-	-
0.4	0.5	-	-	-	-
0.5	0.6	-	-	-	-
0.6	1.5	Bridge or Other			
1.5	1.6	-	-	-	-
1.6	2.4	Bridge or Other			
2.4	2.5	-	-	-	-
2.5	2.6	-	-	-	-
2.6	2.7	-	-	-	-
2.7	2.8	-	-	-	-
2.8	4.2	Bridge or Other			
4.2	4.3	-	-	-	-
4.3	4.7	Bridge or Other			
4.7	4.8	-	-	-	-
4.8	4.9	-	-	-	2
4.9	5.0	-	-	-	5
5.0	5.1	-	-	19	-
5.1	5.2	-	-	7	-
5.2	5.3	-	-	6	7
5.3	5.4	-	-	22	20
5.4	5.5	-	-	27	4
5.5	5.6	-	-	-	-
5.6	5.7	-	-	-	-
5.7	5.8	-	-	2	7
5.8	5.9	-	-	16	10
5.9	6.0	-	-	19	-
6.0	6.1	-	-	-	85
6.1	6.2	Bridge or Other			
6.2	6.3	-	-	-	-
6.3	6.8	Bridge or Other			
6.8	6.9	-	-	-	-
7.1	7.2	Bridge or Other			
7.2	7.3	-	-	25	-
7.3	7.4	-	-	9	-
7.4	7.5	Bridge or Other			
7.5	7.6	-	-	65	-
7.7	7.8	Bridge or Other			
7.8	7.9	-	-	28	-
7.9	8.0	-	-	17	-
8.0	10.6	Bridge or Other			
10.6	10.7	-	-	-	-

Note 1:
All cracks recorded as part of this survey were generally found in the wheel path. But, because they remained linear throughout development ("alligator" pattern did not emerge) it was assumed that cracks were longitudinal.

Table G-8
Project: LA 422
LTRC Cracking Survey: May 2004
"Low-Severity" Longitudinal and Transverse Cracking < 200 linear ft. /10th mile segment)

Mile		Low Transverse Cracking (Linear Feet)		Low Longitudinal Cracking (Linear Feet)	
From	To	Westbound	Eastbound	Westbound	Eastbound
0.2	0.3	-	2	-	-
0.3	0.4	-	4	-	-
0.4	0.5	-	-	-	-
0.5	0.6	-	3	-	-
0.6	1.5	Bridge or Other			
1.5	1.6	-	-	-	2
1.6	2.4	Bridge or Other			
2.4	2.5	-	4	-	-
2.5	2.6	-	4	-	-
2.6	2.7	-	-	5	-
2.7	2.8	-	-	-	2
2.8	4.2	Bridge or Other			
4.2	4.3	4	-	-	-
4.3	4.7	Bridge or Other			
4.7	4.8	-	-	-	3
4.8	4.9	-	-	-	7
4.9	5.0	-	-	-	9
5.0	5.1	-	-	50	-
5.1	5.2	-	-	15	-
5.2	5.3	-	-	10	8
5.3	5.4	-	-	60	85
5.4	5.5	-	-	75	5
5.5	5.6	-	-	-	-
5.6	5.7	-	-	-	-
5.7	5.8	-	-	11	11
5.8	5.9	-	-	37	18
5.9	6.0	-	-	55	-
6.0	6.1	-	-	-	110
6.1	6.2	Bridge or Other			
6.2	6.3	-	4	-	-
6.3	6.8	Bridge or Other			
6.8	6.9	-	-	-	9
7.1	7.2	Bridge or Other			
7.2	7.3	-	-	42	-
7.3	7.4	-	-	28	-
7.4	7.5	Bridge or Other			
7.5	7.6	-	-	185	-
7.7	7.8	Bridge or Other			
7.8	7.9	-	-	150	-
7.9	8.0	-	-	55	-
8.0	10.6	Bridge or Other			
10.6	10.7	-	-	-	-

Note 1:
All cracks recorded as part of this survey were generally found in the wheel path. But, because they remained linear throughout development ("alligator" pattern did not emerge) it was assumed that cracks were longitudinal.

