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Research Report
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LONG-TERM MONITORING OF EXPERIMENTAL FEATURES, SUBTASK 2
Alexandria-Ashland Highway (KY 9) Pavement Performance Monitoring

by

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16. Abstract

Construction on the AA Highway began in late 1985 and was completed in late 1990. Prior to construction, 30 different test sections had been designed into the highway for evaluation. The test sections contain 23 different characteristic qualities and different segment lengths. The segment lengths range from 1.28 to 9.13 miles and took one and a half to four years to complete each segment.

The sections were constructed from various pavement and shoulder designs. The designs are varied by parameters such as the type of subgrade stabilization, drainage type, surface class, surface aggregate, and more. The purpose for monitoring the performance of the AA Highway is to compare the different design types to determine the most feasible, long-lasting design available. There are several factors that impact the long term performance of the pavement. These include the volume of traffic, the classification of traffic, ESAL (equivalent single axle load), and environmental factors. Therefore, the performance of the pavement can not be entirely dependent on the design.

The pavement performance was monitored periodically since construction through 1999. Falling weight deflectometer (FWD) measurements were made, distress surveys were conducted, and rideability data was collected from the Pavement Management Branch of the Division of Operations.

Cracking of all types was the most prevalent form of distress in all the sections. Raveling was the second most prominent distress. Much of these distresses were associated with crushed gravel surfaces. There was less cracking and raveling on sections that were paved with crushed limestone surface mixtures.

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EXECUTIVE SUMMARY

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The sections were constructed from various pavement and shoulder designs. The designs are varied by parameters such as the type of subgrade stabilization, drainage type, surface class, surface aggregate, and more. The purpose for monitoring the performance of the AA Highway is to compare the different design types to determine the most feasible, long-lasting design available. There are several factors that impact the long term performance of the pavement. These include the volume of traffic, the classification of traffic, ESAL (equivalent single axle load), and environmental factors. Therefore, the performance of the pavement can not be entirely dependent on the design.

The pavement performance was monitored periodically since construction through 1999. Falling weight deflectometer (FWD) measurements were made, distress surveys were conducted, and rideability data was collected from the Pavement Management Branch of the Division of Operations.

Cracking of all types was the most prevalent form of distress in all the sections. Raveling was the second most prominent distress. Much of these distresses were associated with crushed gravel surfaces. There was less cracking and raveling on sections that were paved with crushed limestone surface mixtures.

From all of the information gathered in this performance study, it appears that the most significant factor in the performance of all the sections, as measured by rideability, was the performance characteristics of the asphalt surface course. Although the strength characteristics of the deeper pavement layers are undoubtedly important, in this study, their role did not appear to be as important as the surface course (again, this is from the viewpoint of rideability). This conclusion probably holds true because all of the sections were of sufficient design thickness to carry the accumulated ESALs to date, and what appeared to be fatigue cracks in some of the surface courses were probably related to only fatigue in the surface course itself and may not have gone deeper. This should be investigated further by trenching the pavement in one or two locations.

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1.0 INTRODUCTION AND BACKGROUND

Construction of the AA Highway began in late 1985 and was completed in late 1990. Prior to construction, 30 different test sections had been designed into the highway for evaluation. The test sections contain 23 different characteristic qualities and different segment lengths. The segment lengths range from 1.28 to 9.13 miles and took one and a half to four years to complete each segment. A map showing the location of the AA Highway is in Appendix A.

The sections were constructed from various pavement and shoulder designs. The designs are varied by parameters such as the type of subgrade stabilization, drainage type, surface class, surface aggregate, and more. The purpose for monitoring the performance of the AA Highway is to compare the different design types to determine the most feasible, long-lasting design available. There are several factors that impact the long term performance of the pavement. These include the volume of traffic, the classification of traffic, ESAL (equivalent single axle load), and environmental factors. Therefore, the performance of the pavement can not be entirely dependent on the design. However, the design parameters will be the main focus of this report.

2.0 CONSTRUCTION

2.1 Different Design Sections

The sections were designed with different pavement and shoulder characteristics. These design differences included: 1) Several types of subgrade stabilization including cement, lime, and rock stabilization; 2) Different types of subsurface drainage including pipe edge drains, panel drains, drainage blankets with pipe collection systems, and daylighted drainage blankets; 3) Different base materials, including stabilized aggregate, DGA, and crushed stone; and 4) Different bituminous base and surface classes, mixtures, and materials. These characteristics are detailed in Tables 1 - 3. The sections with similar design characteristics were grouped together when reviewing certain aspects of the project such as rutting values and rideability indices. This allowed a comparison to be made between similarly designed sections. Design information on all sections is listed in Appendix B.

Table No. 1. Design Section Location and Contractor Information.

				Contractor	
Section	County	Mile Point	Route Number	G & D	Surf.
C1	Campbell	17.5 - 15	KY 9	Elmo Greer	Elmo Greer
C2	Campbell	14.9 - 13.4	KY 9	Elmo Greer	Eaton
C3	Campbell	13.3 - 10.6	KY 9	Addington	Eaton
B1 & B2	Campbell	10.5 - 8.5	KY 9	Addington	Mago
B3 & B4	Campbell	8.4 - 6.2	KY 9	S & H	Mago
6A	Campbell	6.1 - 5.3	KY 9	Holloway	Mago
6	Campbell	5.2 - 2.1	KY 9	Elmo Greer	Mago
7	Campbell / Pendleton	2.0 - 0 / 4.3 - 2.2	KY 9	Holloway	Elmo Greer
8	Pendleton	2.1 - 0	KY 9	Hall	Elmo Greer
9 & 10	Bracken	19.8 - 12.9	KY 9	Holloway (9), M. Greer (10)	Eaton
11	Bracken	12.8 - 9.6	KY 9	Miller	Lex. Quarry
12	Bracken	9.5 - 5.6	KY 9	R C Durr	Lex. Quarry
13 & 14	Bracken / Mason	5.5 - 0 / 19.5 - 16.0	KY 9	Miller	Mays
15 & 16	Mason	11.8 - 3.8	KY 9	R C Durr	Lex. Quarry
17 & 18	Mason / Lewis	3.7 - 0 / 31.2 - 28.5	KY 9	S & H	Carry-Mays
19	Lewis	28.4 - 25.0	KY 9	Mays-Judy	Mays-Judy
20	Lewis	24.9 - 21.0	KY 9	Elmo Greer	Elmo Greer
21A	Lewis	15.0 - 11.6	KY 9	Elmo Greer	Elmo Greer
21B & 22	Lewis	11.5 - 8.5	KY 9	Elmo Greer	Elmo Greer
23	Lewis	8.4 - 8.0, 6.8 - 8.3	KY 9, KY 10	Bazzack	Lex. Quarry
24	Lewis	8.4 - 11.2	KY 10	Elmo Greer	Easy Rider
25	Lewis	11.2 - 13.5	KY 10	Holloway	Holloway

Table No. 2. Design Section Construction Information for Mainline.

			Pavement as Built																								
			Subgrade				Stabilization			Drainage Blanket		Filter Fabric	Base			Bituminous Base							Binder	Surface			
Section	County	Mile Point	Unclassified	12" Rock Roadbed	24" Rock Roadbed	12" Cement 10%	6" lime 5%	6" lime 6%	9" lime 4%	4" Asphalt Treated	4" Aggregate No. 57	Geotextile Type 3	4" Stabilized Aggregate	4" DGA	4" Crushed Stone	4 1/2" Class I	6" Class I	6 1/2" Class I	7" Class I	8" Class I	8 1/2" Class I	9" Class I	1 1/2" Class I	1" Class A	1 1/4" Class A	1" Class I	1" Class K
C1	Campbell	17.5 - 15	X				X			X											X		X				X
C2	Campbell	14.9 - 13.4	X				X			X		X									X		X		X		
C3	Campbell	13.3 - 10.6	X				X			X											X		X	X			
B1 & B2	Campbell	10.5 - 8.5	X				X			X											X		X				X
B3 & B4	Campbell	8.4 - 6.2	X				X			X											X		X				X
6A	Campbell	6.1 - 5.3	X						X	X											X		X				X
6	Campbell	5.2 - 2.1	X						X	X											X		X				X
7	Campbell Pendleton	2.0 - 0 4.3 - 2.2	X								X		X									X	X				X
8	Pendleton	2.1 - 0	X								X		X									X	X				X
9 & 10	Bracken	19.8 - 12.9	X							X			X							X			X	X			
11	Bracken	12.8 - 9.6	X							X			X						X				X	X			
12	Bracken	9.5 - 5.6																									
	1792 to 1844		X							X			X						X				X	X			
	1844 to 2000+50		X					X		X									X				X	X			
13 & 14	Bracken Mason	5.5 - 0 19.5 - 16.0	X											X						X			X				X
15 & 16	Mason	11.8 - 3.8	X											X						X			X				X
17 & 18	Mason Lewis	3.7 - 0 31.2 - 28.5	X					X						X						X			X				X
19	Lewis	28.4 - 25.0	X					X						X							X		X				X
20	Lewis	24.9 - 21.0			X									X				X					X				X
21A	Lewis	15.0 - 11.6				X				X						X							X				X
21B & 22	Lewis	11.5 - 8.5			X									X			X						X				X
23	Lewis	8.4 - 8.0, 6.8 - 8.3			X										X		X						X				X
24	Lewis	8.4 - 11.2		X										X			X						X			X	
25	Lewis	11.2 - 13.5			X									X			X						X				X
26	Lewis	13.5 - 15.0			X									X			X						X			X	

Table No. 3. Design Section Construction Information for Shoulder.

			Shoulder as Built																						
			Stabilization			Drainage Blanket				Filter Fabric	Base			Bituminous Base			Binder	Surface		DGA	Edge Drain				
Section	County	Mile Point	6" lime 5%	6" lime 6%	9" lime 4%	4" Asphalt Treated	Full Depth Aggregate No. 57	Varied Depth Asphalt Treated	Full Depth Including Wedge	Geotextile Type 3	4" Stabilized Aggregate	4" Earth Built Up	Full Depth DGA	2 1/2" Class I	3" Class I	3 1/2" Class I	1 1/2" Class I	1" Class I	1 1/4" Class A	Wedge	4" Perf. Pipe with Fabric	4" Perf. Pipe with Sock	4" Perf. Pipe with Fabric & Sock	Monsanto Drainage Mat	Daylighted
C1	Campbell	17.5 - 15	X			X								X			X	X		X			X		
C2	Campbell	14.9 - 13.4	X			X				X				X			X		X	X			X		
C3	Campbell	13.3 - 10.6	X			X								X			X	X		X			X		
B1 & B2	Campbell	10.5 - 8.5	X			X								X			X	X		X			X		
B3 & B4	Campbell	8.4 - 6.2	X			X								X			X	X		X			X		
6A	Campbell	6.1 - 5.3			X	X								X			X	X		X			X		
6	Campbell	5.2 - 2.1		X		X								X			X	X		X			X		
7	Campbell Pendleton	2.0 - 0 4.3 - 2.2					X				X				X		X	X				X			
8	Pendleton	2.1 - 0					X				X				X		X	X				X			
9 & 10	Bracken	19.8 - 12.9				X					X			X			X	X		X			X		
11	Bracken	12.8 - 9.6						X			X			X			X	X		X			X		
12	Bracken	9.5 - 5.6																							
	1792 to 1844							X				X		X			X	X		X			X		
	1844 to 2000+50			X				X						X			X	X		X			X		
13 & 14	Bracken Mason	5.5 - 0 19.5 - 16.0											X			X	X	X						X	
15 & 16	Mason	11.8 - 3.8											X			X	X	X			X				
17 & 18	Mason Lewis	3.7 - 0 31.2 - 28.5		X									X			X	X	X			X				
19	Lewis	28.4 - 25.0		X									X			X	X	X							
20	Lewis	24.9 - 21.0											X			X	X	X							
21A	Lewis	15.0 - 11.6							X							X	X	X							X
21B & 22	Lewis	11.5 - 8.5											X			X	X	X							
23	Lewis	8.4 - 8.0, 6.8 - 8.3											X			X	X	X							
24	Lewis	8.4 - 11.2											X			X	X	X							
25	Lewis	11.2 - 13.5											X			X	X	X							
26	Lewis	13.5 - 15.0											X			X	X	X							

2.2 Soil Stabilization and Subsurface Drainage

Two of the primary objectives of the test sections were to evaluate the benefits of soil stabilization either through chemical means by adding hydrated lime or rock stabilization and in addition, to evaluate the benefits of subsurface drainage systems including longitudinal edge drains and drainable bases.

2.2.1 Soil Stabilization

The subgrade in 10 of the 23 design sections was chemically stabilized with hydrated lime. The lime was added to a depth of six or nine inches with a four to six percent ratio. In-place California Bearing Ratio (CBR) tests were conducted on the stabilized soil and further down in the untreated (unstabilized) soil for comparison. CBR tests were conducted in three of the sections (C1, 6, and 19). Tests were conducted at two different locations in each section. In Section C1 (milepost 16.2) and Section 6 (milepost 3.95), no data were collected on the untreated subgrade due to rocks in the subgrade and mechanical problems with the drill rig, respectively. The field testing data are summarized in Table 4 and shown graphically in Figure 1. As shown in Table 4, the average CBR value of the untreated subgrade was 6.6 and the average CBR value after lime stabilization was 71.7. On average, the strength of the subgrade was increased by 76 percent (based on sites where both untreated and treated soils were tested).

Table 4. CBR for Untreated and Lime Treated Soils.

SECTION	COUNTY	MILEPOST	CBR UNTREATED	CBR TREATED	INCREASE AFTER STABILIZATION
C1	Campbell	16.6 NB	15.8	71.1	77%
C1	Campbell	16.2 NB	Rock Encountered	45.7	---
6	Campbell	3.95 NB	Drill Rig Broke	>125	----
6	Campbell	2.9 SB	5.4	8.3	35%
19	Lewis	28.3 NB	3.3	55.6	94%
19	Lewis	26.0 NB	2.3	125	98%
Average strength before and after stabilization			6.6	71.7	
Average increase in subgrade strength after stabilization					76%

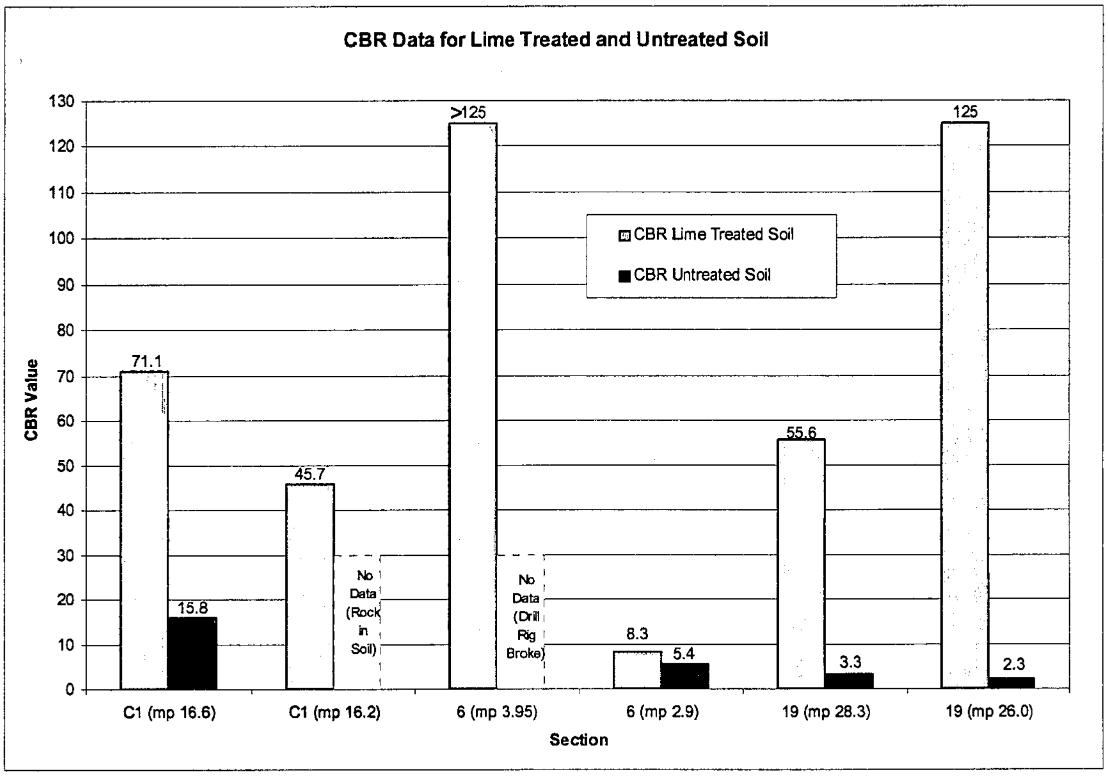

Figure 1. Unstabilized versus Stabilized Soil.

2.2.2 Subsurface Pavement Drainage

Subsurface pavement drainage was incorporated into 22 of the 30 design test sections. Drainage blankets were placed on 16 sections. Fifteen of the drainage blanket sections had pipe edge drain collector systems and one section was daylighted. Six of the test sections had no drainage blanket but did have pavement edge drains. Four of the six edge drain sections were constructed with 4-inch perforated pipe and the other two sections contained Monsanto Panel Drains. The outlet pipes for all the drained sections, excluding the daylighted section, were constructed with single wall corrugated flexible polyethylene pipe. The headwalls were precast concrete headwalls.

2.2.2.1 Edge Drain Headwall Inspection

In July 1999, the edge drain headwalls were visually inspected in order to evaluate the overall effectiveness of the drainage systems. A select number of headwalls were inspected in the 22 different pipe-drained sections. A total of 64 headwalls were inspected. Of the 64 inspected, 76 percent of the headwalls were clean, 13 percent were partially covered, 6 percent were entirely covered, and 5 percent were plugged (Figure 2). Headwalls placed in shallow ditchlines appeared to have the most debris in them (Figures 3 and 4). The foundation of a headwall in Section 19 had been severely eroded (Figure 5).

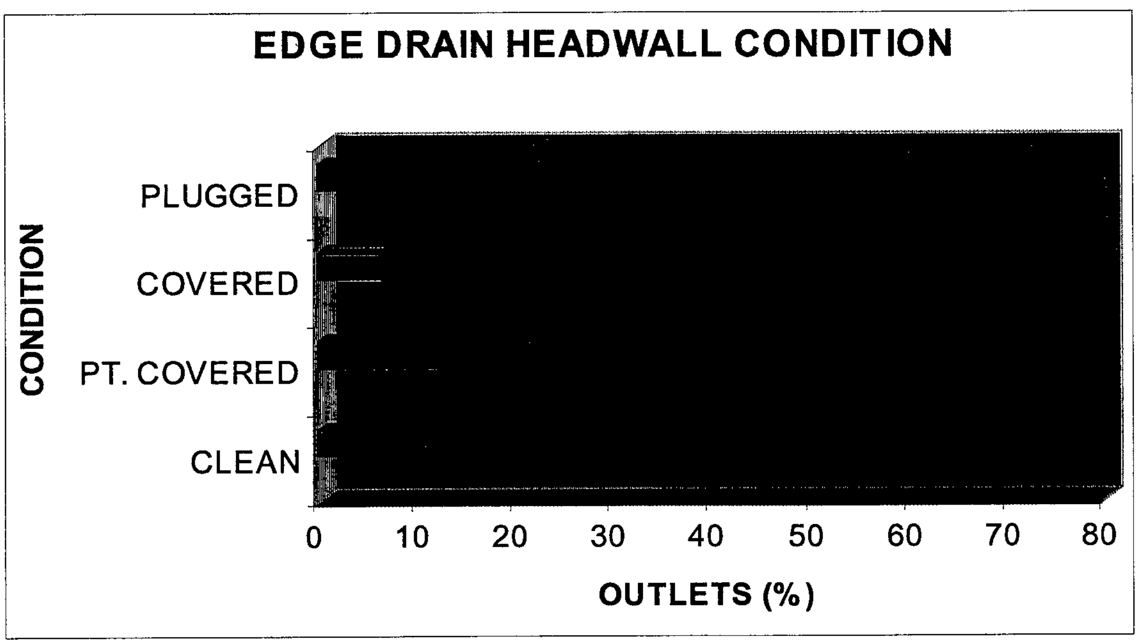

Figure 2. Edge Drain Headwall Conditions.

Figure 3. Headwall Set too Low in Ditchline (Section C3).

Figure 4. Headwall Completely Plugged and too Low in the Ditchline (Section 6).

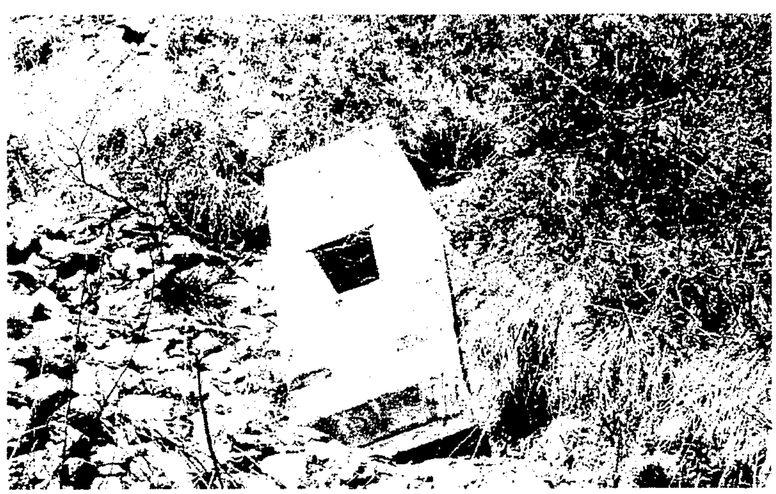

Figure 5. Erosion under Headwall (Section 19).

2.2.2.2 Edge Drain Outlet Pipe Inspection

A total of 64 outlet pipes were inspected with a Cues pipeline inspection camera. The outlet pipe was broken down into five different sections for analysis (Figure 6). These sections are described as follows:

A = Pigtail "stub" precast into the headwall
B = Connector
C = Pipe going through the aggregate shoulder and paved shoulder.
D = Connector from outlet to mainline
E = Mainline perforated pipe

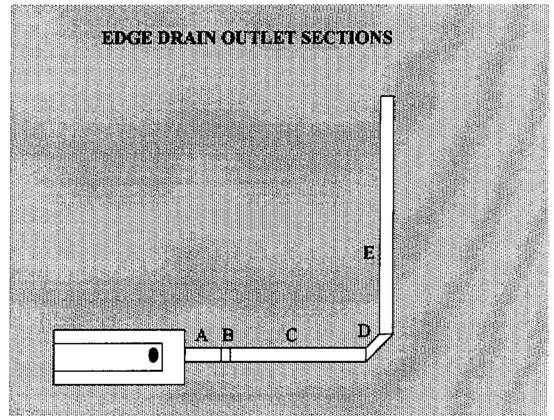

Figure 6. Edge Drain Outlet Sections.

Of the 64 outlet pipes that were inspected, approximately 90 percent of the outlets were significantly damaged. Figure 7 indicates the frequency of damage occurring in each of the outlet pipe sections and shows that the outlet pipe was damaged most often at Section C. Damage to Section C is not typical to previous inspections of edge drains. Generally, Section A and B have higher rates of failure than Section C.

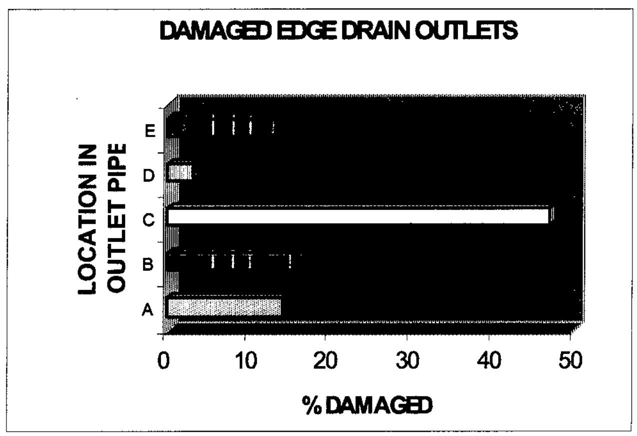

Figure 7. Damaged Outlet Pipe Sections.

In Figure 8, the average percent of open area in the damaged outlet pipe sections is shown graphically. Figure 8 also shows that the closer the damaged outlet pipe section was to the headwall the less percent open the pipe became because of a higher degree of damage to the pipe in this area. A contributing factor to this damage is that the outlet pipe tends to be buried with less cover as the pipe approaches the headwall from the mainline which results in less protection for the pipe.

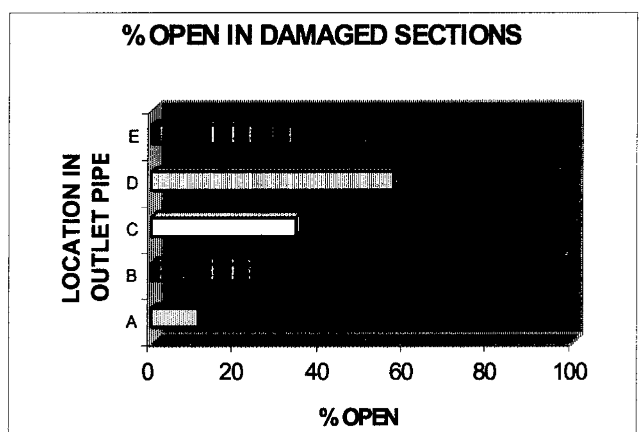

Figure 8. Average Open Area in Each Section.

2.2.2.3 Daylighted Drainage Blanket

Section 21A was the only section that contained a drainage blanket but no edge drains. This is referred to as a daylighted section. The daylighted section was inspected in August 1999. Vegetation had grown over the edges of the drainage blanket and onto the less permeable granular shoulder material (Figure 9 - 11). Several inspection trenches were excavated through the aggregate shoulder directly against the paved shoulder and down to the drainage blanket. The blanket appeared to be clean and open at the edge of the paved shoulder. The permeability of the blanket was evaluated at two locations. At both locations, water was discharged from a water tank through a 3/4-inch hose into the drainage blanket. The drainage blanket at each location readily accepted the water. The water was held constant for approximately 15 to 20 minutes at each location. No water was observed exiting the edges of the blanket. At one of the two locations, a dye tracer was added to the water and allowed to flow into the blanket for an additional 10 minutes. No signs of water exiting the edge of the blanket were observed. A small hole was excavated at the edge of the blanket which had been over grown with vegetation. The water was observed trapped at the edges of the blanket (Figure 12).

Figure 9. Edge of Drainage Blanket Covered with Vegetation.

Figure 10. Edge of Drainage Blanket Covered with Vegetation.

2.2.2.4 Discussion

It was apparent that neither the pipe collector system nor the daylighted system for the drainage blankets were functioning properly. It was also apparent that both systems must be properly constructed and properly maintained in order to be effective. Edge drain headwalls should be inspected after installation and maintenance should be conducted on the headwalls. Daylighted sections should also be maintained by preventing vegetation growth over the outer edges of the blanket.

Figure 11. Edge of Drainage Blanket Covered by Vegetation.

Figure 12. Water Trapped at Edge of Drainage Blanket by Vegetation.

3.0 PERFORMANCE

3.1 Visual Distress Survey

A visual distress survey of all the test sections was conducted in April 1999. Significant raveling, bleeding, and cracking (longitudinal, environmental, transverse, alligator, and fatigue) were observed in several of the sections. Some of the sections had numerous potholes, patches, or had already been rehabilitated. Distress information from each section is reduced in Table 5. Photos from each section are shown in Figures 13 - 45.

Table 5. Visual Inspection/Distress Information.

Section	Description	Visual Inspection								
		Cracks							Surface Defects	
		Longitudinal Cracks in Wheel Path	Longitudinal Cracks Between Wheel Paths	Transverse Cracks	Alligator Cracks	Environmental Cracks	Fatigue Cracks in Wheel Path	Fatigue Cracks Between Wheel Paths	Raveling	Bleeding
C1	Lime Stabilization (6", 5%) Drainage Blanket (4" asphalt treated) Edge Drain (4" perf. pipe w/ fab. & sock)	X		X						
C2	Lime Stabilization (6", 5%) Drainage Blanket (4" asphalt treated) Edge Drain (4" perf. pipe w/ fab. & sock) Filter Fabric (Geotextile Type 3)	X		X						
C3	Lime Stabilization (6", 5%) Drainage Blanket (4" asphalt treated) Edge Drain (4" perf. pipe w/ fab. & sock)	X	X	X	X				X	
B1 & B2	Lime Stabilization (6", 5%) Drainage Blanket (4" asphalt treated) Edge Drain (4" perf. pipe w/ fab. & sock)	X	X						X	
B3 & B4	Lime Stabilization (6", 5%) Drainage Blanket (4" asphalt treated) Edge Drain (4" perf. pipe w/ fab. & sock)	X	X							
6A	Lime Stabilization (9", 4%) Drainage Blanket (4" asphalt treated) Edge Drain (4" perf. pipe w/ fab. & sock)	X	X		X	X				
6	Lime Stabilization (9", 4%) Drainage Blanket (4" asphalt treated) Edge Drain (4" perf. pipe w/ fab. & sock)	X	X			X				
7	Drainage Blanket (4" agg. No. 57) Base (4" stabilized aggregate) Edge Drain (4" perf. pipe w/ sock)					X		X	X	
8	Drainage Blanket (4" agg. No. 57) Base (4" stabilized aggregate) Edge Drain (4" perf. pipe w/ sock)					X			X	
9 & 10	Drainage Blanket (4" asphalt treated) Base (4" stabilized aggregate) Edge Drain (4" perf. pipe w/ fab. & sock)	X	X		X	X			X	
11	Drainage Blanket (4" asphalt treated) Base (4" stabilized aggregate) Edge Drain (4" perf. pipe w/ fab. & sock)		X			X				
12	Lime Stabilization (6", 6%) Drainage Blanket (4" asphalt treated) Base (4" stabilized aggregate) Edge Drain (4" perf. pipe w/ fab. & sock)		X			X				
13 & 14	Base (4" DGA) Edge Drain (Monsanto Mat)		X	X		X				
15 & 16	Base (4" DGA) Edge Drain (4" perf. pipe w/ fab.)		X			X			X	
17 & 18	Lime Stabilization (6", 6%) Base (4" DGA) Edge Drain (4" perf. pipe w/ fab.)		X						X	X
19	Lime Stabilization (6", 6%) Base (4" DGA)						X		X	
20	Base (4" DGA) Rock Roadbed (24")						X		X	
21A	Drainage Blanket (4" asphalt treated) Cement Subgrade (12", 10%) Edge Drain (daylighted)					X	X	X		
21B & 22	Base (4" DGA) Rock Roadbed (24")					X			X	
23	Base (4" Crushed Stone) Rock Roadbed (24")						X	X		
24	Base (4" DGA) Rock Roadbed (12")							X		
25	Base (4" DGA) Rock Roadbed (24")					X		X	X	
26	Base (4" DGA) Rock Roadbed (24")						X			

3.1.1 Section C1

Longitudinal and transverse cracks were observed throughout the section.

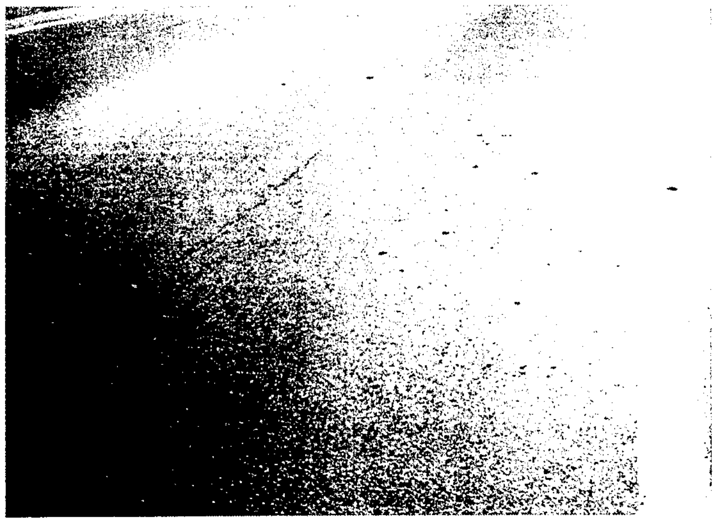

Figure 13. Section C1 (Longitudinal and Transverse Cracks).

3.1.2 Section C2

Longitudinal and transverse cracks were observed throughout the section.

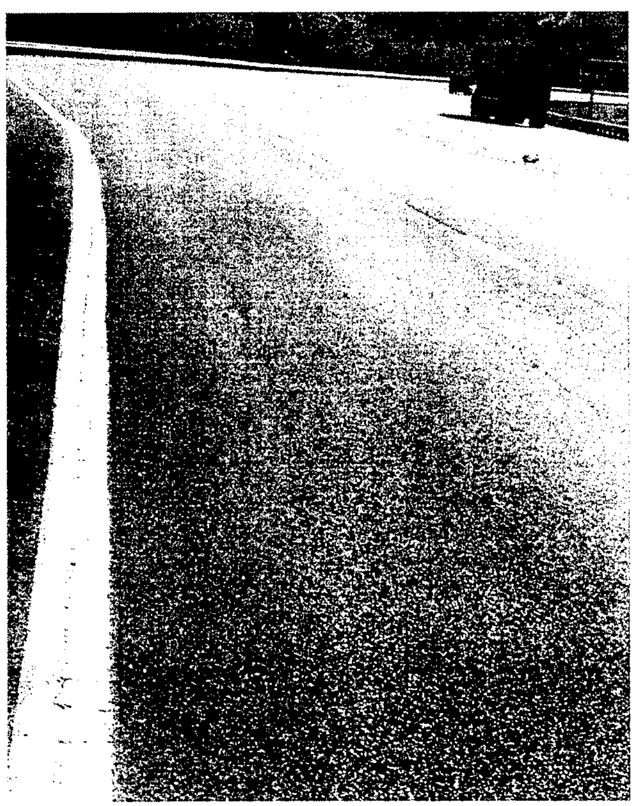

Figure 14. Section C2 (Transverse and Longitudinal Cracks).

3.1.3 Section C3

Longitudinal and transverse cracks were observed throughout the section. Fatigue failures, raveling, and alligator cracking were also observed.

Figure 15. Section C3 (Longitudinal Cracks, Transverse Cracks, Alligator Cracks, Fatigue Failures, and Raveling).

3.1.4 Sections B1 & B2

Longitudinal cracking was observed between the wheel paths, likely resulting from fatigue.

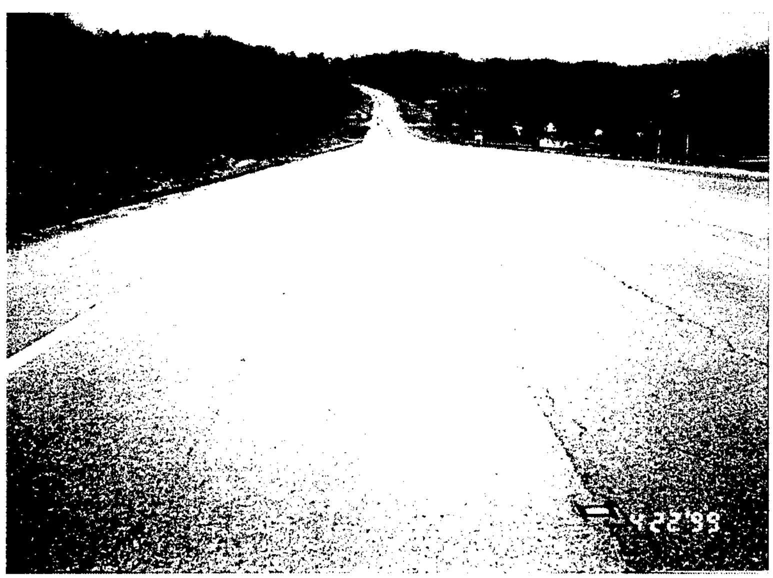

Figure 16. Sections B1 & B2 (Longitudinal Cracks, Fatigue Failures between Wheel Path).

3.1.5 Sections B3 & B4

Longitudinal cracking was observed in and between the wheel paths.

Figure 17. Sections B3 & B4 (Longitudinal Cracks at Center Line and in Wheel Paths).

3.1.6 Section 6A

Longitudinal cracking had occurred in the wheel path and between the wheel paths. Some alligator cracking, block cracking, and environmental cracking were also noted.

Figure 18. Section 6A (Longitudinal Cracks in and Between Wheel Paths, Some Alligator and Environmental Cracks).

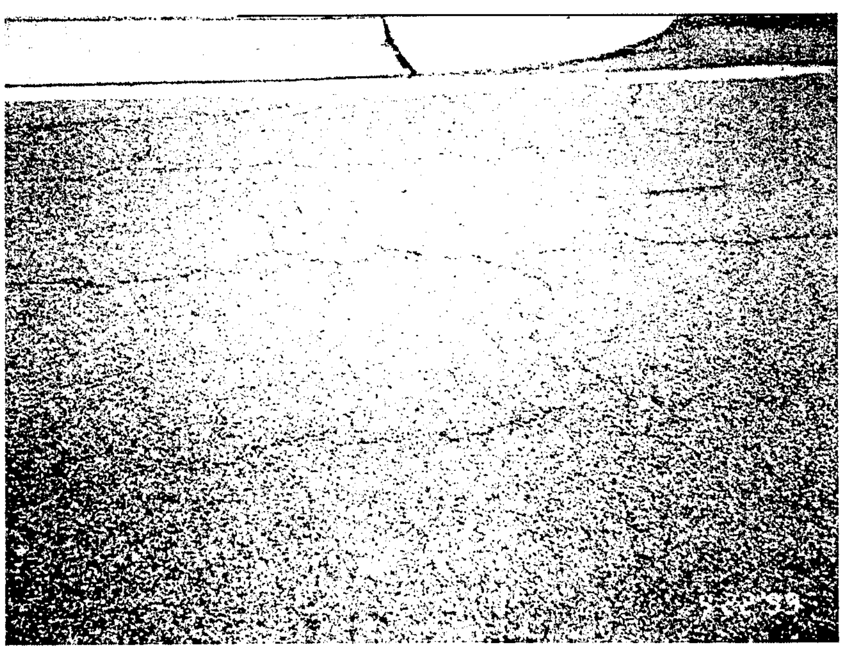

Figure 19. Section 6A (Block Cracking).

3.1.7 Section 6

Longitudinal cracking was noted in and between the wheel paths. Environmental cracking had occurred throughout the section. Water was observed at the centerline.

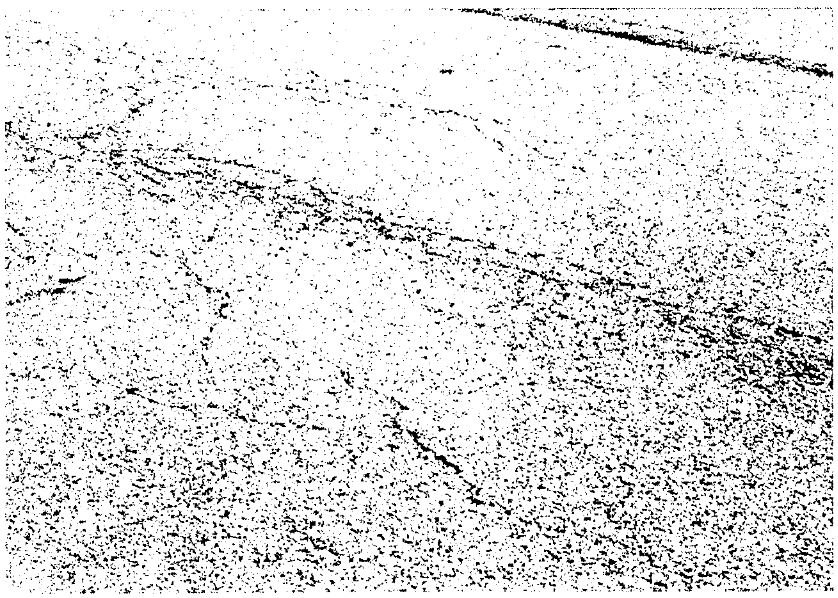

Figure 20. Section 6 (Longitudinal Cracks, Fatigue Cracks, Environmental Cracks Throughout, Water Observed at Centerline).

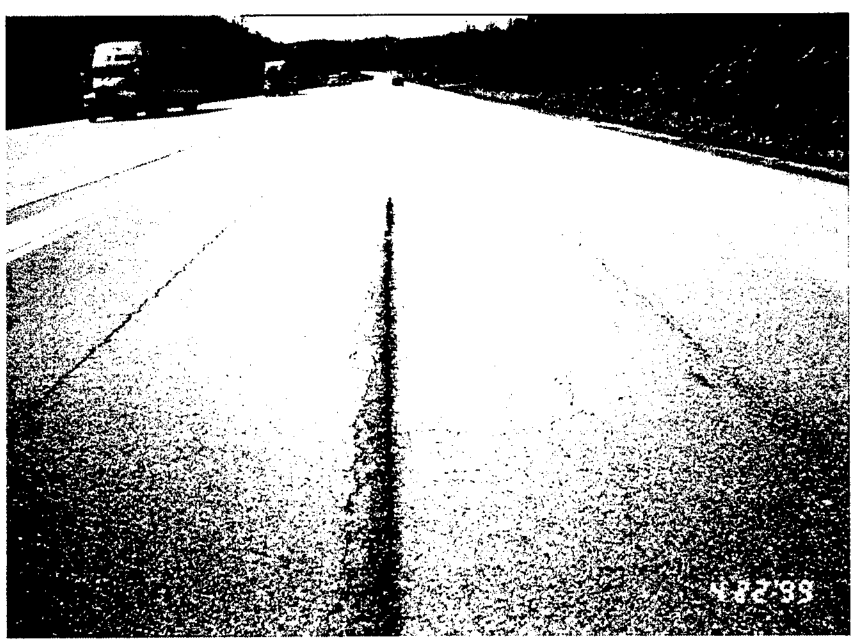

Figure 21. Section 6 (Longitudinal Cracks and Water at Centerline).

3.1.8 Section 7

Environmental cracking and raveling were observed throughout the section. The centerline joint was badly raveled. Significant aggregate loss was also observed. Only a slight amount of fatigue cracking had occurred.

Figure 22. Section 7 (Environmental Cracks Throughout, Center Joint Raveled).

Figure 23. Section 7 (Environmental Cracks).

3.1.9 Section 8

A considerable amount of environmental cracking was observed throughout the section. Raveling and aggregate loss were noted throughout the section. There was a considerable amount of raveling in the wheel path.

Figure 24. Section 8 (Environmental Cracks, Raveling).

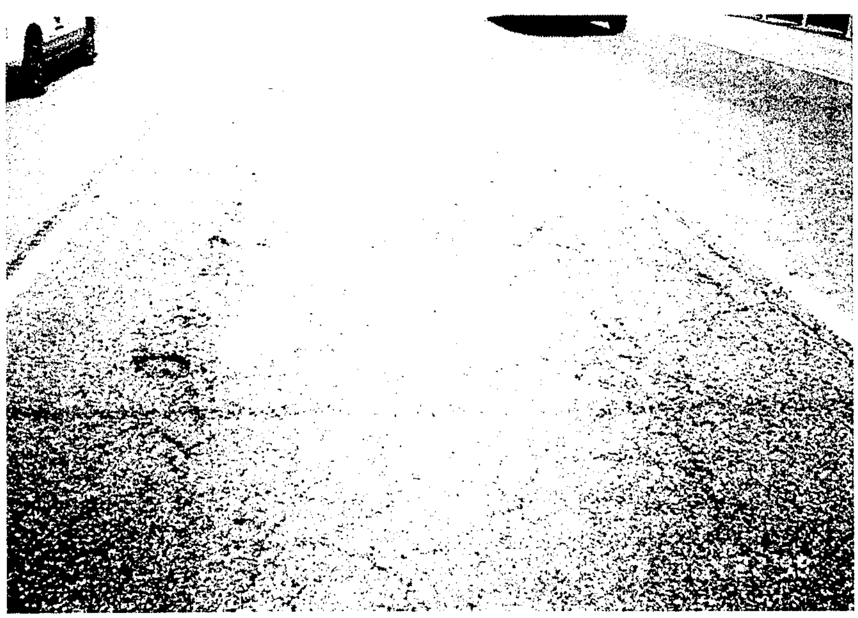

Figure 25. Section 8 (Raveling in Wheel Path).

3.1.10 Sections 9 & 10

Environmental cracks were noted throughout the section. Longitudinal cracking had occurred in and between the wheel path. These appear to be the result of fatigue. Raveling, aggregate loss, and alligator cracking were observed throughout. Water was observed at the centerline of a steep grade.

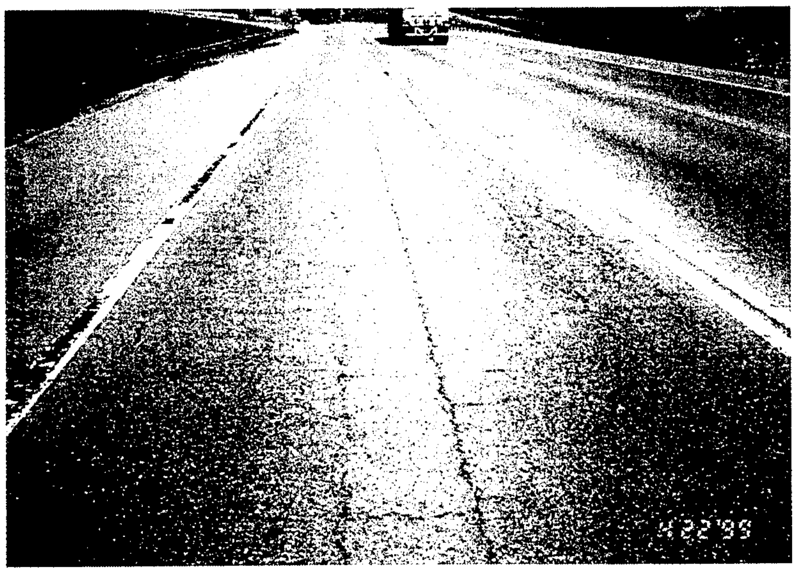

Figure 26. Sections 9 & 10 (Longitudinal Cracks, Environmental Cracks, Alligator Cracks in Wheel Path, Raveling).

Figure 27. Sections 9 & 10 (Longitudinal Cracks, Environmental Cracks, Alligator Cracks in Wheel Path, Raveling).

3.1.11 Section 11

Some environmental cracking was observed in the section. However, cracking was not as bad as previous sections. Longitudinal cracking was observed in some areas of the section. At milepost 11.2, the pavement had been milled.

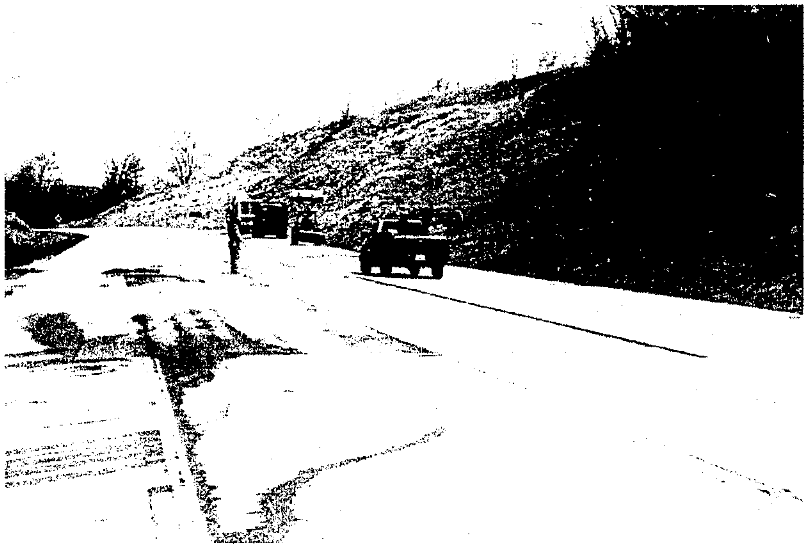

Figure 28. Section 11. Milled Area at Milepost 11.2 (Some Environmental and Longitudinal Cracks Between Wheel Paths).

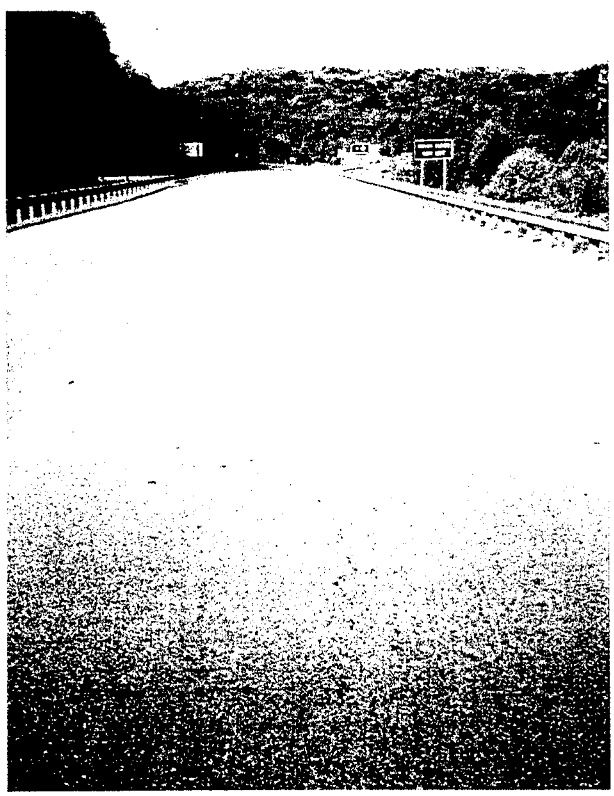

Figure 29. Section 11 (Longitudinal Cracking).