Table G-9
Project: LA 422
"Corrected" ARAN Cracking Survey: September 2004

(Fatigue cracking < 10 ft^2/10^{th} mile segment,
"Low-Severity" Longitudinal and Transverse Cracking < 200 linear ft. /10th mile segment)

Mile		Low Fatigue Cracking (Sqare Feet) (assuming a 1 ft nominal width)		Low Transverse Cracking		Low Longitudinal Cracking (Linear Feet)	
From	To	Westbound	Eastbound	Westbound	Eastbound	Westbound	Eastbound
0.2	0.3	-	3	-	2	-	-
0.3	0.4	-	3	-	4	-	-
0.4	0.5	-	4	-	-	-	-
0.5	0.6	-	4	-	3	-	-
0.6	1.5	Bridge or Other					
1.5	1.6	-	-	-	-	-	5
1.6	2.4	Bridge or Other					
2.4	2.5	-	-	-	4	-	-
2.5	2.6	-	3	-	4	-	-
2.6	2.7	9	-	-	-	-	-
2.7	2.8	-	6	-	-	-	-
2.8	4.2	Bridge or Other					
4.2	4.3	-	-	4	-	-	-
4.3	4.7	Bridge or Other					
4.7	4.8	-	6	-	-	-	-
4.8	4.9	-	11	-	-	-	-
4.9	5.0	-	13	-	-	-	-
5.0	5.1	87	2	-	-	-	-
5.1	5.2	27	-	-	-	-	-
5.2	5.3	15	13	-	-	-	14
5.3	5.4	91	101	-	-	-	-
5.4	5.5	86	8	-	-	-	-
5.5	5.6	-	-	-	-	-	-
5.6	5.7	-	-	-	-	-	-
5.7	5.8	14	19	-	-	-	-
5.8	5.9	49	21	-	-	-	14
5.9	6.0	47	-	-	-	40	-
6.0	6.1	-	145	-	-	-	-
6.1	6.2	Bridge or Other					
6.2	6.3	-	-	-	4	-	-
6.3	6.8	Bridge or Other					
6.8	6.9	-	9	-	-	-	-
7.1	7.2	Bridge or Other					
7.2	7.3	46	-	-	-	26	-
7.3	7.4	-	-	-	-	38	-
7.4	7.5	Bridge or Other					
7.5	7.6	138	-	-	-	138	-
7.7	7.8	Bridge or Other					
7.8	7.9	160	-	-	-	38	-
7.9	8.0	88	-	-	-	-	-
8.0	10.6	Bridge or Other					
10.6	10.7	-	-	-	8	-	-

Note 1:
Figures highlighted in grey represent cracking considered to be in excess of allowable warranty limits according to ARAN (figures confirmed by the 4/12/2005 field inspection).

Note 2:
All cracks recorded as part of this survey generally took a linear form (a "linear foot" measurement better described the distresses observed). But, since the SHRP Distress Manual stipulates that such distresses should be recorded in "square feet", an assumption was made that a one foot nominal width would be applied to all such cracks observed. All cracks were low width, generally no more than 0.035 inches.

APPENDIX H

FWD and Coring Results on LA 422

Table H-1

DYNAFLECT DATA SHEET

State Project No.	819-02-0012	Wheel Path:	RW/CL/LW
Date/Time of Test:	5-11-05	Layer Thickness:	4"
Starting Time:	9:15 AM	Lane Identification:	EB/WB
Ending Time:	10:35 AM	District:	61
Route #:	LA 422	Pavement Type:	HMAC