3.1.12 Section 12

Longitudinal cracking was observed in the wheel path and some at the centerline. Longitudinal cracks were not throughout the entire section, only in certain areas. Environmental cracking was noted in some areas.

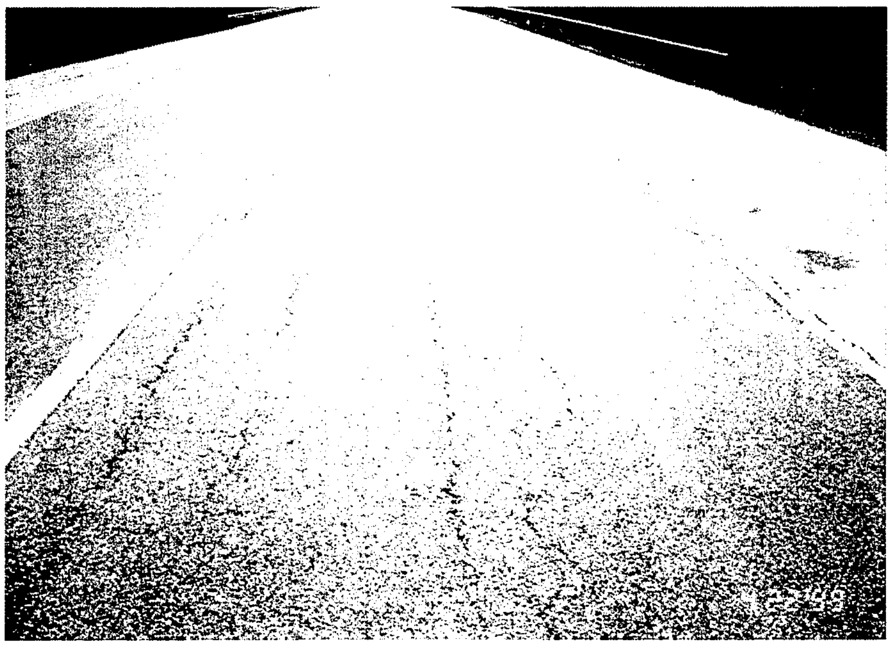

Figure 30. Section 12 (Longitudinal Cracks Between Wheel Paths and Some Environmental Cracks).

Figure 31. Section 12 (Longitudinal Crack at Center of Lane).

3.1.13 Sections 13 & 14

Sections 13 & 14 had failed during the initial construction. The new surface had some environmental cracking and limited longitudinal cracking. Transverse edge drain failures were noted in several areas in the sections.

Figure 32. Sections 13 & 14 (Transverse Edge Drain Failure).

Figure 33. Sections 13 & 14 (Some Longitudinal and Environmental Cracking).

3.1.14 Sections 15 & 16

A considerable amount of raveling had occurred in Sections 15 & 16. Longitudinal cracks were observed between the wheel paths. Some environmental cracking was noted in the sections. The area between Maysville and KY 11 had been overlaid in 1998.

Figure 34. Sections 15 & 16 (Significant Raveling, Longitudinal Cracking, Some Environmental Cracks).

3.1.15 Sections 17 & 18

The surface appeared to be in fairly good condition. Minor bleeding, longitudinal cracking (fatigue), and raveling were observed in some areas of the sections.

Figure 35. Sections 17 & 18 (Transverse Edge Drain).

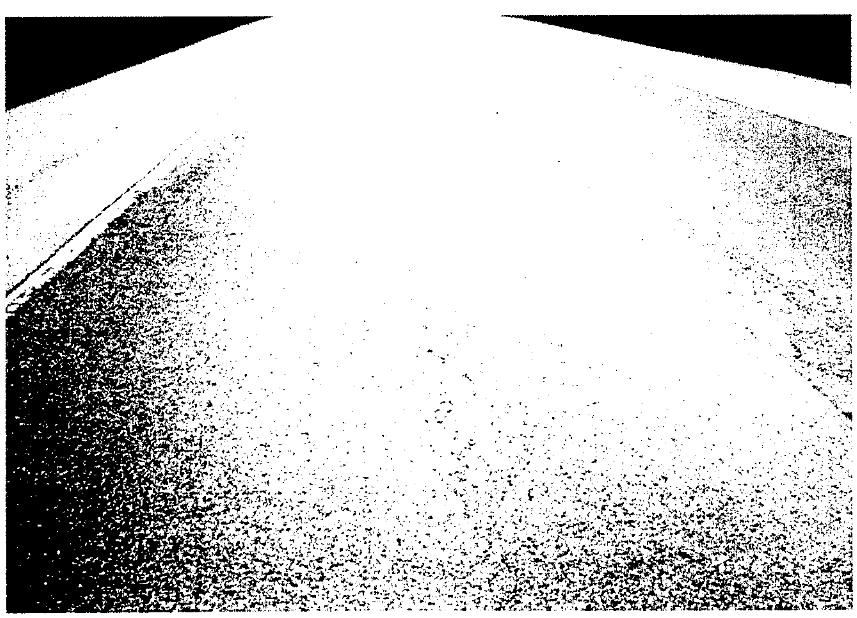

Figure 36. Sections 17 & 18 (Some Longitudinal Fatigue Cracks, Raveling, and Minor Bleeding).

3.1.16 Section 19

A considerable amount of fatigue cracking was observed in the wheel paths. Raveling was also observed in the wheel path. Several large patches were observed throughout the section.

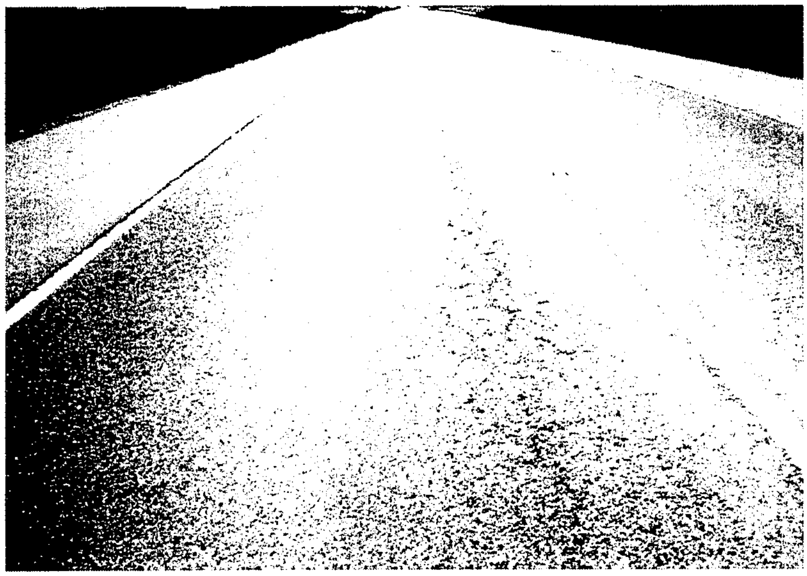

Figure 37. Section 19 (Considerable Fatigue Cracks, Raveling in Wheel Path, Several Patched Areas).

3.1.17 Section 20

Raveling and isolated cracks were observed in the wheel paths in several areas. Isolated base failures were also noted.

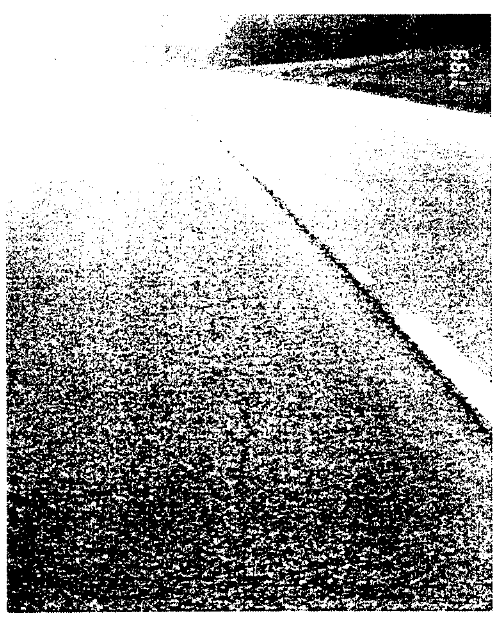

Figure 38. Section 20 (Raveling and Longitudinal Cracking).

3.1.18 Section 21A

Isolated fatigue cracking in and between the wheel paths was observed in parts of the section. Environmental damage was limited. The section had a limestone surface.

Figure 39. Section 21A (Edge of Drainage Blanket).

Figure 40. Section 21A (Some Isolated Fatigue Cracks in and Between Wheel Paths, Little Environmental Damage).

3.1.19 Sections 21B & 22

Both sections had considerable raveling and environmental cracking near the beginning of the sections. Bad raveling and potholes were observed throughout. Most problems were located on steep grades. A long patch was observed in one area of the sections that was on a steep grade.

Figure 41. Sections 21B & 22 (Bad Raveling and Environmental Cracking).

3.1.20 Section 23

Isolated fatigue cracking in and between the wheel paths was observed in isolated areas.

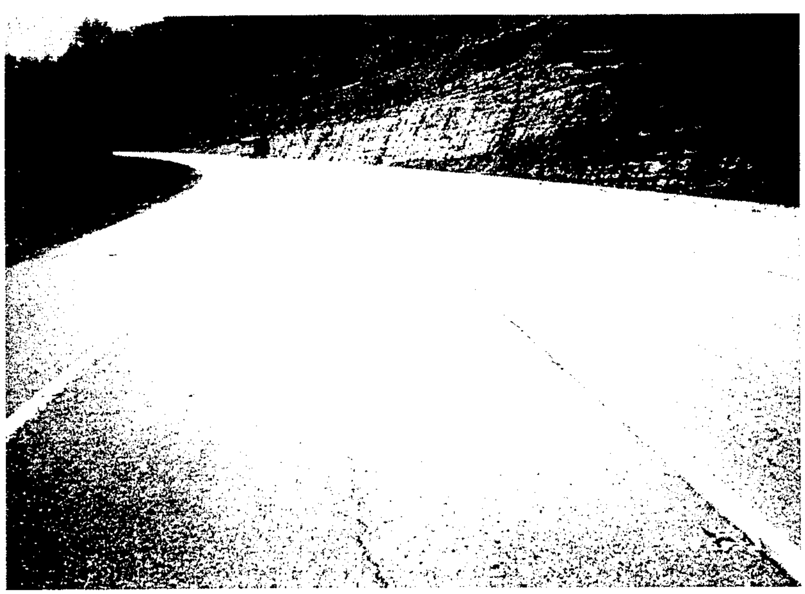

Figure 42. Section 23 (Isolated Fatigue Cracking).

3.1.21 Section 24

The section appeared to be in better condition than most of the other sections. Isolated fatigue cracking was observed in areas.

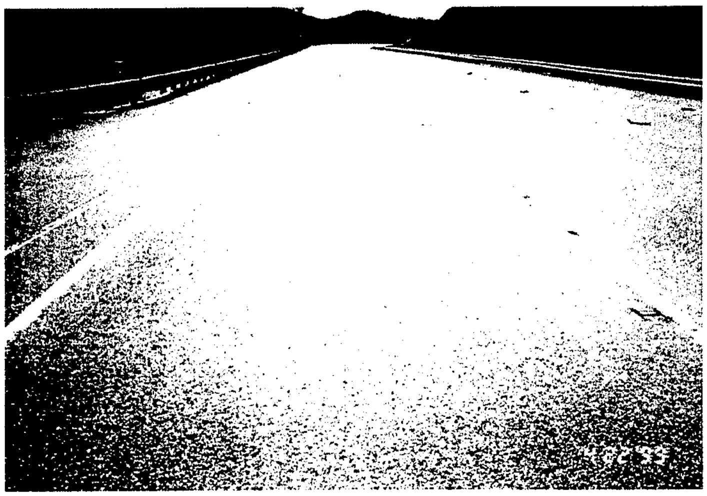

Figure 43. Section 24 (Isolated Fatigue Cracks in Areas).

3.1.22 Section 25

The section had fatigue cracking, raveling, and environmental cracking throughout most of the section.

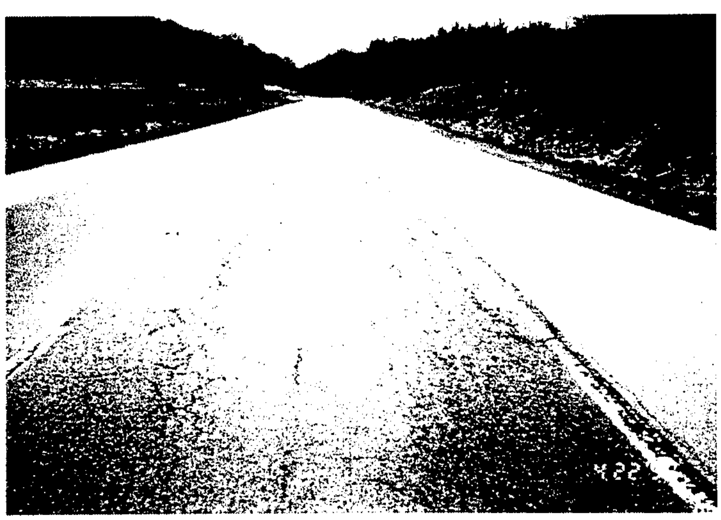

Figure 44. Section 25 (Raveling, Environmental and Fatigue Cracking).

3.1.23 Section 26

The section had some isolated cracking in the wheel paths. Overall, the section appeared to be in good condition.

Figure 45. Section 26 (Some Isolated Cracking in Wheel Path).

3.2 Distress versus Surface Aggregate

It was apparent during the visual survey that surfaces containing crushed limestone appeared to be performing better than surfaces containing crushed river gravel. Of the 30 design sections, 23 sections were constructed with surfaces containing river gravel and the remaining 7 were constructed with limestone (Figure 46). Utilizing distress information in Table 5 and surface information in Figure 46, Table 6 was constructed. As indicated by this table, 30 percent more distress was observed in the river gravel sections than the limestone sections.

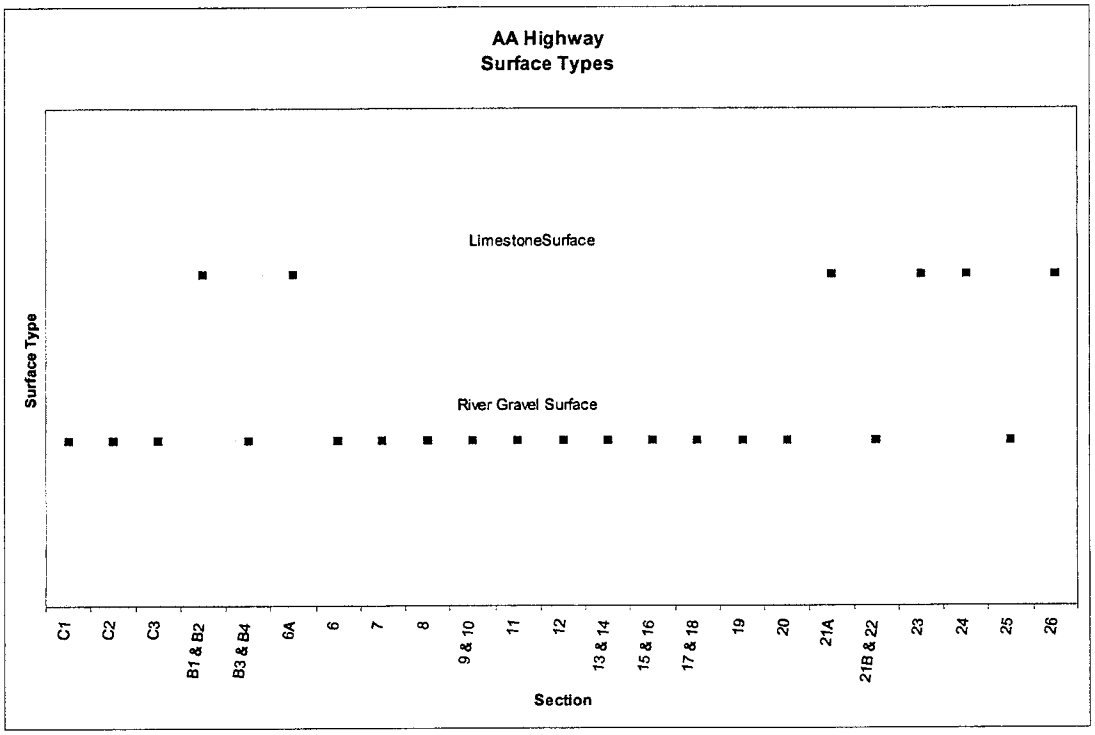

Figure 46. Aggregate used in Surfaces.

Table No. 6

Aggregate	No. of Sections	Total No. of Distresses Observed (No. of Sections x No. of Observed Types of Distresses)	Average No. of Types of Distresses Per Section
River Gravel	**23**	**61**	**2.65**
Limestone	**7**	**13**	**1.85**

3.3 Rutting

As part of the performance evaluation, rutting measurements were taken every tenth of a mile for each design section. The rutting measurements were taken in 1992, 1994, and 1999. In 1992, the average rut value for the sections was 0.09 inches; in 1994, the average rut value was 0.16 inches; and in 1999, the average rut value was 0.21 inches. The values for all the AA Highway sections are shown graphically in Figure 47. The sections with the crushed stone base and rock roadbed (Sections 20 - 26) had the least amount of rutting over the years. Sections 17 & 18, which appeared to be in fairly good condition, had the highest rutting. The visual distress survey indicated that there was bleeding in areas of Sections 17 & 18. This may be an indication of high asphalt content or low void content in the mixture contributing to the higher rutting values.

It is also interesting to note that Sections 15 & 16 had already been overlaid and Sections 17 & 18 had high rutting values, and both of which were drained by a perforated pipe in a fabric wrapped trench. It is possible that the fabric has become blinded and is causing the subgrade to become saturated.

Figure 47 indicates that not only Sections 15 & 16 were overlaid but also Sections 21B & 22. Both of these sections had river gravel surfaces.

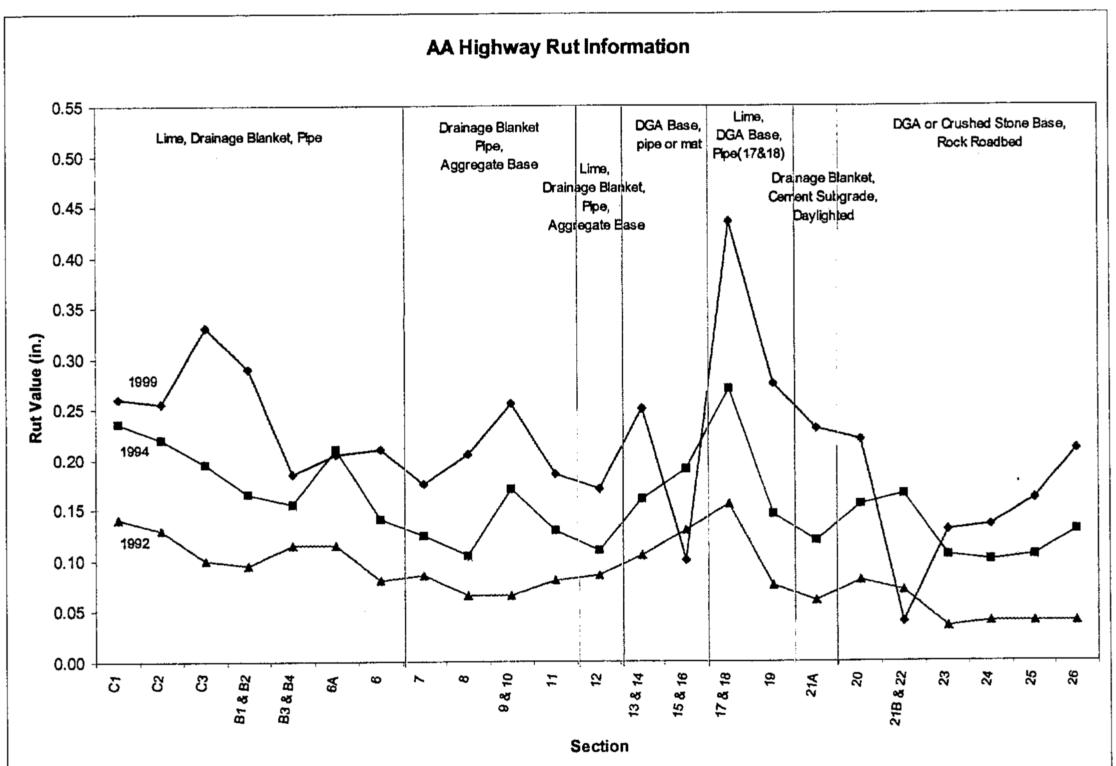

Figure 47. Rutting Per Design Section (1992, 1994, and 1999).

3.4 Rutting Versus Subgrade Type

Rutting versus the type of subgrade stabilization was analyzed. For this analysis, the sections had been divided into three different subgrade characteristics. These included rock roadbed, lime stabilization, and other (or no) stabilization. As shown in Figure 48, the least amount of rutting occurred in the rock roadbed sections.

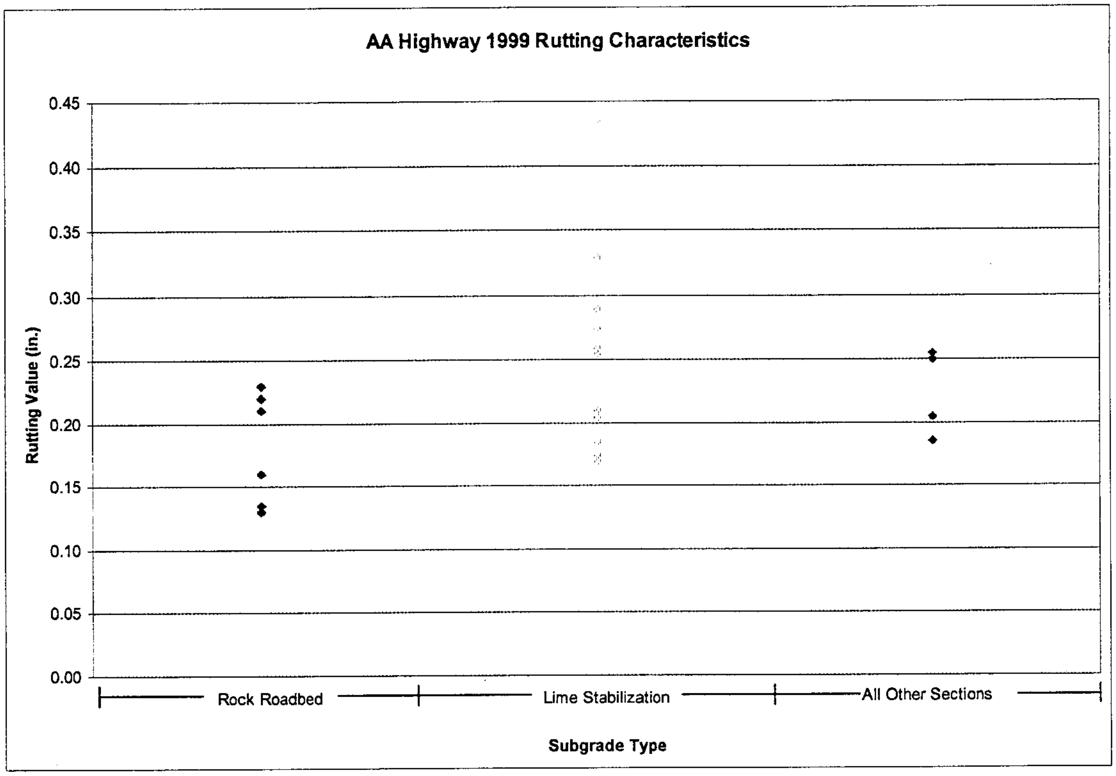

Figure 48. Rutting versus Subgrade Type.

3.5 Rutting versus Surface Aggregate Type

The amount of rutting in each section was compared to the surface aggregate type (Figure 49). The lowest value shown for Sections 15 & 16 and 21B & 22 should be ignored since they had already been overlaid. Analysis indicates that there were approximately 16 percent more rutting in the sections with surfaces constructed of river gravel.

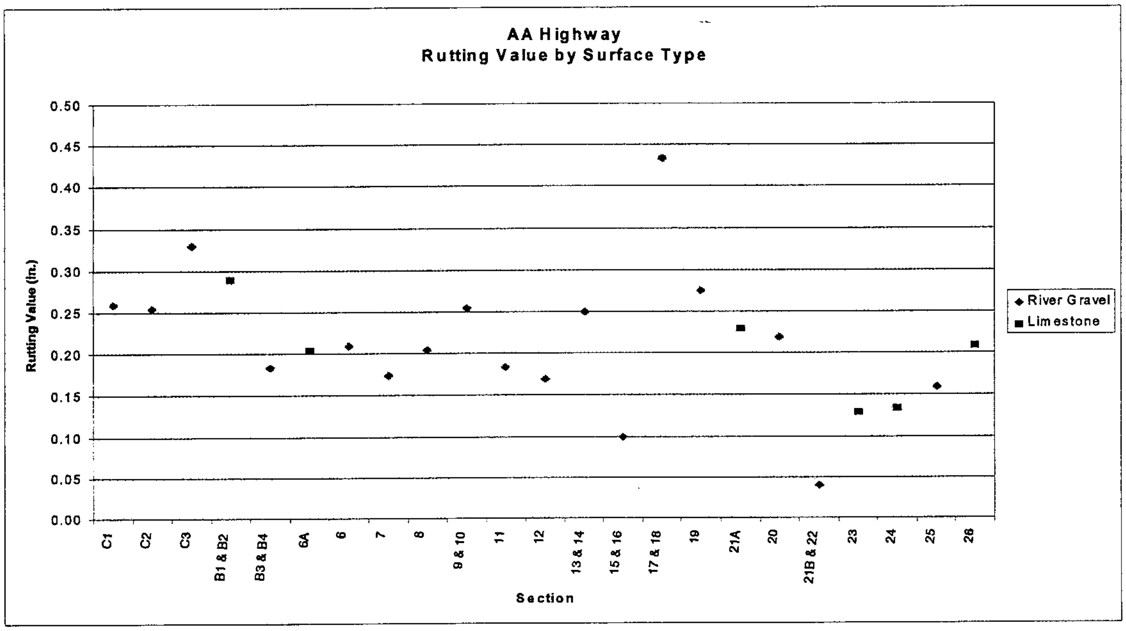

Figure 49. Rutting versus Surface Aggregate Type.

3.6 Rutting versus Surface Class

Rutting versus asphalt surface class was evaluated and is shown in Figures 50 and 51. Rutting for the Class K surfaces averaged 0.23 inch, 0.24 inch for the Class A surface, and 0.17 inch for the Class I surface. The Class I surfaces had the least amount of rutting but were also composed of limestone aggregate.

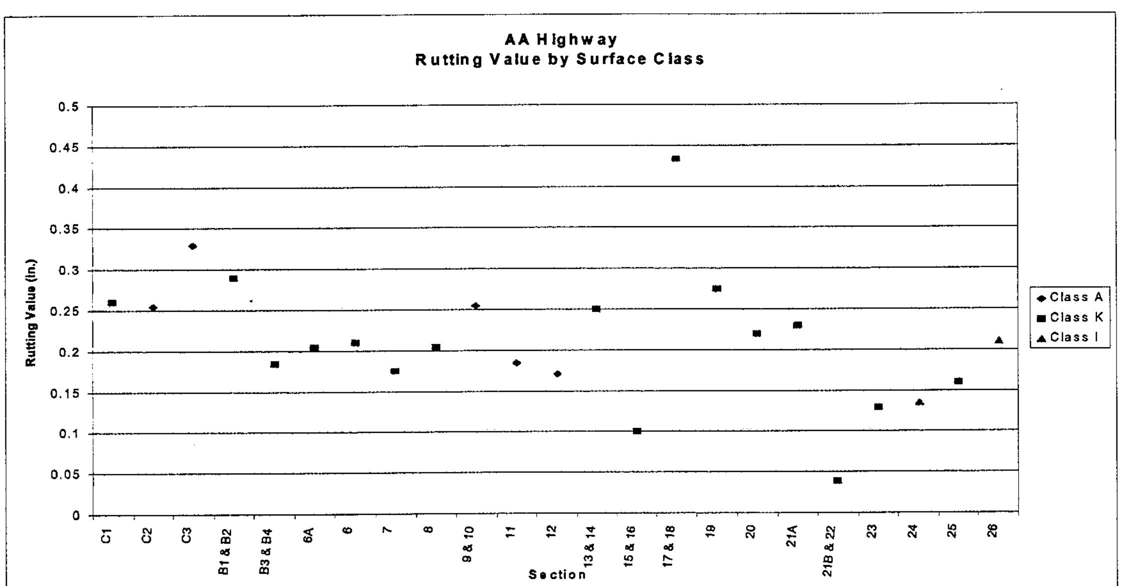

Figure 50. Rutting versus Surface Class.

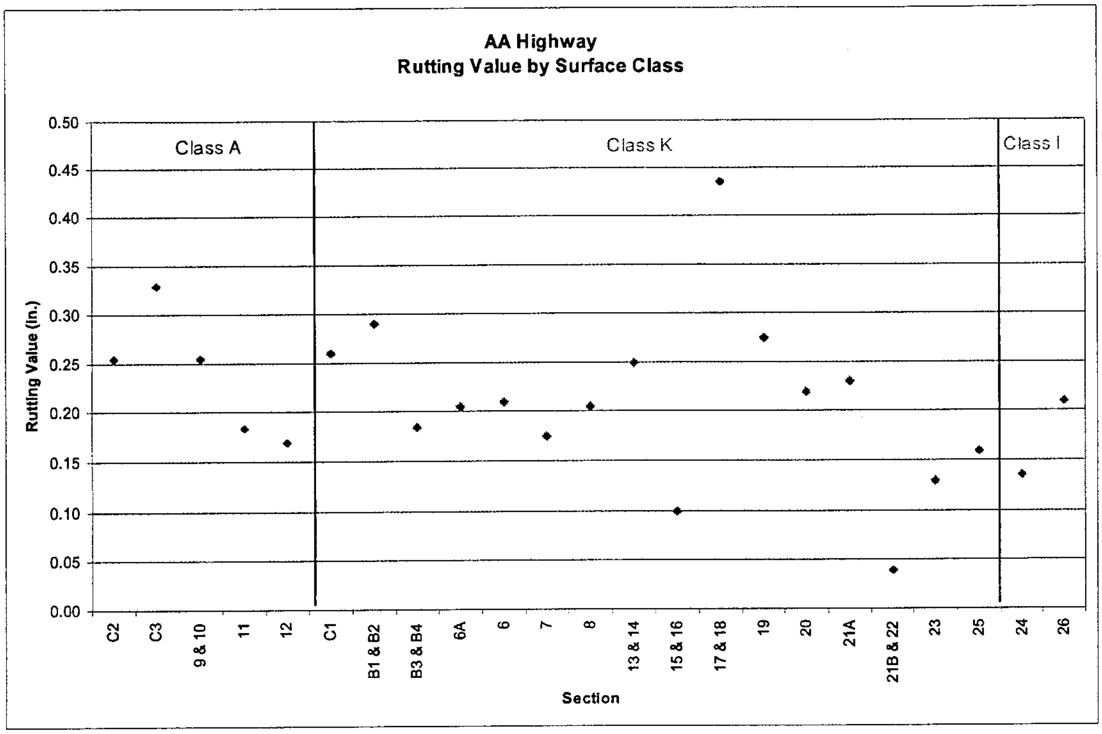

Figure 51. Rutting versus Surface Class.

3.7 Rutting per ESALs versus Design Section

In Figure 52, the accumulated ESALs were taken into account in regards to the amount of rutting in each section. Rutting is more pronounced in Sections 9&10, 13&14, 17&18, and 19 which were all constructed with river gravel surfaces.

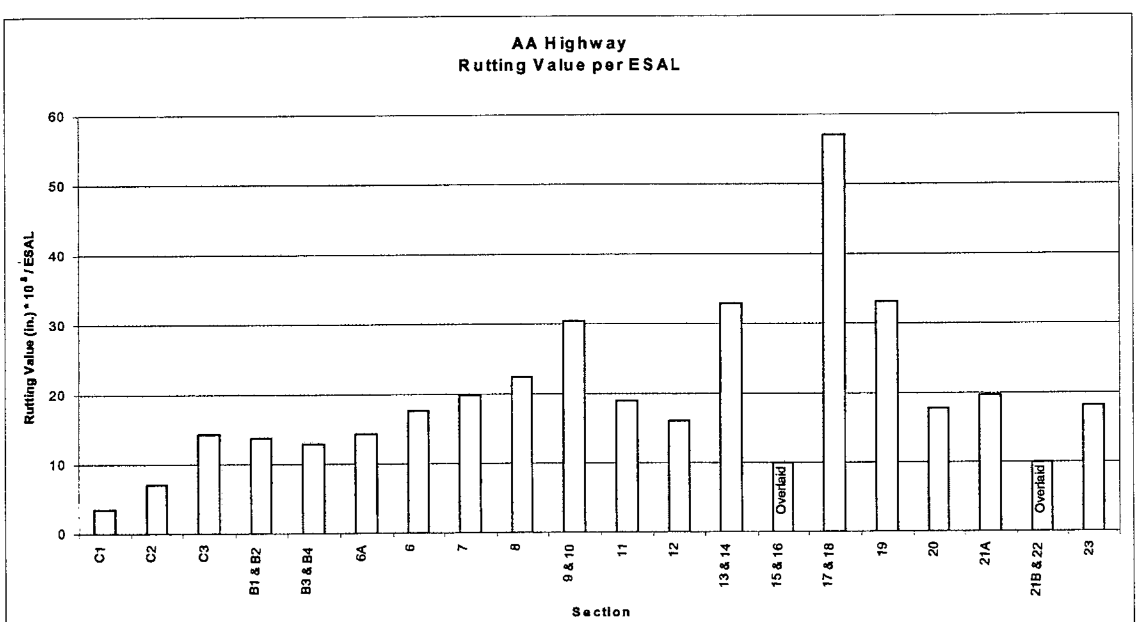

Figure 52. Rutting per ESAL.

3.8 Rutting versus Cumulative ESAL

Rutting versus the accumulation of ESALs over the life of the section was evaluated for all the sections (Figure 53). The amount of ESALs appeared to have a limited impact on the rutting of the sections.

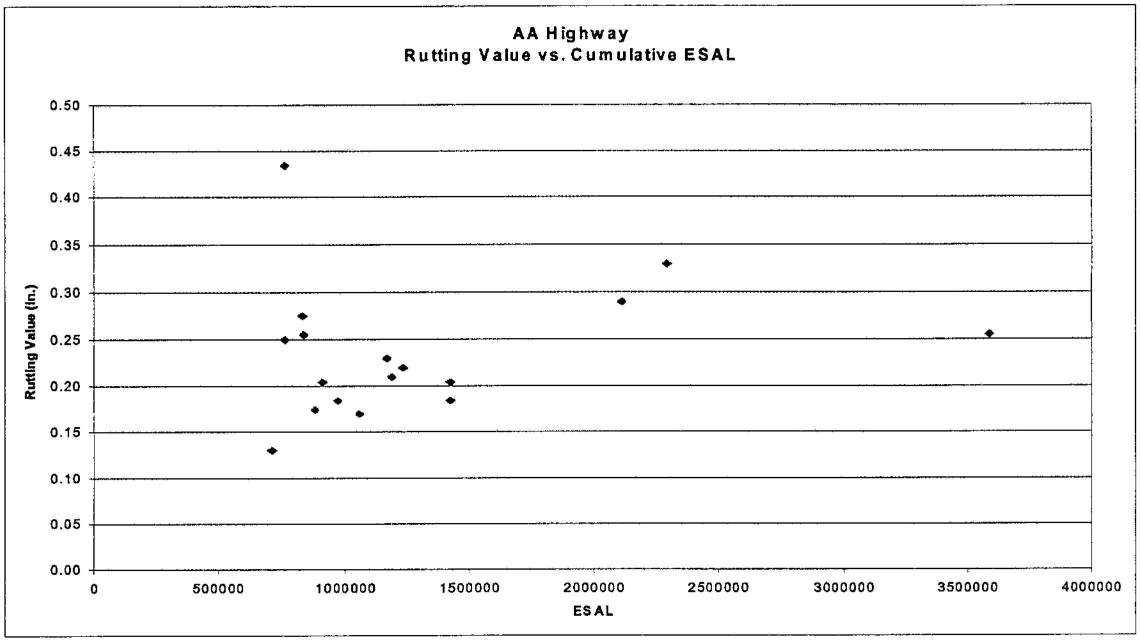

Figure 53. Rutting versus Cumulative ESAL.

3.9 ESALs and Cumulative ESALs Per Design Section

As shown in Figures 54 and 55, the west end of the AA Highway carries more truck traffic than other sections. Section C1, near the intersection of the AA Highway and I-275, carries the most truck traffic and has increased the most in the last 15 years as shown in Figure 55. Also, shown in Figure 54, there is an increase in ESALs in Sections 15 & 16. Sections 15 & 16 are located just west of Maysville.

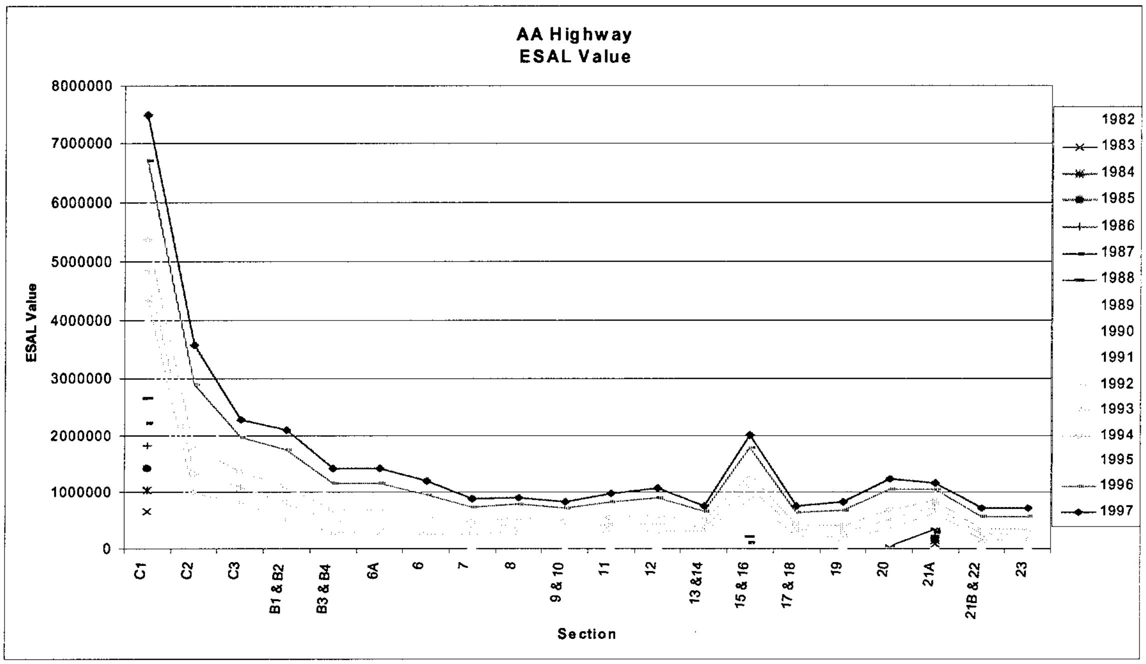

Figure 54. Cumulative ESALs versus Design Section.

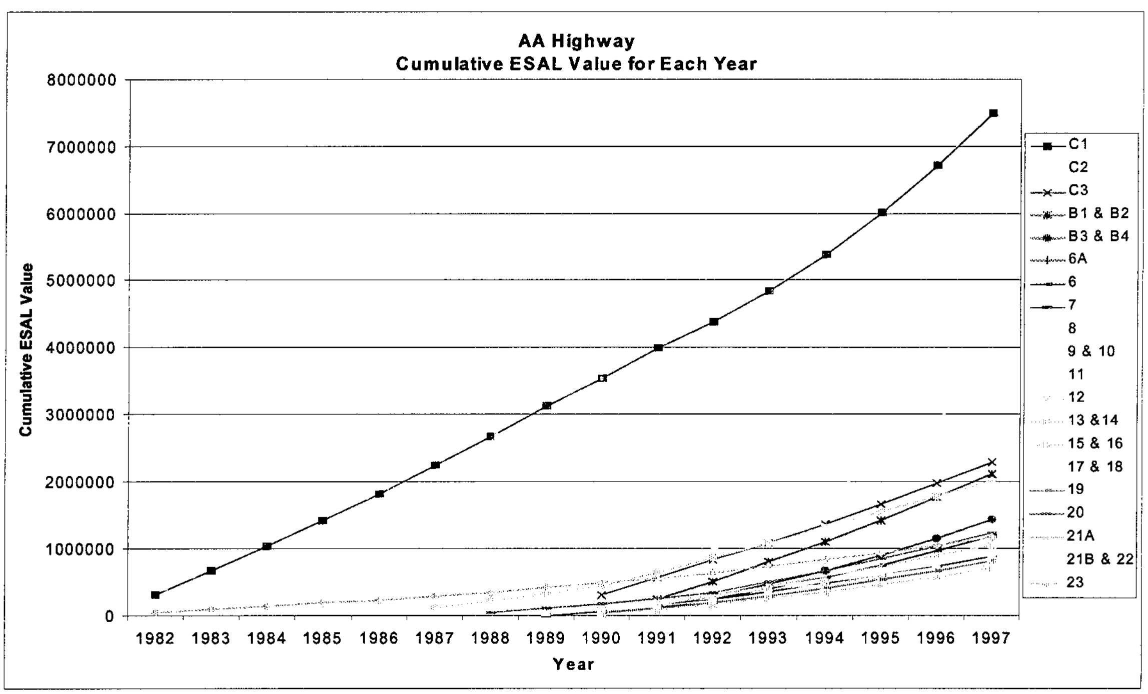

Figure 55. Cumulative ESALs versus Year.

3.10 Rideability Index

The Kentucky Transportation Cabinet collected the initial rideability index (RI) value for the AA Highway in 1990. The RI value is a representation of the smoothness of the pavement surface. In Kentucky, RI values range from zero to five - with five being the smoothest. However, even new asphalt pavement surfaces are seldom higher than 4.5. The initial RI range for all the segments of the AA Highway varied from 3.28 to 4.20. The initial RI values for a number of the segments were not available. The Kentucky Transportation Cabinet collected RI data for the AA Highway each year from 1990 to 1997.

3.10.1 Rate of Deterioration of RI

The historical RI values for each segment of the AA Highway were analyzed using a linear regression analysis. Figure 56 shows an example of that analysis for three sections of the highway (Sections 13 & 14 and Section C1). In that figure, the light orange squares and the light blue triangles represent the actual or measured RI values as a function of year. The straight lines in that figure represent the "best fit" line from the least squares regression analysis. The slope of those straight lines represent the "rate of deterioration" of RI with time. The steeper the line, the more quickly the RI is deteriorating. In subsequent figures, the slope of that line is referred to as "RI Coefficient."

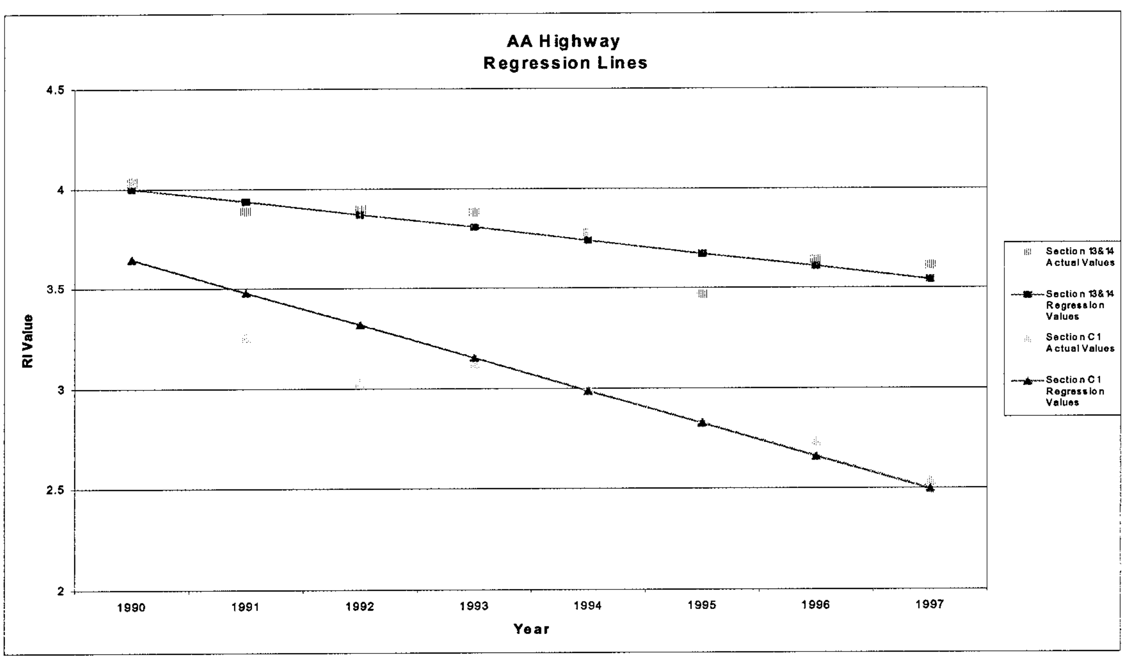

Figure 56. RI Regression Lines.

In Figure 57, the RI coefficients are shown for each section of the AA Highway. They are grouped in that figure by the type of surface aggregate used on that section (crushed gravel or crushed limestone). The RI coefficients for each surface aggregate type were then averaged. The average RI coefficient for the crushed gravel surfaces was 0.0891, and the average for the crushed limestone surfaces was 0.0790. The "critical" RI for a high volume highway (ADT > 8,000) has been determined by the Pavement Management Branch of the Division of Operations to be approximately 2.7. The critical RI is defined as the RI value at which some form of rehabilitation or resurfacing should be performed. If we use the average initial RI value for the sections of 3.89 and the average RI coefficient for each surface type, it can then be estimated what the average life of the crushed gravel and crushed limestone might be before resurfacing would be necessary. The following equation can be used to calculate that estimate.

$$L_s = \frac{RI_i - 2.7}{C_{RI}}$$

Where: L_s = Estimated service life in years,
RI_i = Initial RI (in this case, 3.89),
C_{RI} = RI coefficient obtained from the regression analysis

Using the above equation, the estimated surface life for the sections with crushed gravel was calculated to be 13.4 years, and for the crushed limestone sections, it was calculated to be 14.9 years - a difference of 1.5 years (Figure 58).

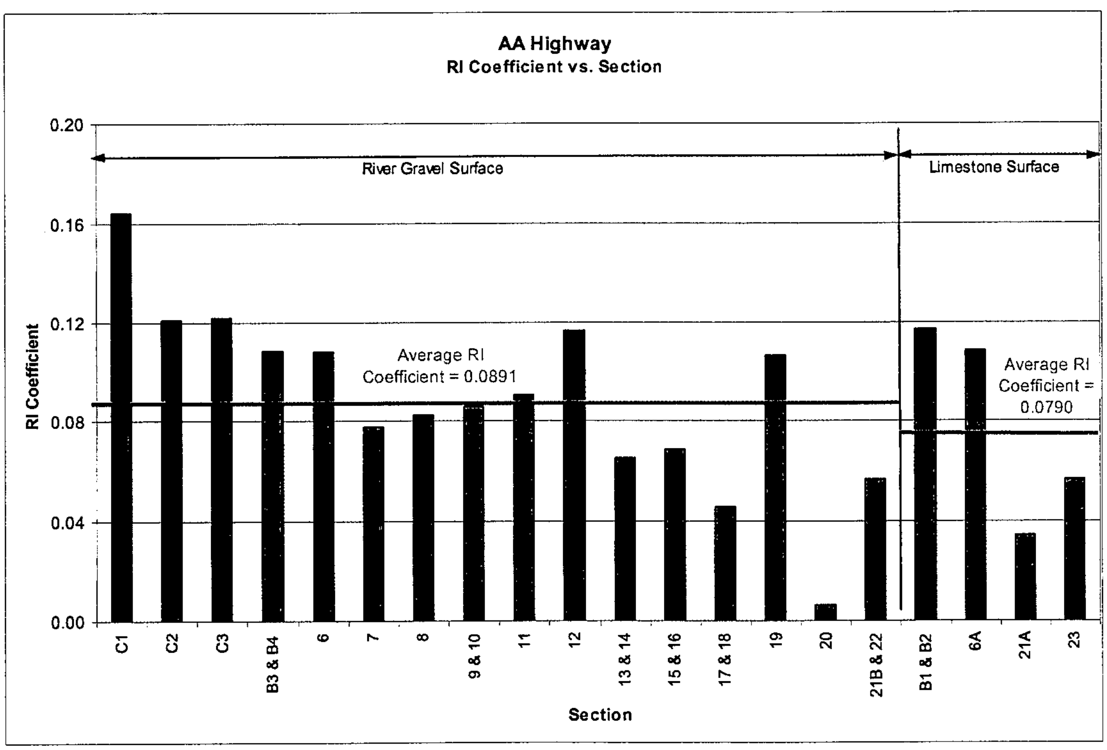

Figure 57. RI Coefficient versus Section.