Station or Location	Dynaflect Sensor Readings					CMD	%SPD	SN	Es (ksi) (subgrade)	Es (ksi) (corrected)	SCI
	#1	#2	#3	#4	#5						
6.034E	0.70	0.60	0.44	0.32	0.21	0.56	65%	3.5	14.9	8.0	0.10
6.037E	0.64	0.54	0.40	0.27	0.18	0.51	63%	3.4	17.0	9.2	0.10
6.039E	0.63	0.52	0.38	0.27	0.18	0.50	63%	3.4	18.0	9.8	0.11
6.042E	0.72	0.68	0.47	0.32	0.20	0.58	66%	3.4	13.0	6.9	0.04
6.058E	0.48	0.42	0.28	0.20	0.14	0.38	63%	3.9	23.5	13.0	0.06
6.060E	0.44	0.38	0.27	0.19	0.13	0.35	64%	4.2	24.0	13.2	0.06
6.062E	0.42	0.35	0.24	0.17	0.12	0.34	62%	4.1	26.5	14.7	0.07
6.064E	0.35	0.30	0.21	0.16	0.12	0.28	65%	4.6	28.0	15.6	0.05
6.056E	0.32	0.27	0.20	0.15	0.11	0.26	66%	4.8	28.0	15.6	0.05
WEST											
7.690LW	0.76	0.62	0.48	0.35	0.24	0.61	64%	3.2	13.0	6.9	0.14
7.686LW	0.99	0.87	0.69	0.52	0.37	0.79	69%	3.2	8.1	4.1	0.12
7.685LW	0.93	0.85	0.61	0.47	0.32	0.74	68%	3.2	8.9	4.5	0.08
7.682LW	0.65	0.57	0.43	0.31	0.20	0.52	66%	3.6	15.0	8.0	0.08
7.670RW	1.13	0.76	0.45	0.27	0.17	0.90	49%	**1.0**	17.0	9.2	0.37
7.686RW	1.80	1.16	0.61	0.32	0.18	1.44	45%	**0.0**	12.0	6.3	0.64
7.685RW	1.86	1.11	0.61	0.32	0.19	1.49	44%	**-0.2**	13.0	6.9	0.75
7.682RW	1.56	1.02	0.51	0.28	0.15	1.25	45%	0.2	14.0	7.5	0.54
7.670RW	1.01	0.77	0.45	0.25	0.14	0.81	52%	1.4	16.5	8.9	0.24
7.655RW	0.52	0.43	0.31	0.22	0.15	0.42	63%	3.7	21.0	11.5	0.09
7.644RW	0.63	0.56	0.43	0.33	0.24	0.50	70%	4.1	13.0	6.9	0.07
7.642RW	0.73	0.64	0.48	0.37	0.26	0.58	68%	3.4	13.0	6.9	0.09
7.639RW	0.82	0.69	0.52	0.39	0.27	0.66	66%	3.3	11.0	5.7	0.13
7.636RW	0.81	0.68	0.52	0.40	0.29	0.65	67%	3.3	10.0	5.2	0.13
7.632RW	0.76	0.66	0.52	0.41	0.29	0.61	69%	3.6	9.9	5.1	0.10
7.627RW	0.79	0.68	0.51	0.38	0.27	0.63	67%	3.4	10.5	5.4	0.11
7.609CL	0.73	0.63	0.48	0.36	0.26	0.58	67%	3.6	12.5	6.6	0.10
7.606CL	0.80	0.69	0.52	0.39	0.28	0.64	67%	3.3	10.1	5.2	0.11
7.604CL	0.79	0.67	0.51	0.38	0.27	0.63	66%	3.3	11.5	6.0	0.12
					Averages:						

Remarks: LW- LEFT WHEEL PATH
RW-RIGHT WHEEL PATH
CL- CENTER LINE

Air Temp	5 Day High-Low Temperature #1	#2	#3	#4	#5
High	83	84	84	79	89
Low	49	55	59	65	60
Average					71

	Degrees Celsius		Degrees Fahrenheit
Pavement Surface			88
5 Day Mean + Surface Temp.			159
Corrected Temperature			78
Correction Factor			0.80