Figure 58 shows the estimated life expectancy for each section calculated from the formula. The average service life from all the sections with a river gravel surface and a limestone surface is also shown in Figure 58. Section 20 was omitted from the graph because of the unacceptable value of 93.6 years that was calculated from the formula. This could be attributed to the linear regression that was used in the RI coefficient calculation. Sections 15 & 16 and Sections 21B & 22 have already been overlaid. The actual service life for Sections 15 & 16 was 12 years compared to the estimated 13.0 years. The actual service life for Sections 21B & 22 was 10 years compared to the estimated 18.2 years. This could also be attributed to the linear regression.

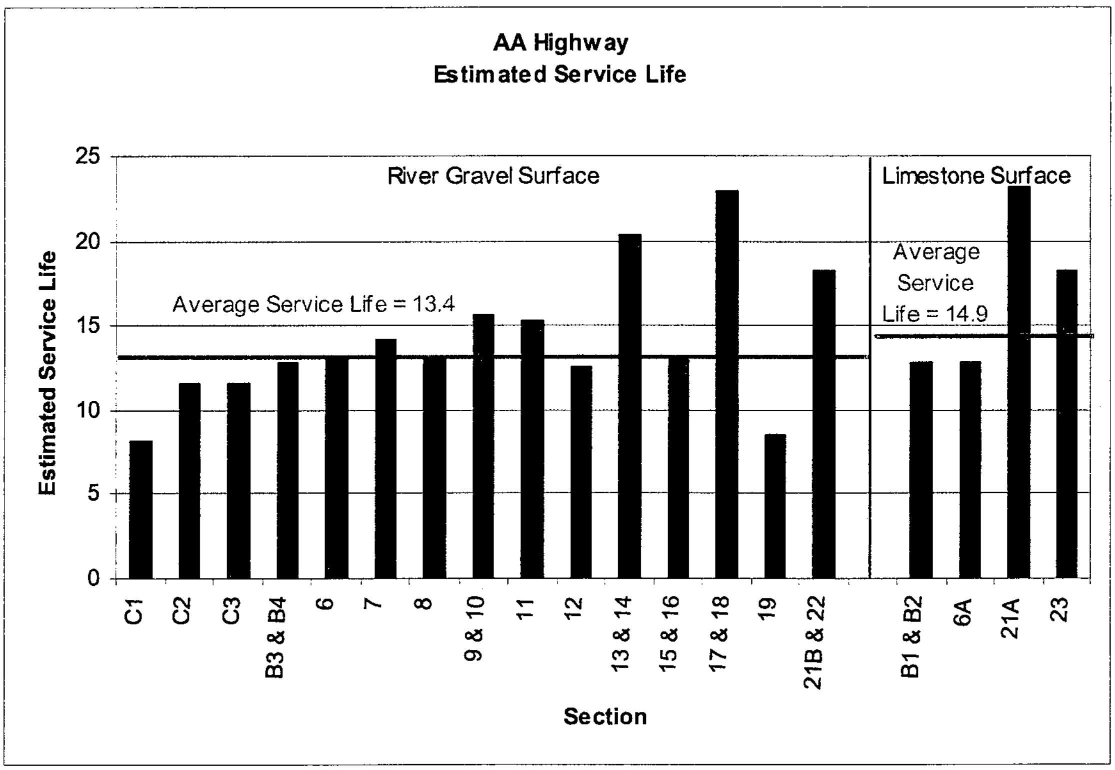

Figure 58. Estimated Service Life for Each Section.

3.10.2 Variables Affecting RI Coefficient

In Figure 59, the RI coefficient or rate of deterioration is plotted as a function of accumulated ESALs for each section. There appears to be little or no correlation below 2,000,000 ESALs. Above 2,000,000 ESALs, there appears to be some effect produced by accumulated loads.

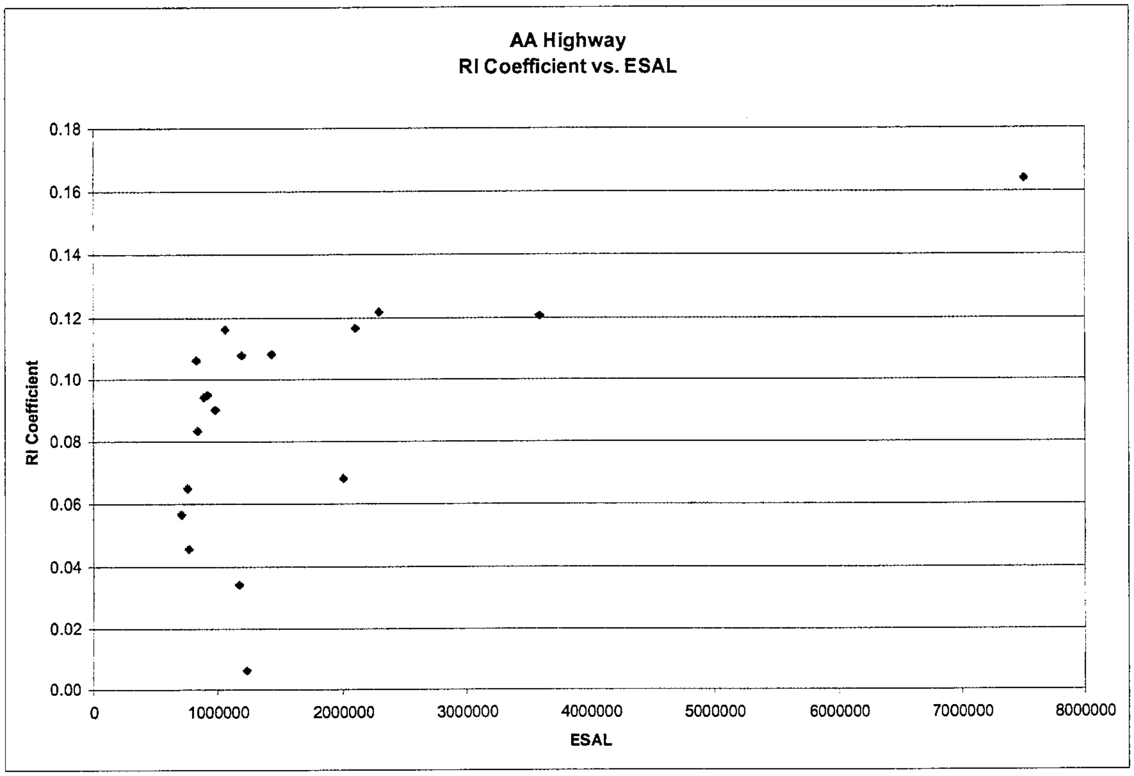

Figure 59. RI Coefficient versus Accumulated ESALs.

In Figures 60 though 62, the RI coefficient is plotted as a function of the back calculated modulus of the AC surface, AC base, and the untreated subgrade, respectively. These moduli values were obtained from the Falling Weight Deflectometer (FWD), to be discussed later. As each of those figures show, there was no correlation between the modulus of any of the pavement layers and the RI coefficient.

As a result, it must be concluded that the factors influencing ride quality are apparently more related to characteristics of the surface layer.

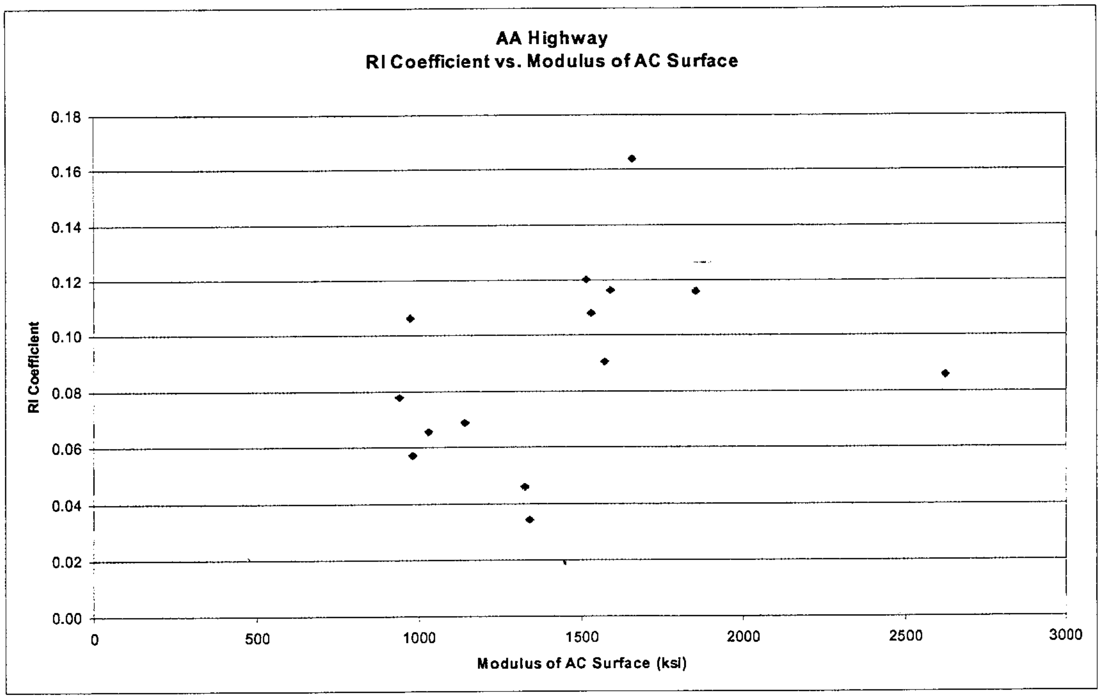

Figure 60. RI Coefficient versus Modulus of AC Surface.

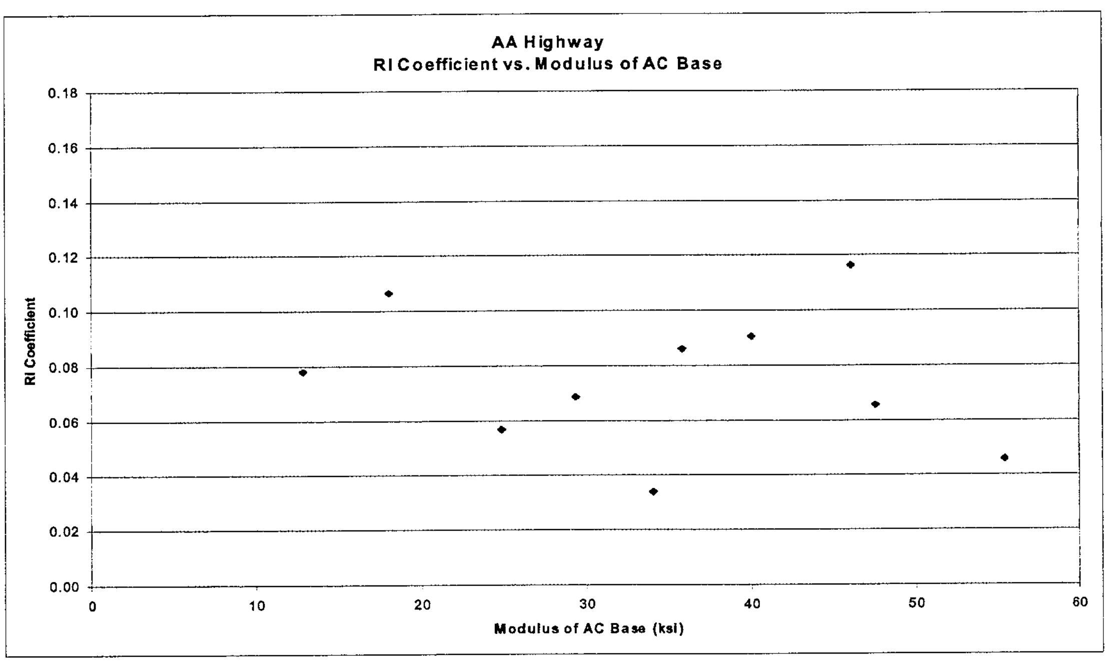

Figure 61. RI Coefficient versus Modulus of AC Base.

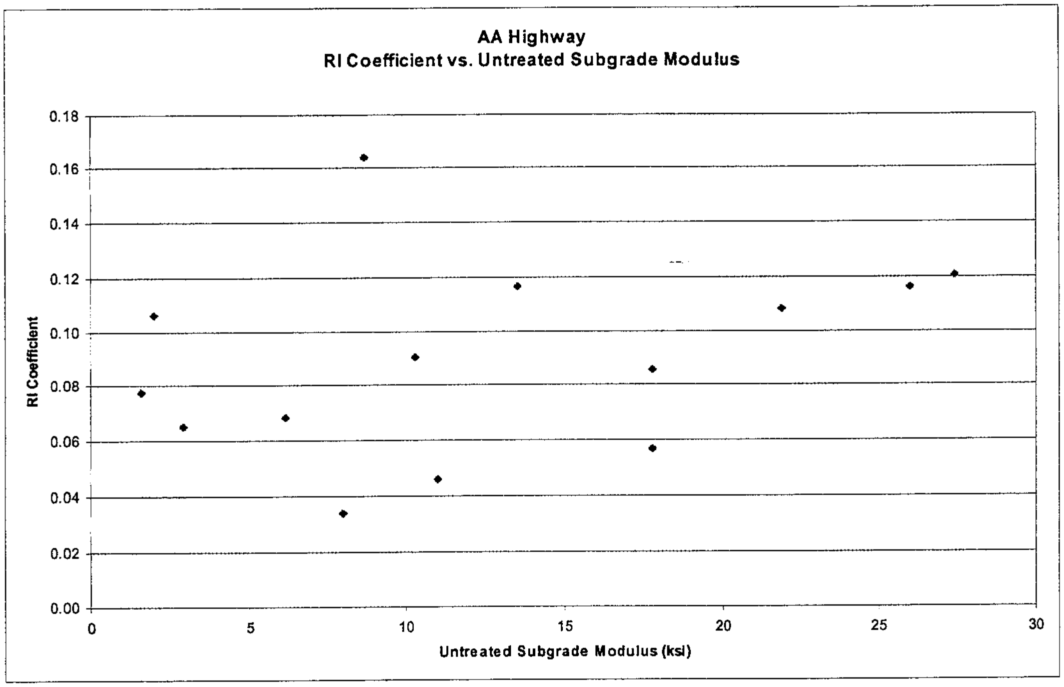

Figure 62. RI Coefficient versus Untreated Subgrade Modulus.

4.0 FWD (FALLING WEIGHT DEFLECTOMETER) ANALYSIS

FWD testing was performed throughout the different test sections. The tests were taken on 0.10 mile increments in each section. FWD analysis indicates that the AC modulus varied from as low as 940 ksi in Section 7 to as high as 2625 ksi in Sections 9 & 10 (Figure 63). It is uncertain why the AC modulus is higher in Sections 9 & 10 than other sections.

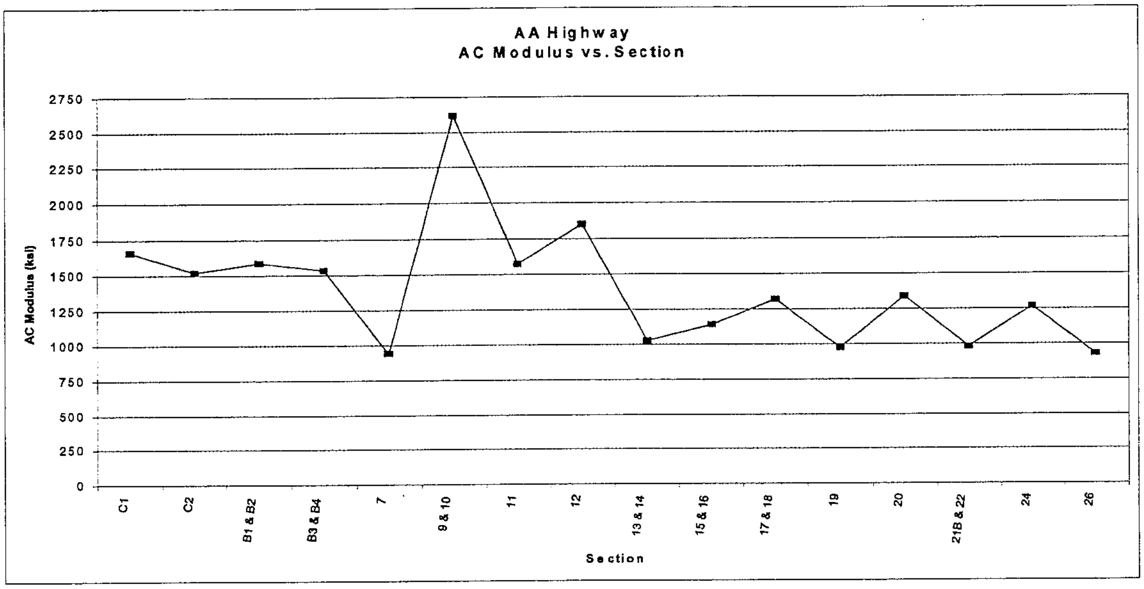

Figure 63. AC Modulus versus Section.

Drainage blanket modulus values from the FWD analysis indicated strengths from as low as 19 ksi to as high as 176 ksi (Figure 64).

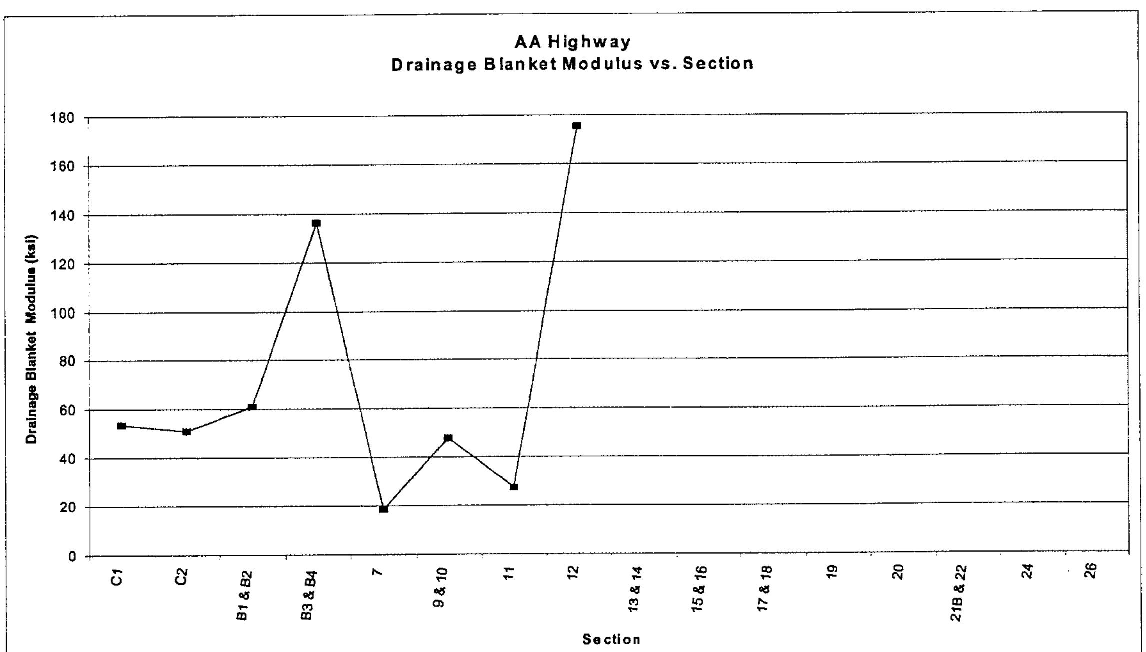

Figure 64. Drainage Blanket Modulus versus Section.

The DGA modulus ranged from as low as 18 ksi to 127 ksi (Figure 65).

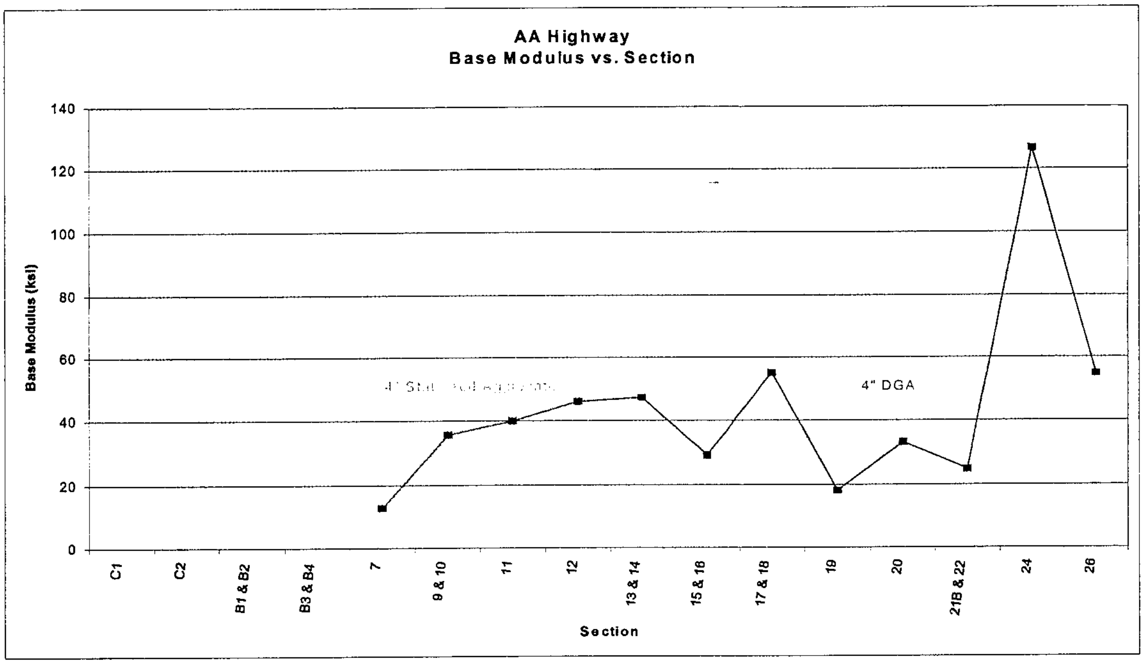

Figure 65. Base Modulus versus Section.

The FWD analysis indicated that the strength of the unstabilized subgrade ranged from as low as 2 ksi in Section 7 to as high as 27 ksi in Section C2 (Figure 66).

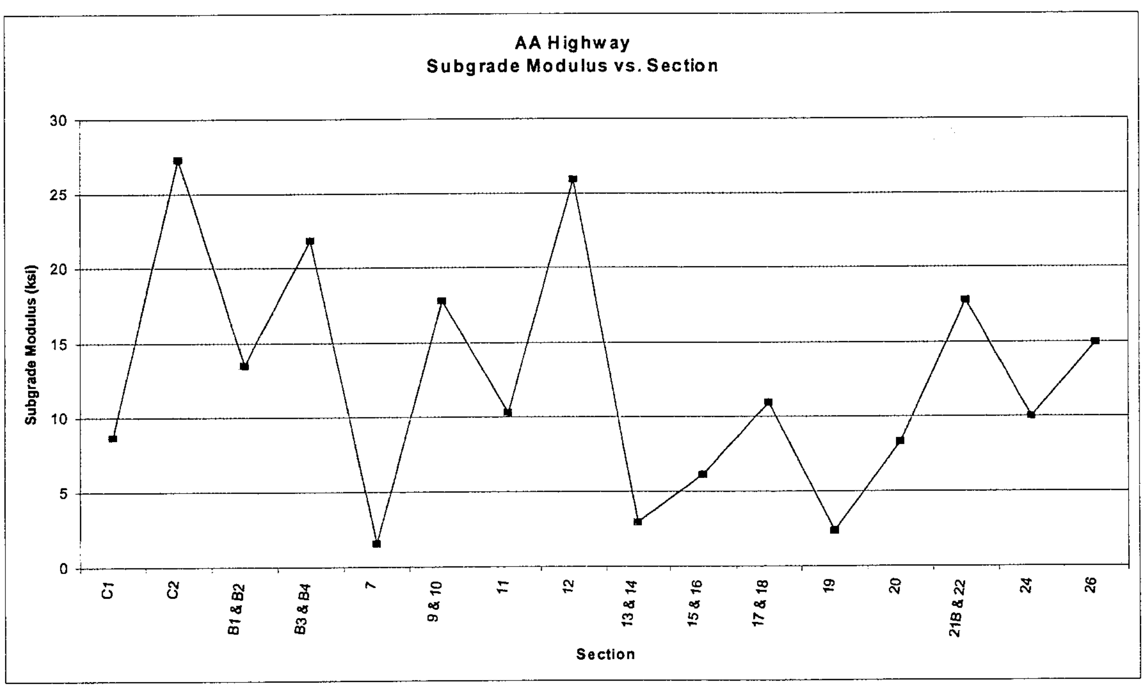

Figure 66. Subgrade Modulus versus Section.

As shown in Figure 67, the stabilized subgrade strength ranged from as low as 16 ksi in Section C1 to as high as 34 ksi in Section 12. Stabilized subgrade values are plotted along with unstabilized subgrades in Figure 68. In most cases, the stabilized soils were substantially stronger than the unstabilized soils.

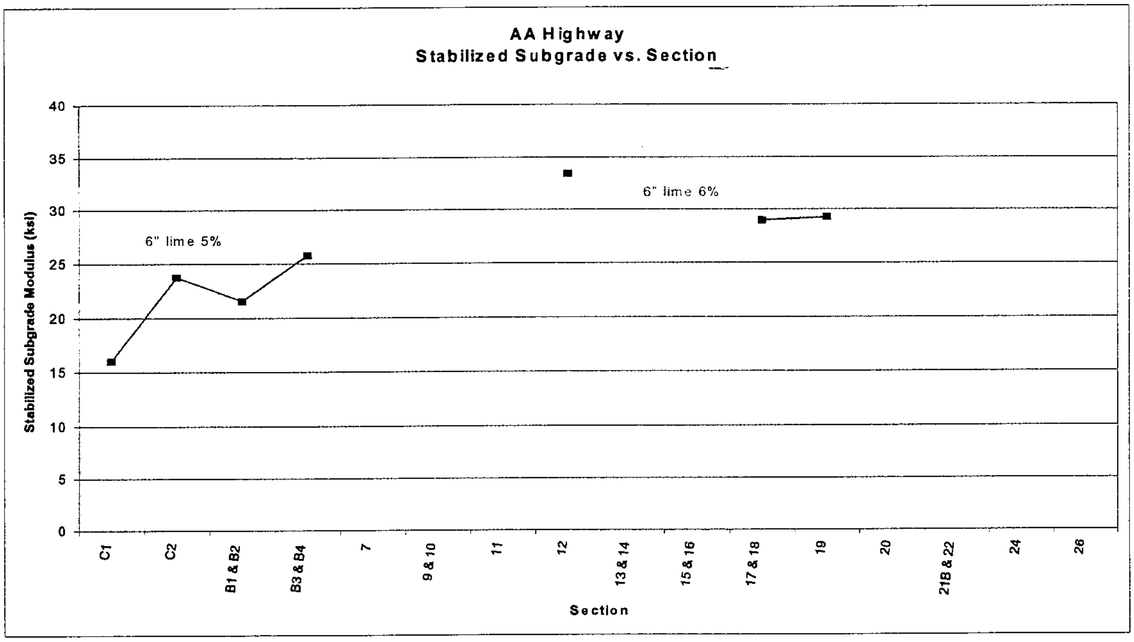

Figure 67. Stabilized Subgrade Modulus versus Section.

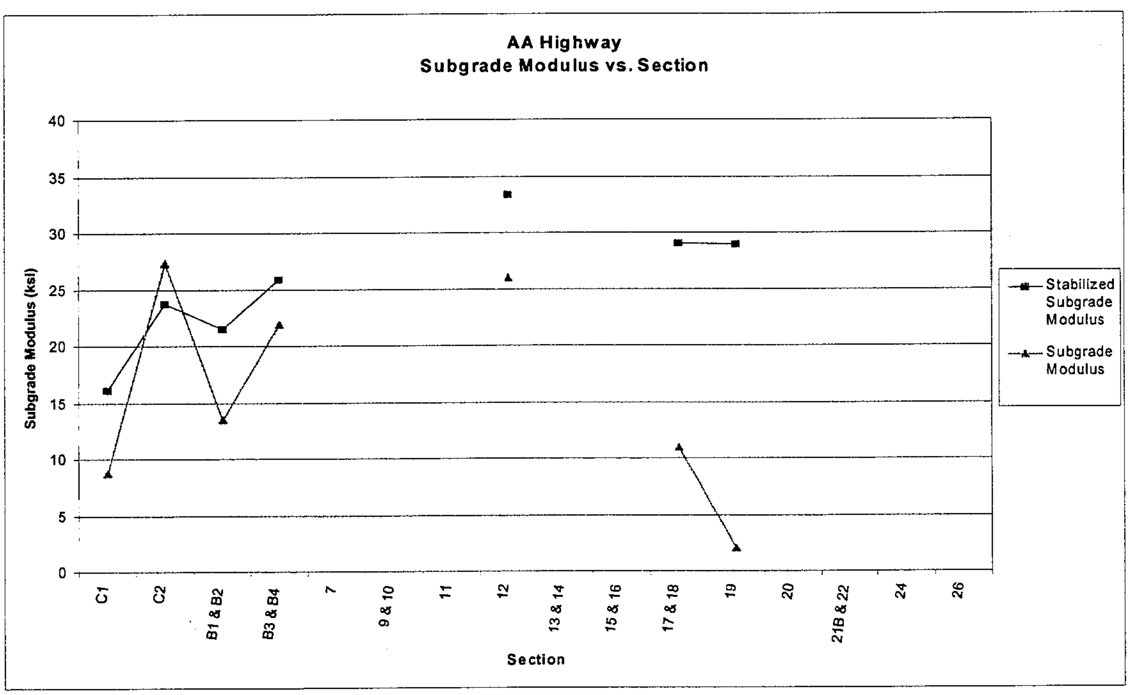

Figure 68. Stabilized and Unstabilized Subgrade Modulus versus Section.

5.0 CONCLUSIONS

5.1 Drainage

1.0 Over 75 percent of the headwalls for the subsurface drains on the AA Highway appeared to be clean. However, the remaining headwalls were partly to completely plugged.

2.0 Inspections of the drains themselves indicated that most damage to the system had occurred in the outlet pipe that runs from the back of the headwall, through the aggregate and paved shoulder. Approximately 45 percent of these sections of pipe had been damaged.

3.0 Section 21A was the only section which was constructed with the daylighted drainage blanket with no edge drains. There appeared to be no significant performance difference between this section and the sections with edge drains. The edge of the drainage blanket had partially been overgrown with vegetation, which may have reduced the effectiveness of the blanket.

5.2 Distresses

5.2.1 Cracking and Raveling

1.0 Cracking of all forms was, by far, the most prevalent form of distress on the AA Highway. Almost all sections experienced one or more forms of cracking — from environmental to fatigue cracking.

2.0 Raveling was the second most prevalent form of distress. Approximately 16 of 26 sections exhibited some amount of raveling.

3.0 In general, sections paved with a crushed limestone aggregate surface had fewer distresses than sections with crushed gravel surfaces. Crushed gravel surfaces averaged 2.65 distresses per section and limestone aggregate surfaces averaged 1.85 distresses per section.

5.2.2 Rutting

1.0 Rutting did not appear to be significantly influenced by type of subgrade treatment (rock roadbed, lime stabilization, or other treatment).

2.0 Rutting was not significantly influenced by surface aggregate type (crushed gravel or crushed limestone).

3.0 Rutting was not significantly influenced by surface type (Class A, Class K, or Class I).

4.0 Rutting was not significantly influenced by accumulated ESALs.

5.0 Sections 17 & 18 had significantly larger amounts of rutting than any other sections. It appeared the surface mixture may have had excess asphalt binder or low void content because some bleeding was evident throughout the section. This would have contributed to excess rutting.

5.3 Performance (Rideability)

1.0 Based on the Rideability Index and a linear regression analysis of rideability index with time, the crushed gravel surfaces would have an average service life of 13.4 years and the crushed limestone aggregate surfaces would have an average service life of 14.9 years — a difference of 1.5 years. However, the sections that have already been overlaid were rehabilitated before their estimated service life. It appears this may be due to the linear regression model that was used. A second degree polynomial would probably have estimated the service life more accurately.

2.0 Rideability did not appear to be significantly influenced by accumulated ESALs below 2,000,000 ESALs. Above 2,000,000 ESALs, there may have been some relationship; however, there were insufficient data points for development.

3.0 Rideability did not appear to be influenced by the modulus of the AC surface, AC base or the modulus of the untreated subgrade.

5.4 Falling Weight Deflectometer Analysis (FWD)

1.0 The backcalculated modulii values for the various pavement layers varied widely between sections and no conclusions could be drawn from the information.

2.0 From the FWD analysis of the subgrade soil, it is clear that lime stabilization of the subgrade dramatically increases the modulus of the subgrade.

5.5 General Comment

From all of the information gathered in this performance study, it appears that the most significant factor in the performance of all the sections, as measured by rideability, was the performance characteristics of the asphalt surface course. Although the strength characteristics of the deeper pavement layers are undoubtedly important, in this study, their role did not appear to be quite as influential as the surface course (again, this is from the viewpoint of rideability). This conclusion probably holds true because all of the sections were of sufficient design thickness to carry the accumulated ESALs to date, and what appeared to be fatigue cracks in some of the surface courses were probably related to only fatigue in the surface course itself and may not have gone deeper. This should be investigated further by trenching the pavement in one or two locations.

6.0 RECOMMENDATIONS

1.0 All subsurface drainage structures and outlet headwalls should be maintained to provide optimum drainage for the pavement structure. This includes cleaning headwalls and clearing vegetation from the edge of the daylighted drainage blanket.

2.0 Stabilizing weak clay subgrades with lime is highly recommended and should be continued as standard practice on all new construction projects. This helps to provide strong working platforms against which to compact the pavement layers and undoubtedly provides additional strength to the pavement structure, although this additional strength could not be quantified in this study.

3.0 Because the performance of the surface course appeared to be of great significance, it is recommended that great attention continue to be given to the mixture design of the surface course. This includes attention to the type of aggregate used in the mixture.

4.0 One or two locations should be trenched in the near future to determine where and to what extent the surface cracks are occurring.

APPENDIX A
MAP

KENTUCKY'S AA HIGHWAY

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APPENDIX B
DESIGN SECTIONS

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AA Highway MP Termini

Section	County	Old MP	New MP	Route
Sec C1	Campbell	0.4 - 3.0	17.5 - 15.0	KY 9
Sec C2	Campbell	3.1 - 4.6	14.9 - 13.4	KY 9
Sec C3	Campbell	4.7 - 7.4	13.3 - 10.6	KY 9
Sec B1 & B2	Campbell	7.5 - 9.5	10.5 - 8.5	KY 9
Sec B3 & B4	Campbell	9.6 - 11.8	8.4 - 6.2	KY 9
Sec 6A	Campbell	11.9 - 12.7	6.1 - 5.3	KY 9
Sec 6	Campbell	12.8 - 15.9	5.2 - 2.1	KY 9
Sec 7	Campbell & Pendleton	16.0 - 18.0 / 0 - 2.1	2.0 - 0 / 4.3 - 2.2	KY 9
Sec 8	Pendleton	2.2 - 4.3	2.1 - 0	KY 9
Sec 9 & 10	Bracken	0 - 6.9	19.8 - 12.9	KY 9
Sec 11	Bracken	7.0 - 10.2	12.8 - 9.6	KY 9
Sec 12	Bracken	10.3 - 14.3	9.5 - 5.6	KY 9
Sec 13 & 14	Bracken & Mason	14.4 - 19.8 / 0 - 3.5	5.5 - 0 / 19.5 - 16.0	KY 9
No Sec	Mason	3.6 - 7.6	15.9 - 11.9	KY 9
Sec 15 & 16	Mason	7.7 - 15.8	11.8 - 3.8	KY 9
Sec 17 & 18	Mason & Lewis	15.9 - 19.5 / 0 - 2.7	3.7 - 0 / 31.2 - 28.5	KY 9
Sec 19	Lewis	2.8 - 6.1	28.4 - 25.0	KY 9
Sec 20	Lewis	6.2 - 10.1	24.9 - 21.0	KY 9
No Sec	Lewis	10.2 - 16.1	20.9 - 15.1	KY 9
Sec 21A	Lewis	16.2 - 19.8	15.0 - 11.6	KY 9
Sec 21B & 22	Lewis	19.9 - 22.9	11.5 - 8.5	KY 9
Sec 23	Lewis	23.0 - 23.2 / 23.3 - 25.0	8.4 - 8.0 / 6.8 - 8.3	KY 9 / KY 10
Sec 24	Lewis	25.1 - 27.4	8.4 - 11.2	KY 10
Sec 25	Lewis	27.5 - 29.6	11.3 - 13.5	KY 10
Sec 26	Lewis	29.7 - 31.3	13.6 - 15.0	KY 10

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PROJECT LOCATIONS

SECTION	
C1	FROM: I 275 AND KY.RT.9 INTERCHANGE TO: 117' E. OF MURNAN RD.
C2	FROM: 117' E. OF MURNAN RD. TO: 1896'W. OF EAST ALEXANDRIA PIKE
C3	FROM: 1896'W. OF EAST ALEXANDRIA PIKE TO: 117' W. OF FOUR MILE ROAD
B1-B2	FROM: 117' W. OF FOUR MILE ROAD TO: 700' E. OF KY. 1997
B3-B4	FROM: 700' E. OF KY. 1997 TO: KY.1996
6A	FROM: KY.1996 TO: 4900' W. OF GUBSER MILL RD.
6	FROM: 4900' W. OF GUBSER MILL RD. TO: 200' E. OF WASHINGTON TRACE RD.
7-8	FROM: 200' E. OF WASHINGTON TRACE RD. TO: 2300' W. OF PUMP STATION RD.
9-10	FROM: 2300' W. OF PUMP STATION RD. TO: 3400' E. OF KY.1109
11-12	FROM: 3400' E. OF KY.1109 TO: KY. 19
13-14	FROM: KY. 19 TO: INTERSECTION WITH EXISTING KY. 10 6092' E. OF KY. 435
15B-16	FROM: INTERSECTION WITH EXISTING KY. 10 8676' W.OF US 68 TO: KY. 1449
17-18	FROM: KY. 1449 TO: 440' W.OF KY. 57
19	FROM: 440' W.OF KY. 57 TO: 2072' W.OF RIBOLT RD.
20	FROM: 2072' W.OF RIBOLT RD. TO: INTERSECTION WITH EXISTING KY. 10 7600' E. OF POPLAR FLAT RD.
21A	FROM: INTERSECTION WITH EXISTING KY. 10 8500' W.OF HAZEL BRANCH RD. TO: 180 E.OF KY. 59
21B-22	FROM: 180 E.OF KY. 59 TO: 65' E.OF KY. 1149
23	FROM: 65' E.OF KY. 1149 TO: 11,125' W.OF SPY RUN RD.
24	FROM: 11,125' W.OF SPY RUN RD. TO: 1127' E.OF SPY RUN RD.
25	FROM: 1127' E.OF SPY RUN RD. TO: 3715' E.OF GREENBRIER HOLLOW RD.
26	FROM: 3715' E.OF GREENBRIER HOLLOW RD. TO: 3463' E. OF MONTGOMERY CREEK RD.

INDEX

TYPE CONSTRUCTION	GRADE, DRAIN & SURFACING
LENGTH	2.727 MILES
CONTRACTOR	ELMO GREER
WORK STARTED	10/24/88
PROJECT COMPLETE	11/13/90
TYPICAL SECTION	SEE APPENDIX A

PAVEMENT-DESIGNED

SUBGRADE	UNCLASSIFIED
STABILIZATION	6" LIME - 6%
FILTER FABRIC	GEOTEXTILE TYPE 3
DRAINAGE BLANKET	4" ASPHALT TREATED
BIT.BASE	8 1/2" CLASS I
BINDER	1 1/2" CLASS I
SURFACE	1" CLASS A OR K

SHOULDER

STABILIZATION	6" LIME - 6%
FILTER FABRIC	GEOTEXTILE TYPE 3
DRAINAGE BLANKET	VAR DEPTH ASPHALT TREATED
BIT.BASE	2 1/2" CLASS I
BINDER	1 1/2" CLASS I
SURFACE	1" CLASS I
D G A	WEDGE
EDGE DRAINS	4" PERF PIPE WITH FABRIC & SOCK

PAVEMENT AS BUILT

SUBGRADE	UNCLASSIFIED
STABILIZATION	6" LIME - 5%
DRAINAGE BLANKET	4" ASPHALT TREATED
BIT.BASE	8 1/2" CLASS I
BINDER	1 1/2" CLASS I
SURFACE	1" CLASS K

SHOULDER

STABILIZATION	6" LIME - 5%
DRAINAGE BLANKET	4" ASPHALT TREATED
BIT.BASE	2 1/2" CLASS I
BINDER	1 1/2" CLASS I
SURFACE	1" CLASS I
D G A	WEDGE
EDGE DRAIN	4" PERF PIPE WITH FABRIC & SOCK

TYPE CONSTRUCTION	GRADE,DRAIN & SURFACING
LENGTH	1.96 MILES
CONTRACTOR	ELMO GREER G&D;EATON SURF
WORK STARTED	5/5/88
PROJECT COMPLETE	11/14/90
TYPICAL SECTION	SEE APPENDIX A

PAVEMENT-DESIGNED

SUBGRADE	UNCLASSIFIED
STABILIZATION	6" LIME - 6%
DRAINAGE BLANKET	4" ASPHALT TREATED
BIT.BASE	8 1/2" CLASS I
BINDER	1 1/2" CLASS I
SURFACE	1 1/4" CLASS A

SHOULDER

STABILIZATION	6" LIME - 6%
DRAINAGE BLANKET	VAR DEPTH ASPHALT TREATED
BIT.BASE	2 1/2" CLASS I
BINDER	1 1/2" CLASS I
SURFACE	1 1/4" CLASS I
D G A	WEDGE
EDGE DRAINS	4" PERF PIPE WITH FABRIC & SOCK

PAVEMENT AS BUILT

SUBGRADE	UNCLASSIFIED
STABILIZATION	6" LIME - 5%
FILTER FABRIC	GEOTEXTILE TYPE 3
DRAINAGE BLANKET	4" ASPHALT TREATED
BIT.BASE	8 1/2" CLASS I
BINDER	1 1/2" CLASS I
SURFACE	1 1/4" CLASS A

SHOULDER

STABILIZATION	6" LIME - 5%
FILTER FABRIC	GEOTEXTILE TYPE 3
DRAINAGE BLANKET	4" ASPHALT TREATED
BIT.BASE	2 1/2" CLASS I
BINDER	1 1/2" CLASS I
SURFACE	1 1/4" CLASS A
D G A	WEDGE
EDGE DRAIN	4" PERF PIPE WITH FABRIC & SOCK

TYPE CONSTRUCTION	GRADE,DRAIN & SURFACING
LENGTH	2.64 MILES
CONTRACTOR	ADDINGTON G&D;EATON SURF.
WORK STARTED	5/13/88
PROJECT COMPLETE	6/8/90
TYPICAL SECTION	SEE APPENDIX A
PAVEMENT-DESIGNED	
SUBGRADE	UNCLASSIFIED
STABILIZATION	6" LIME - 6%
FILTER FABRIC	GEOTEXTILE TYPE 3
DRAINAGE BLANKET	4" ASPHALT TREATED
BIT.BASE	8 1/2" CLASS I
BINDER	1 1/2" CLASS I
SURFACE	1" CLASS A OR K
SHOULDER	
STABILIZATION	6" LIME - 6%
FILTER FABRIC	GEOTEXTILE TYPE 3
DRAINAGE BLANKET	VAR DEPTH ASPHALT TREATED
BIT.BASE	2 1/2" CLASS I
BINDER	1 1/2" CLASS I
SURFACE	1" CLASS I
D G A	WEDGE
EDGE DRAINS	4" PERF PIPE WITH FABRIC & SOCK
PAVEMENT AS BUILT	
SUBGRADE	UNCLASSIFIED
STABILIZATION	6" LIME - 5%
DRAINAGE BLANKET	4" ASPHALT TREATED
BIT.BASE	8 1/2" CLASS I
BINDER	1 1/2" CLASS I
SURFACE	1" CLASS A
SHOULDER	
STABILIZATION	6" LIME - 5%
DRAINAGE BLANKET	4" ASPHALT TREATED
BIT.BASE	2 1/2" CLASS I
BINDER	1 1/2" CLASS I
SURFACE	1" CLASS I
D G A	WEDGE
EDGE DRAIN	4" PERF PIPE WITH FABRIC & SOCK

TYPE CONSTRUCTION	GRADE,DRAIN & SURFACING
LENGTH	2.17 MILES
CONTRACTOR	ADDINGTON G&D;MAGO SURF
WORK STARTED	9/20/88
PROJECT COMPLETE	12/7/89
TYPICAL SECTION	SEE APPENDIX A

PAVEMENT-DESIGNED

SUBGRADE	UNCLASSIFIED
STABILIZATION	6" LIME - 6%
DRAINAGE BLANKET	4" ASPHALT TREATED
BIT.BASE	8 1/2" CLASS I
BINDER	1 1/2" CLASS I
SURFACE	1 1/4" CLASS A OR K

SHOULDER

STABILIZATION	6" LIME - 6%
DRAINAGE BLANKET	VAR DEPTH ASPHALT TREATED
BIT.BASE	2 1/2" CLASS I
BINDER	1 1/2" CLASS I
SURFACE	1" CLASS I
D G A	WEDGE
EDGE DRAINS	4" PERF PIPE WITH FABRIC

PAVEMENT AS BUILT

SUBGRADE	UNCLASSIFIED
STABILIZATION	6" LIME - 5%
DRAINAGE BLANKET	4" ASPHALT TREATED
BIT.BASE	8 1/2" CLASS I
BINDER	1 1/2" CLASS I
SURFACE	1" CLASS K

SHOULDER

STABILIZATION	6" LIME - 5%
DRAINAGE BLANKET	4" ASPHALT TREATED
BIT.BASE	2 1/2" CLASS I
BINDER	1 1/2" CLASS I
SURFACE	1" CLASS I
D G A	WEDGE
EDGE DRAIN	4" PERF PIPE WITH FABRIC & SOCK

TYPE CONSTRUCTION	GRADE, DRAIN & SURFACING
LENGTH	1.97 MILES
CONTRACTOR	S&H G&D;MAGO SURF
WORK STARTED	4/15/87
PROJECT COMPLETE	10/15/90
TYPICAL SECTION	SEE APPENDIX A

PAVEMENT-DESIGNED

SUBGRADE	UNCLASSIFIED
STABILIZATION	6" LIME - 6%
FILTER FABRIC	GEOTEXTILE TYPE 2
DRAINAGE BLANKET	4" ASPHALT TREATED
BIT.BASE	8 1/2" CLASS I
BINDER	1 1/2" CLASS I
SURFACE	1 1/4" CLASS A OR K

SHOULDER

STABILIZATION	6" LIME - 6%
FILTER FABRIC	GEOTEXTILE TYPE 2
DRAINAGE BLANKET	FULL DEPTH ASPHALT TREATED
BIT.BASE	2 1/2" CLASS I
BINDER	1 1/2" CLASS I
SURFACE	1" CLASS I
D G A	WEDGE
EDGE DRAINS	4" PERF PIPE WITH FABRIC & SOCK

PAVEMENT AS BUILT

SUBGRADE	UNCLASSIFIED
STABILIZATION	6" LIME - 5%
DRAINAGE BLANKET	4" ASPHALT TREATED
BIT.BASE	8 1/2" CLASS I
BINDER	1 1/2" CLASS I
SURFACE	1" CLASS K

SHOULDER

STABILIZATION	6" LIME - 5%
DRAINAGE BLANKET	4" ASPHALT TREATED
BIT.BASE	2 1/2" CLASS I
BINDER	1 1/2" CLASS I
SURFACE	1" CLASS I
D G A	WEDGE
EDGE DRAIN	4" PERF PIPE WITH FABRIC & SOCK

TYPE CONSTRUCTION	GRADE, DRAIN & SURFACING
LENGTH	1.28 MILES
CONTRACTOR	HOLLOWAY G&D;MAGO SURF
WORK STARTED	4/15/87
PROJECT COMPLETE	4/30/90
TYPICAL SECTION	SEE APPENDIX A