Note: Problem area is highlighted in grey

Table H-2
Core Log Report: LA 422, 5-11-2005, SP 819-02-0012

Direction	Control-Section/ Log-Mile (CSLM) (mi.)	Asphaltic Concrete Modulus (E_{AC}) (ksi)	Soil Cement Modulus (E_{SC}) (ksi)	Subgrade Modulus ($E_{subg.}$) (ksi)	Corrected Subgrade Modulus ($E_{corr.}$) (ksi)	Structural Number (SN) (-)	Description
westbound	7.690	3268.1	160.2	14.5	6.0	3.2	CORE LOCATION CRACK AREA INSIDE WHEEL PATH
westbound	7.686	1931.4	135.6	6.4	0.0	3.2	CORE LOCATION CRACK AREA INSIDE WHEEL PATH
westbound	7.685	477.3	10.9	12.0	3.7	3.2	CORE LOCATION CRACK AREA OUTSIDE WHEEL PATH
westbound	7.682	3413.0	19.8	13.8	5.4	3.6	CORE LOCATION CRACK AREA OUTSIDE WHEEL PATH
westbound	7.670	858.9	29.8	15.9	7.2	1.0	CRACK AREA OUTSIDE WHEEL PATH
westbound	7.655	2820.8	138.5	28.3	18.4	3.7	GRIND AREA OUTSIDE WHEEL PATH
westbound	7.644	3470.7	390.0	17.6	8.8	4.1	GOOD AREA OUTSIDE WHEEL PATH
westbound	7.642	3706.8	206.4	15.8	7.1	3.4	GOOD AREA OUTSIDE WHEEL PATH
westbound	7.639	2428.0	117.6	14.1	5.7	3.3	GOOD AREA OUTSIDE WHEEL PATH
westbound	7.636	2934.4	312.3	13.7	5.3	3.3	GOOD AREA OUTSIDE WHEEL PATH
westbound	7.633	2962.3	346.3	12.8	4.5	3.6	GOOD AREA OUTSIDE WHEEL PATH
westbound	7.609	3251.9	357.6	15.6	7.0	3.6	GOOD AREA CENTER OF LANE
westbound	7.606	2264.3	289.8	13.7	5.3	3.3	GOOD AREA CENTER OF LANE
westbound	7.604	4335.5	213.5	14.1	5.7	3.3	GOOD AREA CENTER OF LANE
eastbound	6.034	4769.4	110.2	15.9	7.3	3.5	CORE LOCATION TESTING ON CRACK
eastbound	6.037	6288.2	60.7	18.9	9.9	3.4	TESTING IN CRACKED AREA
eastbound	6.039	2464.9	170.7	19.8	10.8	3.4	TESTING IN CRACKED AREA
eastbound	6.042	1352.7	69.1	15.8	7.1	3.4	CORE LOCATION TESTING IN CRACKED AREA
eastbound	6.058	8636.9	93.3	35.0	24.5	3.9	GOOD AREA
eastbound	6.060	1345.9	381.4	37.6	26.8	4.2	GOOD AREA
eastbound	6.064	2562.8	520.8	47.8	36.0	4.6	GOOD AREA
eastbound	6.066	5408.2	588.4	46.2	34.6	4.8	GOOD AREA
WESTBOUND AVERAGES:		2723.1	194.9	14.9	6.4	3.3	
EASTBOUND AVERAGES:		4103.6	249.3	29.6	19.6	3.9	
TYPICAL VALUES:		450 ksi (TRB)	200 ksi (TRB)	15 ksi (TRB)	11.3 ksi (parish)	2.54 (Dynaflect)	

Note: Problem area highlighted in grey

Cross-Sectional Characteristics: LA 422, 5-11-2005, SP 819-02-0012

Log Mile	Pavement			Base		Sub-Base	
Roadway	Type	Depth (in)	Width (ft)	Type	Depth (in)	Type	Depth (in)
5.0 @ CL	HMAC	1.75	19.67	Gravel Sandy Loam	7.25	Silty Clay	15
5.2 @ 5.25 RT CL	HMAC	2	19.83	Gravel Sandy Clay Loam	5	Silty Clay	17
5.4 @ 4.83 LT CL	HMAC	2	20.00	Gravel Sandy Loam	8	Sandy Clay Loam	14
5.8 @ 5.00 RT CL	HMAC	2.5	19.00	Gravel Sandy Clay Loam	9.5	Gravel Sandy Clay Loam	12
6.0 @ 4.67 LT CL	HMAC	2	18.58	Gravel Sandy Loam	12	Silty Clay Loam	10
7.6 @ 6.33 RT CL	HMAC	2	18.75	Gravel Sandy Clay Loam	8	Gravel Light Silty Clay	14
7.8 @ 5.25 LT CL	HMAC	2	19.50	Gravel Sandy Loam	7	Silty Loam	15

APPENDIX I

Memorandum: Thermoplastic Pavement Marking Material Comparison

MEMORANDUM

TO: MR. WILLIAM H. TEMPLE, P.E.
DOTD CHIEF ENGINEER

FROM: RICK HOLM
SYSTEMS CONSTRUCTION ENGINEER

DATE: AUGUST 15, 2001

SUBJECT: THERMOPLASTIC PAVEMENT MARKING MATERIAL COMPARISON

This memo presents a summary of the results of DOTD's Striping Committee's efforts to improve thermoplastic pavement markings.