PAVEMENT-DESIGNED

SUBGRADE	UNCLASSIFIED
STABILIZATION	6" LIME - 6%
FILTER FABRIC	GEOTEXTILE TYPE 2
DRAINAGE BLANKET	4" ASPHALT TREATED
BIT.BASE	8 1/2" CLASS I
BINDER	1 1/2" CLASS I
SURFACE	1 1/4" CLASS A OR K

SHOULDER

STABILIZATION	6" LIME - 6%
FILTER FABRIC	GEOTEXTILE TYPE 2
DRAINAGE BLANKET	VAR DEPTH ASPHALT TREATED
BIT.BASE	2 1/2" CLASS I
BINDER	1 1/2" CLASS I
SURFACE	1" CLASS I
D G A	WEDGE
EDGE DRAINS	4" PERF PIPE WITH FABRIC & SOCK

PAVEMENT AS BUILT

SUBGRADE	UNCLASSIFIED
STABILIZATION	9" LIME - 4%
DRAINAGE BLANKET	4" ASPHALT TREATED
BIT.BASE	8 1/2" CLASS I
BINDER	1 1/2" CLASS I
SURFACE	1" CLASS K

SHOULDER

STABILIZATION	9" LIME - 4%
DRAINAGE BLANKET	4" ASPHALT TREATED
BIT.BASE	2 1/2" CLASS I
BINDER	1 1/2" CLASS I
SURFACE	1" CLASS I
D G A	WEDGE
EDGE DRAIN	4" PERF PIPE WITH FABRIC & SOCK

TYPE CONSTRUCTION	GRADE,DRAIN & SURFACING
LENGTH	2.72 MILES
CONTRACTOR	ELMO GREER G&D;MAGO SURF
WORK STARTED	6/9/86
PROJECT COMPLETE	4/30/90
TYPICAL SECTION	SEE APPENDIX A

PAVEMENT-DESIGNED

SUBGRADE	UNCLASSIFIED
BASE	4"STABILIZED AGGREGATE
DRAINAGE BLANKET	4" ASPHALT TREATED
BIT.BASE	8 1/2" CLASS I
BINDER	1 1/2" CLASS I
SURFACE	1 1/4" CLASS A OR K

SHOULDER

BASE	4"STABILIZED AGGREGATE
DRAINAGE BLANKET	VAR DEPTH ASPHALT TREATED
BIT.BASE	2 1/2" CLASS I
BINDER	1 1/2" CLASS I
SURFACE	1" CLASS I
D G A	WEDGE
EDGE DRAINS	4" PERF PIPE WITH FABRIC & SOCK

PAVEMENT AS BUILT

SUBGRADE	UNCLASSIFIED
STABILIZATION	9" LIME - 4%
DRAINAGE BLANKET	4" ASPHALT TREATED
BIT.BASE	8 1/2" CLASS I
BINDER	1 1/2" CLASS I
SURFACE	1" CLASS K

SHOULDER

STABILIZATION	6" LIME - 6%
DRAINAGE BLANKET	4" ASPHALT TREATED
BIT.BASE	2 1/2" CLASS I
BINDER	1 1/2" CLASS I
SURFACE	1" CLASS I
D G A	WEDGE
EDGE DRAIN	4" PERF PIPE WITH FABRIC & SOCK

TYPE CONSTRUCTION	GRADE, DRAIN & SURFACING
LENGTH	4.31 MILES
CONTRACTOR	HOLLOWAY G&D;E GREER SURF
WORK STARTED	9/17/86
PROJECT COMPLETE	7/16/89
TYPICAL SECTION	SEE PAGE 9.1 & APPENDIX A&B

PAVEMENT-DESIGNED

SUBGRADE	UNCLASSIFIED
BASE	4"STABILIZED AGGREGATE
DRAINAGE BLANKET	4" AGGREGATE NO.57
BIT.BASE	9" CLASS I
BINDER	1 1/2" CLASS I
SURFACE	1 " CLASS K

SHOULDER

BASE	4"STABILIZED AGGREGATE
DRAINAGE BLANKET	FULL DEPTH AGGREGATE NO.57
BIT.BASE	3" CLASS I
BINDER	1 1/2" CLASS I
SURFACE	1" CLASS I
EDGE DRAINS	4" PERF PIPE

PAVEMENT AS BUILT

SUBGRADE	UNCLASSIFIED
BASE	4"STABILIZED AGGREGATE
DRAINAGE BLANKET	4" AGGREGATE NO.57
BIT.BASE	9" CLASS I
BINDER	1 1/2" CLASS I
SURFACE	1" CLASS K

SHOULDER

BASE	4"STABILIZED AGGREGATE
DRAINAGE BLANKET	FULL DEPTH AGGREGATE NO.57
BIT.BASE	3" CLASS I
BINDER	1 1/2" CLASS I
SURFACE	1" CLASS I
EDGE DRAIN	4" PERF PIPE WITH SOCK

TYPE CONSTRUCTION	GRADE,DRAIN & SURFACING
LENGTH	2.29 MILES
CONTRACTOR	HALL G&D;E GREER SURF
WORK STARTED	11/4/85
PROJECT COMPLETE	7/16/89
TYPICAL SECTION	SEE PAGE 9.1 & APPENDIX B

PAVEMENT-DESIGNED

SUBGRADE	UNCLASSIFIED
BASE	4"STABILIZED AGGREGATE
DRAINAGE BLANKET	4" AGGREGATE NO.57
BIT.BASE	9" CLASS I
BINDER	1 1/2" CLASS I
SURFACE	1 " CLASS K

SHOULDER

BASE	4"STABILIZED AGGREGATE
DRAINAGE BLANKET	FULL DEPTH AGGREGATE NO.57
BIT.BASE	3" CLASS I
BINDER	1 1/2" CLASS I
SURFACE	1" CLASS I
EDGE DRAINS	4" PERF PIPE

PAVEMENT AS BUILT

SUBGRADE	UNCLASSIFIED
BASE	4"STABILIZED AGGREGATE
DRAINAGE BLANKET	4" AGGREGATE NO.57
BIT.BASE	9" CLASS I
BINDER	1 1/2" CLASS I
SURFACE	1" CLASS K

SHOULDER

BASE	4"STABILIZED AGGREGATE
DRAINAGE BLANKET	FULL DEPTH AGGREGATE NO.57
BIT.BASE	3" CLASS I
BINDER	1 1/2" CLASS I
SURFACE	1" CLASS I
EDGE DRAIN	4" PERF PIPE WITH SOCK

AA HIGHWAY

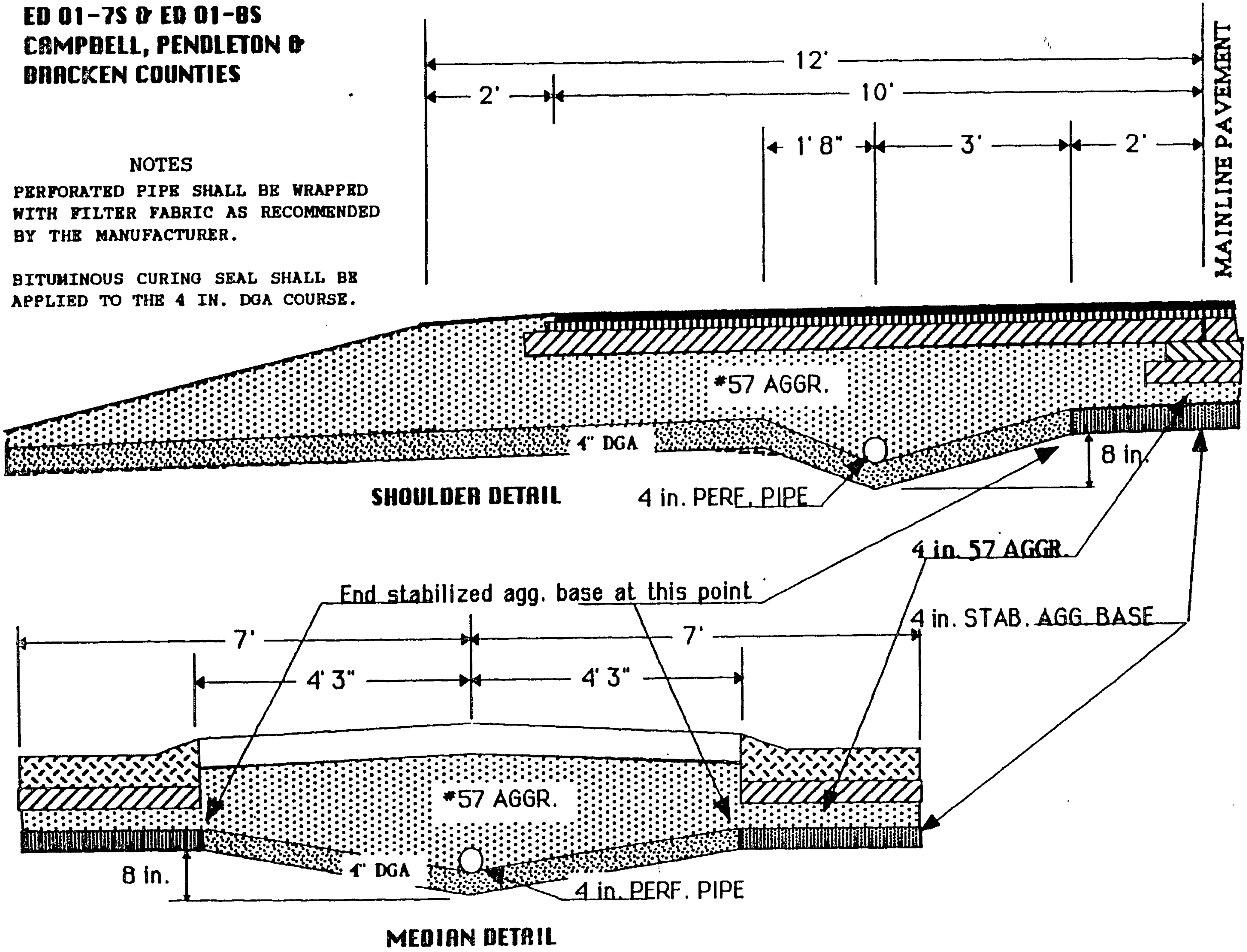
ED 01-7S & ED 01-8S
CAMPBELL, PENDLETON &
BRACKEN COUNTIES

PAVEMENT DRAINAGE BLANKET DETAIL

NOTES

PERFORATED PIPE SHALL BE WRAPPED WITH FILTER FABRIC AS RECOMMENDED BY THE MANUFACTURER.

BITUMINOUS CURING SEAL SHALL BE APPLIED TO THE 4 IN. DGA COURSE.



TYPE CONSTRUCTION	GRADE,DRAIN & SURFACING
LENGTH	6.72 MILES
CONTRACTOR	HOLLOWAY 9;M.GREER 10;G&D EATON; SURF.
WORK STARTED	8/26/86
PROJECT COMPLETE	4/17/90
TYPICAL SECTION	SEE APPENDIX B

PAVEMENT-DESIGNED

SUBGRADE	UNCLASSIFIED
BASE	4"STABILIZED AGGREGATE
DRAINAGE BLANKET	4" ASPHALT TREATED
BIT.BASE	8" CLASS I
BINDER	1 1/2" CLASS I
SURFACE	1 " CLASS A OR K

SHOULDER

BASE	4"STABILIZED AGGREGATE
DRAINAGE BLANKET	VAR DEPTH ASPHALT TREATED
BIT.BASE	2 1/2" CLASS I
BINDER	1 1/2" CLASS I
SURFACE	1" CLASS I
EDGE DRAINS	4" PERF PIPE W/FABRIC & SOCK

PAVEMENT AS BUILT

SUBGRADE	UNCLASSIFIED
BASE	4"STABILIZED AGGREGATE
DRAINAGE BLANKET	4" ASPHALT TREATED
BIT.BASE	8" CLASS I
BINDER	1 1/2" CLASS I
SURFACE	1" CLASS A

SHOULDER

BASE	4"STABILIZED AGGREGATE
DRAINAGE BLANKET	4" ASPHALT TREATED
BIT.BASE	2 1/2" CLASS I
BINDER	1 1/2" CLASS I
SURFACE	1" CLASS I
EDGE DRAIN	4" PERF PIPE W/FABRIC & SOCK
D G A	WEDGE

TYPE CONSTRUCTION	GRADE, DRAIN & SURFACING
LENGTH	3.35 MILES
CONTRACTOR	MILLER G&D; LEX QUARRY SURF.
WORK STARTED	12/16/87
PROJECT COMPLETE	9/5/90
TYPICAL SECTION	SEE APPENDIX B
PAVEMENT-DESIGNED	
SUBGRADE	UNCLASSIFIED
STABILIZATION	6"LIME-6%
FILTER FABRIC	GEOTEXTILE TYPE 2
DRAINAGE BLANKET	4" ASPHALT TREATED
BIT.BASE	7" CLASS I
BINDER	1 1/2" CLASS I
SURFACE	1 " CLASS A OR K
SHOULDER	
STABILIZATION	6"LIME-6%
FILTER FABRIC	GEOTEXTILE TYPE 2
DRAINAGE BLANKET	VAR DEPTH ASPHALT TREATED
BIT.BASE	2 1/2" CLASS I
BINDER	1 1/2" CLASS I
SURFACE	1" CLASS I
EDGE DRAINS	4" PERF PIPE W/FABRIC & SOCK
D G A	WEDGE
PAVEMENT AS BUILT	
SUBGRADE	UNCLASSIFIED
BASE	STABILIZED AGGREGATE
DRAINAGE BLANKET	4" ASPHALT TREATED
BIT.BASE	7" CLASS I
BINDER	1 1/2" CLASS I
SURFACE	1" CLASS A
SHOULDER	
BASE	STABILIZED AGGREGATE
DRAINAGE BLANKET	VAR DEPTH ASPHALT TREATED
BIT.BASE	2 1/2" CLASS I
BINDER	1 1/2" CLASS I
SURFACE	1" CLASS I
EDGE DRAIN	4" PERF PIPE W/FABRIC & SOCK
D G A	WEDGE

TYPE CONSTRUCTION	GRADE,DRAIN & SURFACING
LENGTH	3.94 MILES
CONTRACTOR	R C DURR G&D; LEX QUARRY SURF.
WORK STARTED	7/2/86
PROJECT COMPLETE	8/7/90
TYPICAL SECTION	SEE APPENDIX B

PAVEMENT-DESIGNED

SUBGRADE	UNCLASSIFIED
STABILIZATION	6"LIME-6%
FILTER FABRIC	GEOTEXTILE TYPE 2
DRAINAGE BLANKET	4" ASPHALT TREATED
BIT.BASE	7" CLASS I
BINDER	1 1/2" CLASS I
SURFACE	1 " CLASS A OR K

SHOULDER

STABILIZATION	6"LIME-6%
FILTER FABRIC	GEOTEXTILE TYPE 2
DRAINAGE BLANKET	VAR DEPTH ASPHALT TREATED
BIT.BASE	2 1/2" CLASS I
BINDER	1 1/2" CLASS I
SURFACE	1" CLASS I
D G A	WEDGE
EDGE DRAINS	4" PERF PIPE W/FABRIC & SOCK

PAVEMENT AS BUILT

SUBGRADE	UNCLASSIFIED
BASE 1792 TO 1844	4" STABILIZED AGGREGATE
STABILIZATION	6"LIME-6% 1844 TO 2000+50
DRAINAGE BLANKET	4" ASPHALT TREATED
BIT.BASE	7" CLASS I
BINDER	1 1/2" CLASS I
SURFACE	1" CLASS A

SHOULDER

BASE 1792 TO 1844	4" EARTH BUILT UP
STABILIZATION	6"LIME-6% 1844 TO 2000+50
DRAINAGE BLANKET	VAR DEPTH ASPHALT TREATED
BIT.BASE	2 1/2" CLASS I
BINDER	1 1/2" CLASS I
SURFACE	1" CLASS I
EDGE DRAIN	4" PERF PIPE W/FABRIC & SOCK
D G A	WEDGE

TYPE CONSTRUCTION	GRADE,DRAIN & SURFACING
LENGTH	9.13 MILES
CONTRACTOR	MILLER G&D; MAYS SURF.
WORK STARTED	5/6/86
PROJECT COMPLETE	6/27/89
TYPICAL SECTION	SEE APPENDIX B & PAGE 13.1

PAVEMENT-DESIGNED

SUBGRADE	UNCLASSIFIED
BASE	4" D G A
BIT.BASE	8" CLASS I
BINDER	1 1/2" CLASS I
SURFACE	1 " CLASS K

SHOULDER

BASE	9 1/2" D G A
BIT.BASE	3 1/2" CLASS I
BINDER	1 1/2" CLASS I
SURFACE	1" CLASS I
EDGE DRAINS	4" PERF PIPE W/FABRIC

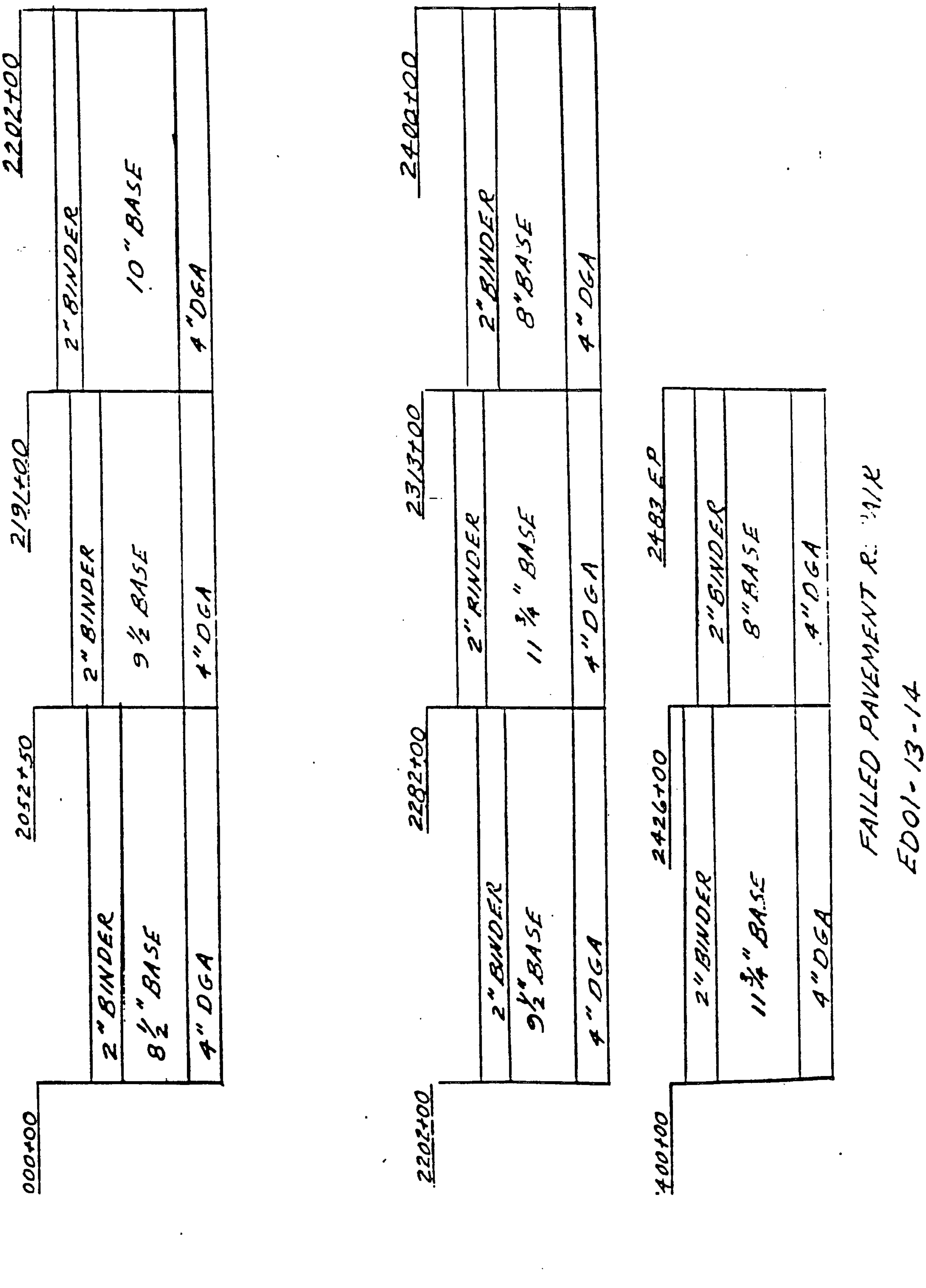
PAVEMENT AS BUILT

SUBGRADE	UNCLASSIFIED
BASE	4" D G A
BIT.BASE *	8" CLASS I
BINDER *	1 1/2" CLASS I
SURFACE	1" CLASS K

SHOULDER

BASE	FULL DEPTH D G A
BIT.BASE	3 1/2" CLASS I
BINDER	1 1/2" CLASS I
SURFACE	1" CLASS I
EDGE DRAIN	MONSANTO DRAINAGE MAT

* SEE PAGE 13.1 FOR OVERLAY DETAIL


000+00
2052+50
2191+00
2202+00
2 " BINDER
8 1/2 " BASE
4 " DGA
2 " BINDER
9 1/2 BASE
4 " DGA
2 " BINDER
10 " BASE
4 " DGA
2202+00
2282+00
2313+00
2400+00
2 " BINDER
9 1/2 " BASE
4 " DGA
2 " BINDER
11 3/4 " BASE
4 " DGA
2 " BINDER
8 " BASE
4 " DGA
400+00
2426+00
2483 EP
2 " BINDER
11 3/4 " BASE
4 " DGA
2 " BINDER
8 " BASE
4 " DGA
FAILED PAVEMENT R
ED01-13-14

TYPE CONSTRUCTION	SURFACE & GRADE & DRAIN
LENGTH	8.13 MILES
CONTRACTOR	DURR G&D; LEX QUARRY SURF.
WORK STARTED	3/11/86
PROJECT COMPLETE	7/7/89
TYPICAL SECTION	SEE APPENDIX A & B

PAVEMENT-DESIGNED

SUBGRADE	UNCLASSIFIED
BASE	4" D G A
BIT.BASE	8" CLASS I
BINDER	1 1/2" CLASS I
SURFACE	1 " CLASS K

SHOULDER

BASE	9 1/2" D G A
BIT.BASE	3 1/2" CLASS I
BINDER	1 1/2" CLASS I
SURFACE	1" CLASS I
EDGE DRAINS	4" PERF PIPE W/FABRIC

PAVEMENT AS BUILT

SUBGRADE	UNCLASSIFIED
BASE	4" D G A
BIT.BASE	8" CLASS I
BINDER	1 1/2" CLASS I
SURFACE	1" CLASS K

SHOULDER

BASE	FULL DEPTH D G A
BIT.BASE	3 1/2" CLASS I
BINDER	1 1/2" CLASS I
SURFACE	1" CLASS I
EDGE DRAIN	4" PERF PIPE W/FABRIC

TYPE CONSTRUCTION	GRADE & DRAIN & SURFACE
LENGTH	6.61 MILES
CONTRACTOR	S&H G&D; CARRY-MAYS SURF.
WORK STARTED	5/27/86
PROJECT COMPLETE	/13/89
TYPICAL SECTION	SEE APPENDIX B

PAVEMENT-DESIGNED

SUBGRADE	UNCLASSIFIED
STABILIZATION	6"LIME-6%
BASE	4" D G A
BIT.BASE	8" CLASS I
BINDER	1 1/2" CLASS I
SURFACE	1 " CLASS K

SHOULDER

BASE	9 1/2" D G A
BIT.BASE	3 1/2" CLASS I
BINDER	1 1/2" CLASS I
SURFACE	1" CLASS I
EDGE DRAINS	4" PERF PIPE W/FABRIC

PAVEMENT AS BUILT

SUBGRADE	UNCLASSIFIED
STABILIZATION	6"LIME-6%
BASE	4" D G A
BIT.BASE	8" CLASS I
BINDER	1 1/2" CLASS I
SURFACE	1 " CLASS K

SHOULDER

STABILIZATION	6"LIME-6%
BASE	FULL DEPTH D G A
BIT.BASE	3 1/2" CLASS I
BINDER	1 1/2" CLASS I
SURFACE	1" CLASS I
EDGE DRAIN	4" PERF PIPE W/FABRIC

TYPE CONSTRUCTION	GRADE & DRAIN & SURFACE
LENGTH	3.43 MILES
CONTRACTOR	MAYS-JUDY
WORK STARTED	10/2/86
PROJECT COMPLETE	6/21/88
TYPICAL SECTION	SEE APPENDIX A

<u>PAVEMENT-DESIGNED</u>

SUBGRADE	UNCLASSIFIED
STABILIZATION	6"LIME-6%
BASE	4" D G A
BIT.BASE	81/2" CLASS I
BINDER	1 1/2" CLASS I
SURFACE	1 " CLASS K

<u>SHOULDER</u>

STABILIZATION	6"LIME-6%
BASE	FULL DEPTH D G A
BIT.BASE	3 1/2" CLASS I
BINDER	1 1/2" CLASS I
SURFACE	1" CLASS I
EDGE DRAINS	4" PERF PIPE W/FABRIC

<u>PAVEMENT AS BUILT</u>

SUBGRADE	UNCLASSIFIED
STABILIZATION	6"LIME-6%
BASE	4" D G A
BIT.BASE	81/2" CLASS I
BINDER	1 1/2" CLASS I
SURFACE	1 " CLASS K

SHOULDER

STABILIZATION	6"LIME-6%
BASE	FULL DEPTH D G A
BIT.BASE	3 1/2" CLASS I
BINDER	1 1/2" CLASS I
SURFACE	1" CLASS I

TYPE CONSTRUCTION	GRADE & DRAIN & SURF
LENGTH	3.98 MILES
CONTRACTOR	E.GREER
WORK STARTED	9/12/86
PROJECT COMPLETE	12/1/88
TYPICAL SECTION	SEE APPENDIX B
PAVEMENT-DESIGNED	
SUBGRADE	24" ROCK ROADBED
BASE	4" D G A
BIT.BASE	6 1/2" CLASS I
BINDER	1 1/2" CLASS I
SURFACE	1 " CLASS K
SHOULDER	
BASE	FULL DEPTH D G A
BIT.BASE	3 1/2" CLASS I
BINDER	1 1/2" CLASS I
SURFACE	1" CLASS I
PAVEMENT AS BUILT	
SUBGRADE	24" ROCK ROADBED
BASE	4" D G A
BIT.BASE	6 1/2" CLASS I
BINDER	1 1/2" CLASS I
SURFACE	1 " CLASS K
SHOULDER	
BASE	FULL DEPTH D G A
BIT.BASE	3 1/2" CLASS I
BINDER	1 1/2" CLASS I
SURFACE	1" CLASS I

TYPE CONSTRUCTION	GRADE & DRAIN & SURF
LENGTH	3.67 MILES
CONTRACTOR	E.GREER
WORK STARTED	2/19/87
PROJECT COMPLETE	10/25/89
TYPICAL SECTION	SEE APPENDIX B
PAVEMENT-DESIGNED	
SUBGRADE	UNCLASSIFIED
BASE	4" D G A
BIT.BASE	8" CLASS I
BINDER	1 1/2" CLASS I
SURFACE	1 " CLASS K
SHOULDER	
BASE	FULL DEPTH D G A
BIT.BASE	3 1/2" CLASS I
BINDER	1 1/2" CLASS I
SURFACE	1" CLASS I
PAVEMENT AS BUILT	
SUBGRADE	12"CEMENT 10%
DRAINAGE BLANKET	4" ASPHALT TREATED
BIT.BASE	4 1/2" CLASS I
BINDER	1 1/2" CLASS I
SURFACE	1 " CLASS K
SHOULDER	
DRAINAGE BLANKET	FULL DEPTH INCLUDING WEDGE
BIT.BASE	3 1/2" CLASS I
BINDER	1 1/2" CLASS I
SURFACE	1" CLASS I

TYPE CONSTRUCTION	GRADE & DRAIN & SURF
LENGTH	2.84 MILES
CONTRACTOR	E.GREER
WORK STARTED	10/15/87
PROJECT COMPLETE	10/23/89
TYPICAL SECTION	SEE APPENDIX B
PAVEMENT-DESIGNED	
SUBGRADE	24" ROCK ROADBED
BASE	4" D G A
BIT.BASE	5" CLASS I
BINDER	1 1/2" CLASS I
SURFACE	1 " CLASS K
SHOULDER	
BASE	FULL DEPTH D G A
BIT.BASE	3 1/2" CLASS I
BINDER	1 1/2" CLASS I
SURFACE	1" CLASS I
PAVEMENT AS BUILT	
SUBGRADE	24" ROCK ROADBED
DRAINAGE BLANKET	4" D G A
BIT.BASE	6" CLASS I
BINDER	1 1/2" CLASS I
SURFACE	1 " CLASS K
SHOULDER	
BASE	FULL DEPTH D G A
BIT.BASE	3 1/2" CLASS I
BINDER	1 1/2" CLASS I
SURFACE	1" CLASS I

TYPE CONSTRUCTION	GRADE & DRAIN & SURF
LENGTH	2.09 MILES
CONTRACTOR	BAZZACK G&D;LEX QUA.SURF
WORK STARTED	11/11/87
PROJECT COMPLETE	4/17/90
TYPICAL SECTION	SEE APPENDIX B
<u>PAVEMENT-DESIGNED</u>	
SUBGRADE	24" ROCK ROADBED
BASE	4" D G A
BIT.BASE	6" CLASS I
BINDER	1 1/2" CLASS I
SURFACE	1 " CLASS K
<u>SHOULDER</u>	
BASE	FULL DEPTH D G A
BIT.BASE	3 1/2" CLASS I
BINDER	1 1/2" CLASS I
SURFACE	1" CLASS I
<u>PAVEMENT AS BUILT</u>	
SUBGRADE	24" ROCK ROADBED
BASE	4" CRUSHED STONE
BIT.BASE	6" CLASS I
BINDER	1 1/2" CLASS I
SURFACE	1 " CLASS K
SHOULDER	
BASE	FULL DEPTH D G A
BIT.BASE	3 1/2" CLASS I
BINDER	1 1/2" CLASS I
SURFACE	1" CLASS I

TYPE CONSTRUCTION	GRADE & DRAIN & SURF
LENGTH	2.35 MILES
CONTRACTOR	E.GREER G&D;EASY RIDER SURF.
WORK STARTED	12/17/87
PROJECT COMPLETE	10/8/90
TYPICAL SECTION	SEE APPENDIX B
PAVEMENT-DESIGNED	
SUBGRADE	12" ROCK ROADBED
BASE	4" D G A
BIT.BASE	6" CLASS I
BINDER	1 1/2" CLASS I
SURFACE	1 " CLASS I
SHOULDER	
BASE	FULL DEPTH D G A
BIT.BASE	3 1/2" CLASS I
BINDER	1 1/2" CLASS I
SURFACE	1" CLASS I
PAVEMENT AS BUILT	
SUBGRADE	12" ROCK ROADBED
BSAE	4" D G A
BIT.BASE	6" CLASS I
BINDER	1 1/2" CLASS I
SURFACE	1 " CLASS I
SHOULDER	
BASE	FULL DEPTH D G A
BIT.BASE	3 1/2" CLASS I
BINDER	1 1/2" CLASS I
SURFACE	1" CLASS I

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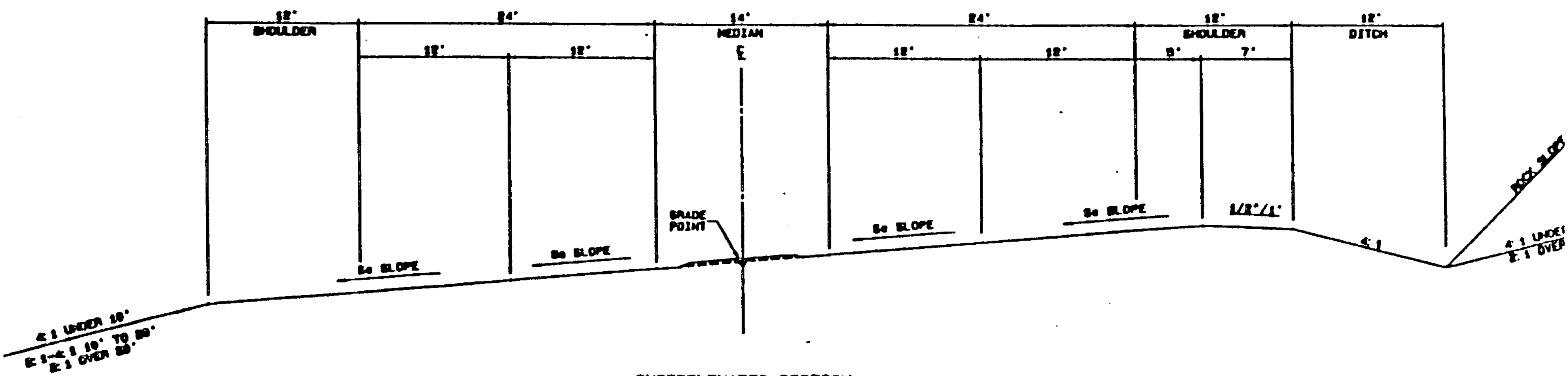
TYPE CONSTRUCTION	GRADE & DRAIN & SURF
LENGTH	2.21 MILES
CONTRACTOR	HOLLOWAY G&D; SURF.
WORK STARTED	12/9/87
PROJECT COMPLETE	8/14/89
TYPICAL SECTION	SEE APPENDIX B
<u>PAVEMENT-DESIGNED</u>	
SUBGRADE	24" ROCK ROADBED
BASE	4" D G A
BIT.BASE	6" CLASS I
BINDER	1 1/2" CLASS I
SURFACE	1 " CLASS K
<u>SHOULDER</u>	
BASE	FULL DEPTH D G A
BIT.BASE	3 1/2" CLASS I
BINDER	1 1/2" CLASS I
SURFACE	1" CLASS I
<u>PAVEMENT AS BUILT</u>	
SUBGRADE	24" ROCK ROADBED
BSAE	4" D G A
BIT.BASE	6" CLASS I
BINDER	1 1/2" CLASS I
SURFACE	1 " CLASS K
<u>SHOULDER</u>	
BASE	FULL DEPTH D G A
BIT.BASE	3 1/2" CLASS I
BINDER	1 1/2" CLASS I
SURFACE	1" CLASS I

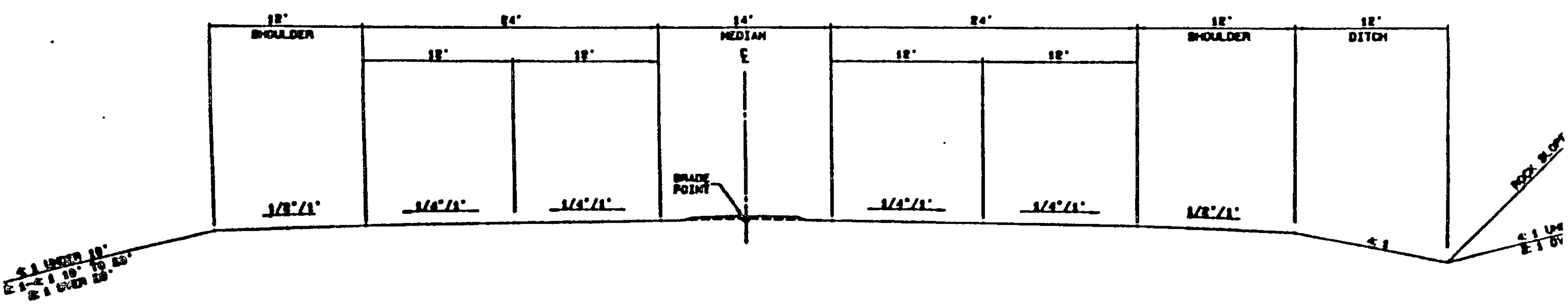
TYPE CONSTRUCTION	GRADE & DRAIN & SURF
LENGTH	2.01 MILES
CONTRACTOR	E.GREER G&D;E.RIDER SURF.
WORK STARTED	12/22/87
PROJECT COMPLETE	11/27/90
TYPICAL SECTION	SEE APPENDIX B
PAVEMENT-DESIGNED	
SUBGRADE	24" ROCK ROADBED
BASE	4" D G A
BIT.BASE	6" CLASS I
BINDER	1 1/2" CLASS I
SURFACE	1 " CLASS I
SHOULDER	
BASE	FULL DEPTH D G A
BIT.BASE	3 1/2" CLASS I
BINDER	1 1/2" CLASS I
SURFACE	1" CLASS I
PAVEMENT AS BUILT	
SUBGRADE	24" ROCK ROADBED
BSAE	4" D G A
BIT.BASE	6" CLASS I
BINDER	1 1/2" CLASS I
SURFACE	1 " CLASS I
SHOULDER	
BASE	FULL DEPTH D G A
BIT.BASE	3 1/2" CLASS I
BINDER	1 1/2" CLASS I
SURFACE	1" CLASS I

'AA' HIGHWAY
TYPICAL SECTIONS

I-275 TO IVOR ROAD
US 68 TO KY RTE 11

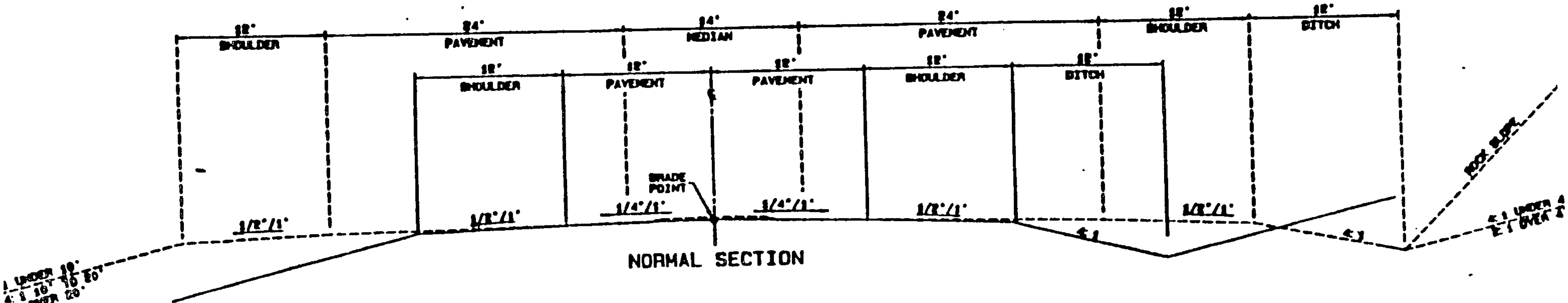


SUPERELEVATED SECTION

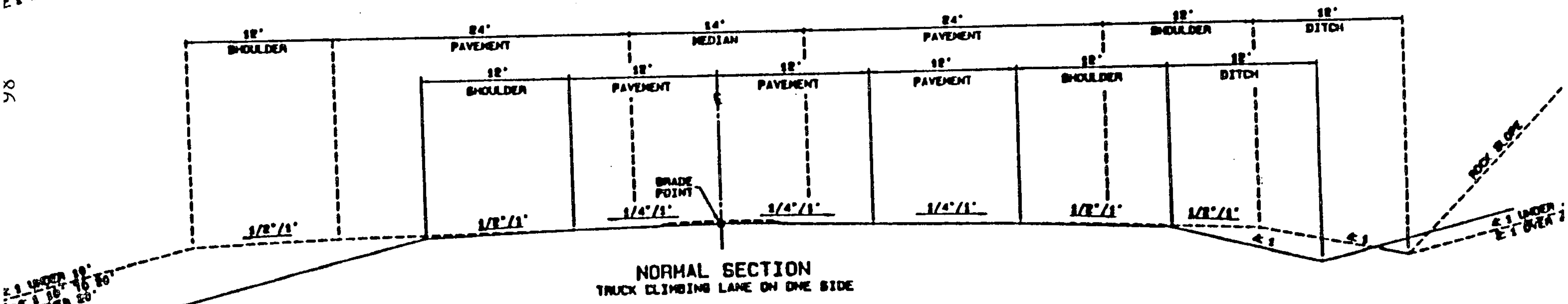


NORMAL SECTION

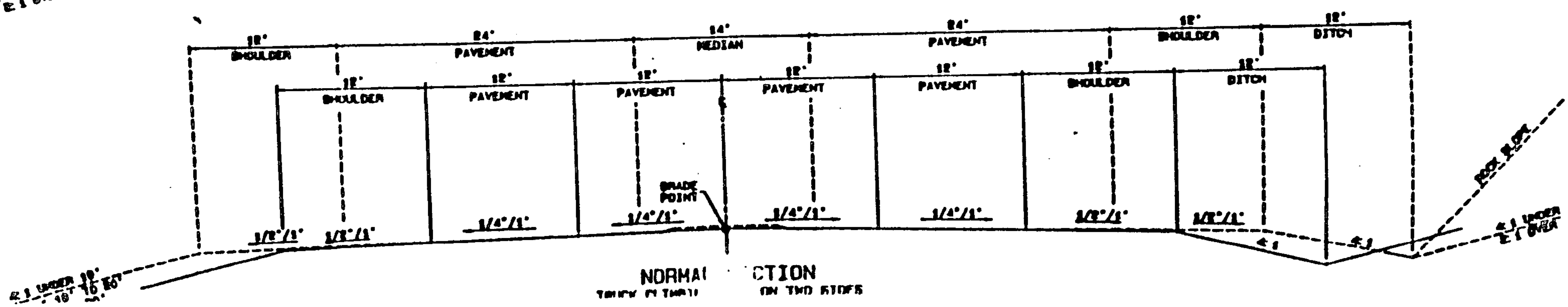
'AA' HIGHWAY
TYPICAL SECTIONS
IVOR ROAD TO US 60
KY RTE 11 TO GRAYSON - GREENUP SPLIT



NORMAL SECTION



NORMAL SECTION
TRUCK CLIMBING LANE ON ONE SIDE



NORMAL SECTION
TRUCK CLIMBING LANE ON TWO SIDES

A A	LENGTH	CONTRACT TYPE	CONTRACT TIME	DAYS USED	CONTRACTOR	CONTRACT AMOUNT	ADJUSTMENT	ADJUSTED AMOUNT	PAID TO DATE	COST/MILE	COMPLETE
C1	2.727	G.D.&S.	737	764	R GREER	11,544.08	605.57	12,149.65	12,078.24	4,455.32	11/13/90
C2	1.962	G.D.I.S.	937	938	R GREER	9,077.82	292.60	9,370.42	9,369.15	4,775.95	11/14/90
C2	1.962	SURF	158	148	EATON	3,578.07	5.70	3,583.77	2,921.65	1,826.59	12/7/90
C3	2.723	G.D.I.S.	317	239	ADDINGTON	7,356.50	437.94	7,794.45	7,631.67	2,862.45	6/8/90
C3	2.639	SURF	155	126	EATON	3,145.32	.00	3,145.32	2,821.40	1,191.86	10/17/90
12MI CK		BRIDGE	304	311	C.J.MAHAN	1,651.98	.00	1,651.98	1,617.99		11/8/90
B1-2	2.32	G.D.I.S.	589	444	ADDINGTON	8,738.45	(320.80)	8,417.65	8,359.98	3,622.05	12/7/89
B1-2	2.17	SURF	133	163	MAGO	2,275.62	3.78	2,279.40	2,137.55	1,050.41	11/14/90
B3	.963	G.D.I.S.	180	177	S&H	2,098.73	45.19	2,143.92	2,118.42	2,226.29	8/8/88
B4	1.004	G.D.I.S.	151	149	S&H	1,764.64	5.55	1,770.18	1,754.49	1,763.13	9/16/88
B3-4	1.967	SURF	677	677	MAGO	1,798.92	146.51	1,945.44	1,746.80	989.04	10/15/90
6-A	1.105	G&D	182	143	HOLLOWAY	1,753.35	110.60	1,863.95	1,798.66	1,686.83	11/28/88
6	2.746	G.D.I.S.	271	200	R.GREER	4,684.80	964.71	5,649.51	5,636.51	2,057.36	12/4/87
6A	1.277	SURF	509	509	MAGO	1,244.30	(35.78)	1,208.51	1,140.98	946.37	4/30/90
6	2.715	SURF	509	509	MAGO	2,675.45	109.58	2,785.03	2,671.84	1,025.79	4/30/90
TOTAL	28.284				FLOR-HUC	63,388.03	2,371.14	65,759.17	63,805.33	2,324.96	
7	4.308	G.D.I.S.	312	246	HOLLOWAY	8,460.58	422.03	8,882.62	8,858.89	2,061.89	8/24/88
8	2.289	G.D.I.S.	270	287	HALL	4,346.94	642.20	4,989.14	4,838.66	2,179.61	10/19/87
7-8	6.597	SURF	161	160	R.GREER	5,082.54	(90.32)	4,992.22	4,525.80	756.74	7/6/89
9	3.352	G.D.I.S.	302	267	HOLLOWAY	10,700.64	47.15	10,747.79	10,699.72	3,206.38	9/30/88
10	3.371	G.D.I.S.	275	152	M.GREER	10,843.09	197.19	11,040.29	11,022.09	3,275.08	3/24/88
9-10	6.723	SURF	518	516	EATON	4,432.21	(11.49)	4,420.72	4,260.90	657.55	4/17/90
TOTAL	26.640				JAM-WIN	43,866.01	1,206.76	45,072.77	44,206.08	1,691.92	
11	3.460	G.D.I.S	604	602	MILLER	7,993.77	.00	7,993.77	7,766.05	2,310.34	8/2/89
11	3.350	SURF	510	567	LEX.QUA.	1,946.07	23.81	1,969.88	1,723.54	588.03	9/5/90
12	3.939	SURF	469	538	LEX.QUA.	2,091.43	(32.35)	2,059.08	1,858.48	522.74	8/7/90
12	4.157	G.D.I.S.	277	216	R.C.DURR	7,632.93	21.43	7,654.36	7,136.29	1,841.32	6/10/88
13	3.548	G.D.I.S.	244	233	MILLER	5,584.91	88.40	5,673.31	5,628.51	1,599.02	11/2/87
13-14	9.125	SURF	207	204	MAYS	4,230.22	903.75	5,133.97	5,123.83	562.63	6/27/89
14	4.043	G.D.I.S.	D.C.	506	MILLER	3,789.73	230.17	4,019.91	3,981.11	994.29	7/24 87
TOTAL	31.622				VAN-MEL	33,269.06	1,235.21	34,504.27	33,217.82	1,091.15	
15-A	3.049	G.D.I.S	539	534	R.C.DURR	2,616.30	74.88	2,691.18	2,594.24	882.64	8/28/87
15B-16	8.125	S.I.G.D	251	245	LEX.QUA.	5,432.39	944.13	6,376.53	6,313.26	784.80	7/7/89
16	3.262	G.D.I.S.	176	138	S&H	2,704.33	28.29	2,732.61	2,720.40	837.71	8/19/87
17-18	6.613	G.D.I.S.	243	239	S&H	4,356.60	103.95	4,460.55	4,453.22	674.51	6/6/88
17-18	6.503	SURF	126	124	CAREY&MAYS	3,416.85	80.21	3,497.06	3,420.63	537.76	6/13/89
TOTAL	27.552				HAZ-ERD	18526.467	1231.457	19757.924	19501.748	717.11	
19	3.428	G.D.&S	183	182	MAYS-JUDY	5,256.89	23.05	5,279.94	5,268.08	1,540.24	6/21/88
20	3.977	G.D.&S	278	265	R.GREER	7,443.01	825.55	8,268.56	8,262.54	2,079.09	12/1/88
21-A	3.674	G.D.&S	322	270	R.GREER	7,432.27	1,970.25	9,402.52	9,151.99	2,559.20	10/25/89
21B-22	2.840	G.D.&S	315	272	R.GREER	5,940.94	919.71	6,860.65	6,702.55	2,415.72	10/23/89
TOTAL	13.919				H-M-B	26073.111	3738.560	29811.670	29385.160	2,141.80	
23	2.348	G.D.I.S.	260	106	BIZZACK	5,344.81	39.27	5,384.08	5,289.83	2,293.05	9/9/88
24	2.348	G.D.I.S.	193	188	R.GREER	2,857.74	295.30	3,153.04	2,997.17	1,342.86	7/21/89
23	2.092	SURF	305	322	LEX.QUA.	872.83	4.15	876.97	798.73	419.20	4/17/90
24	2.348	SURF	169	132	R-RIDER	1,268.68	139.98	1,408.65	1,289.23	599.94	10/8/90
25	2.211	G.D.&S	214	211	HOLLOWAY	4,752.11	354.75	5,106.85	4,914.87	2,309.75	8/14/89
26	1.949	G.D.I.S.	161	151	R.GREER	2,963.42	9.75	2,973.17	2,914.21	1,525.49	4/14/89
26	2.01	SURF	516	513	R RIDER	899.83	97.51	997.34	862.80	496.93	11/27/90
TOTAL	15.303				H-M-B	18959.413	940.698	19900.112	19066.839	1,300.41	
TOTAL	143.320	G-D	60.92	G,D,S,	18.86	204,082.09	10,723.83	214,805.92	209,182.98	1,498.79	
		SURFACE	63.54				.05				