Introduction

There has long been a problem with thermoplastic pavement markings losing all or most of its retroreflectivity within two years after installation. This rapid loss of retroreflectivity has resulted in a tremendous increase in liability for the Department, along with numerous complaints from the travelling public, state officials, and DOTD maintenance and construction personnel. Additionally, maintenance crews must prematurely restripe a roadway once a year that would otherwise needs no maintenance. The additional cost associated with each restripe typically averages $400.00/mile/year.

In an effort to improve the overall quality of thermoplastic pavement markings, a Striping Committee was formed with representatives from construction, maintenance, and industry. DOTD members include Mr. Rick Holm, Mr. Henry Lacinak, Mr. Bill Oliver, Mr. Jay McCain, and Mr. Kevin McKinney. Mr. Eddie Baxley of Stars and Stripes and Mr. Larry Martin of Gulf Industries, Inc. are the industry representatives. Both thermoplastic suppliers and bead manufactures were solicited for comments and recommendations.

Evaluation Procedure

Minimum retroreflective standards for new pavement markings have recently been established by ASTM and are 250 mcd/lux/m^2 for white and 175mcd/lux/m^2 for yellow. No minimum standards have been established for existing pavement markings. As a general rule, it is believed that any pavement marking having a retroreflective value of less than 150 mcd/lux/m^2 should be scheduled for replacement in the near future, and any pavement marking having a retroreflective value of less than 100mcd/lux/m^2 should be replaced immediately.

Retroreflective readings were taken using either the Mirolux 30 or Retrolux 1500 retroreflectometer. Both instruments use the industry standard 30-meter geometry. There was no standard for collecting data and all data was collected using the industry rule of thumb, 3 locations/mile. Recently, ASTM adopted a standard for gathering data, but the standard is very cumbersome and labor intensive.

The following pavement marking applications were evaluated:

Standard Thermoplastic and Beads

This application is DOTD's standard specification for pavement markings.

Standard Thermoplastic with 40% Intermix beads and 80% Round bead top coat

The Committee developed the specification used for this pavement marking application. The standard specification was modified to increase the percent of intermix beads from a range of 30-40 percent to a minimum of 40 percent, and the minimum percent rounds was changed from 70 to 80.

Standard Thermoplastic with 48% intermix beads and AASHTO modified bead topcoat

Bead manufacturer, Cataphote, Inc., recommended the specification for this application. The standard specification was modified to increase the percent of intermix beads from a range of 30-40 percent to a minimum of 48 percent, and the size of the topcoat beads was increased.

Standard Thermoplastic with Double Application of Large Beads (Visibead)

The standard thermoplastic specification was used with a larger size intermix and top coat bead. This product was chosen for two reasons. First, the beads are coated with an adhesion coating, which, according to the manufacturer, helps the glass beads bond better in thermoplastic material. Second, the beads are larger than normal and help provide wet night retroreflectivity to motorist.

Inverted Profile

The inverted profile stripe is a manufacturing process that enhances retroreflectivity by using a special rotatable wheel line profiling device that creates vertical faces within the thermoplastic pavement markings. This product was developed to increase wet-night reflectivity. The manufacturing process to create the inverted profile is patented and one supplier is licensed to sell this product in Louisiana. The specification requires a 4-year in place warranty by the contractor, which requires replacement if the retroreflectivity does not exceed 100 mcd/lux/m^2 after four years.

The Striping Committee has monitored five different test sections located on interstate and non-interstate routes as follows:

Product	Location	Roadway	Monitoring Period
Standard Thermoplastic and Beads	**LA 40 St. Tamany Parish**	**24 feet 2-lane**	**2 years**
Standard Thermoplastic with 40% intermix beads and 80% Round bead top coat	**LA 442 Livingston Parish**	**24 feet 2-lane**	**2 years**
Standard Thermoplastic with 48% intermix beads and AASHTO modified bead topcoat	**LA 442 Livingston Parish**	**24 feet 2-lane**	**2 years**
Standard Thermoplastic with Double Application of Large Beads (Visibead)	**I-12, O'Neal Ln. – Walker Livingston Parish**	**4-lane interstate**	**1 year**
Inverted Profile (4/98 Specification) with test coating on beads	**I-10, Atchafalaya Spillway St. Martin Parish**	**4-lane interstate**	**4+ years**
Inverted Profile (4/98 Specification)	**I-55 Tangipahoa Parish**	**4-lane interstate**	**3 years**

Quality Control

The degree of quality control varied between projects. The installation of Standard Thermoplastic and Beads on LA 40 was by contract. The degree of quality control exercised by the contractor in the installation of the material is not known. The material was installed one day prior to the collection of the retroreflective values.

The manufacturers were aware of the monitoring of the pavement markings for performance on LA 442, I-12, I-10, and I-55. The pavement markings were installed with representatives of the material manufacturer present, along with numerous personnel from DOTD and the contractor. A high degree of quality control was exhibited during the installations at these sites. Initial retroreflectivity readings were collected within the recommended ASTM timeframe.

Results

The attached graphs show the results of the field evaluations.

Life Cycle Cost

The initial cost for standard specification thermoplastic and beads typically averages $2000.00/ mile for a 4" solid line. After 2-years, the material had fallen below the rule of thumb of acceptable reflectivity and required restriping. When compared to the 4-year warranty of the inverted profile (GulfLine) stripe, the life cycle cost of our current stripe is $700.00/mile/year (($2000.00 + $400.00 + $400.00)/4). This does not take into consideration the additional exposure of maintenance personnel and the inconvenience to the motoring public, especially on the interstate system.

As the field evaluation of standard thermoplastic and the double application of large beads (Visibead) are not complete, an accurate life cycle cost cannot be determined. This stripe costs an additional $330.00/mile more than the standard specification thermoplastic and beads.

Inverted profile (GulfLine) has a high initial cost of $5000.00/mile resulting in a life cycle cost of $1250.00/mile/year for the 4-year warranty period. In the case of the I-10 location, which is almost 5 years old, the life cycle cost drops to $1000.00/mile/year.

Conclusions

The performance of the Standard Thermoplastic and Beads installed on LA 40 was unsatisfactory within a year of installation. The primary reason for this poor performance was bead retention. The overall condition of the lines is good and restriping has been recommended. It should be noted that this specification is used on all DOTD projects.

The two separate blends of thermoplastic and beads installed on LA 442 were performing well after the first year of installation. However, between 12 and 24 months, the centerline markings for both products were well below the replacement value of 100 mcd/lux/m^2. The primary reason for this poor performance was bead retention, yet the overall condition of the lines was very good.

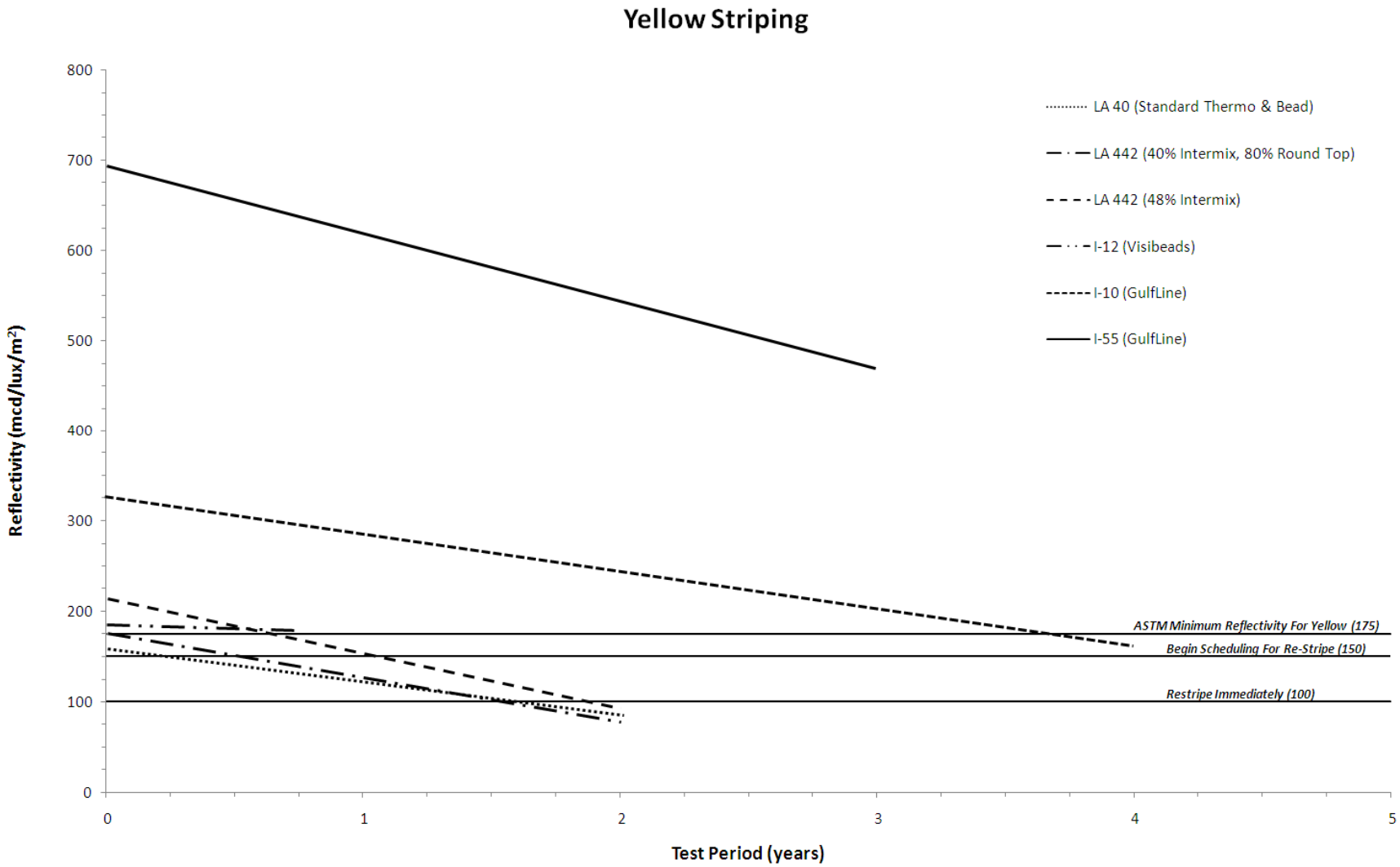
The I-10 & I-55 inverted profile pavement marking (GulfLine) locations have, by far, outperformed the standard thermoplastic, and the Committee recommended thermoplastic/bead blends. After 4 years and 8 months of service, the I-10 location continues to provide bright lines, wet night visibility, and retroreflectivity values above the recommended replacement values. Although the manufacturer warrants this material for 4 years, it is not unreasonable to believe that a life expectancy of 5 years or more can be expected, especially on high-speed free rolling routes such as the interstate system.

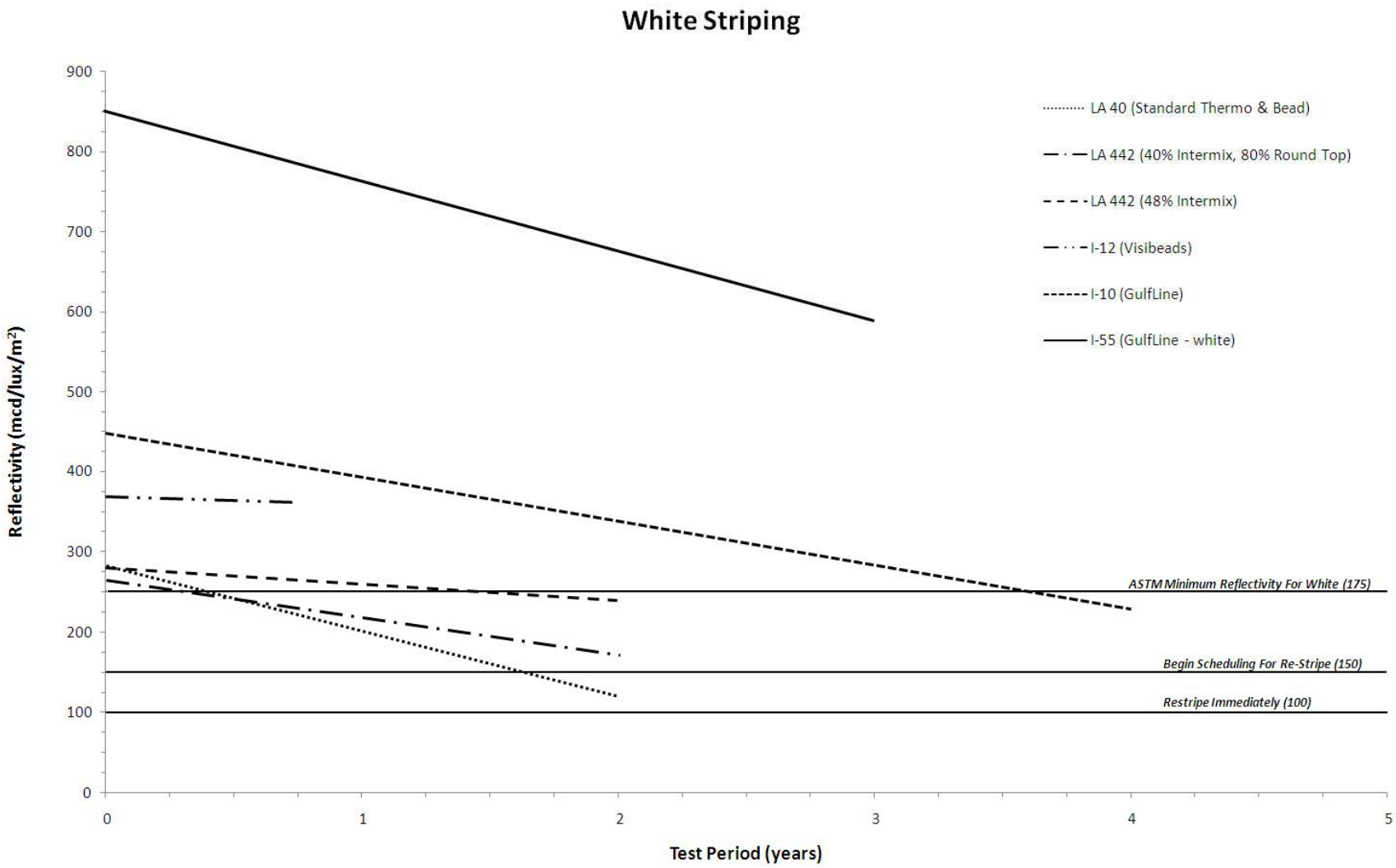
After one year of monitoring, the Standard Thermoplastic with the double application of large beads (Visibead) has shown a negligible rate of decline in loss of reflectivity. This rate of degradation is superior to all the products tested. Based on this rate of decline, this product shows the promise of providing acceptable retroreflective values and wet night retroreflectivity throughout the life of the pavement markings. Monitoring of the material will continue throughout its life cycle.

Recommendations

The Committee recommends the Department install inverted profile on all interstate and major 4-lane routes that have little or no ambient lighting. It is felt that with the wet night characteristics of this material combined with the 4-year warranty, the Department will obtain a very cost-effective pavement marking system. This implementation should include interstate maintenance striping projects administered through Traffic Services. Due to the high initial cost of inverted profile (GulfLine), it is not recommended to install this material on all state routes. This would not be feasible, nor is it believed to be practical.

Standard thermoplastic and the double application of large beads (Visibead) should immediately replace our current thermoplastic pavement markings on all remaining projects. Although we have only 1-year data, initial placement readings and the negligible rate of retroreflectivity decline are superior to our current standard markings. This stripe offers a greater degree of wet night reflectivity over our current thermoplastic markings, which has virtually no wet reflectivity. The cost of this change is minimal. According to the large bead (Visibead) representative, this system is currently being used by other states with success.


Yellow Striping
Reflectivity (mcd/lux/m²)
800
700
600
500
400
300
200
100
0
0
1
2
3
4
5
Test Period (years)
LA 40 (Standard Thermo & Bead)
LA 442 (40% Intermix, 80% Round Top)
LA 442 (48% Intermix)
I-12 (Visibeads)
I-10 (GulfLine)
I-55 (GulfLine)
ASTM Minimum Reflectivity For Yellow (175)
Begin Scheduling For Re-Stripe (150)
Restripe Immediately (100)


White Striping
Reflectivity (mcd/lux/m²)
900
800
700
600
500
400
300
200
100
0
0
1
2
3
4
5
Test Period (years)
LA 40 (Standard Thermo & Bead)
LA 442 (40% Intermix, 80% Round Top)
LA 442 (48% Intermix)
I-12 (Visibeads)
I-10 (GulfLine)
I-55 (GulfLine - white)
ASTM Minimum Reflectivity For White (175)
Begin Scheduling For Re-Stripe (150)
Restripe Immediately (100)