INSTALLATION REPORT

USE OF FABRIC IN FLEXIBLE PAVEMENTS— 1980

by

C. S. Hughes
Senior Research Scientist

(The opinions, findings, and conclusions expressed in this report are those of the author and not necessarily those of the sponsoring agencies.)

Virginia Highway and Transportation Research Council
(A Cooperative Organization Sponsored Jointly by the Virginia Department of Highways & Transportation and the University of Virginia)

Charlottesville, Virginia

April 1981

VHTRC 81-R43

VDOT Research Library

BITUMINOUS RESEARCH ADVISORY COMMITTEE

R. L. ALWOOD, Chairman, District Materials Engineer, VDH&T

A. D. BARNHART, District Materials Engineer, VDH&T

P. F. CECCHINI, District Engineer, VDH&T

J. L. CORLEY, Assistant District Engineer — Construction, VDH&T

W. R. DAVIDSON, Assistant Maintenance Engineer, VDH&T

W. A. DENNISON, District Materials Engineer, VDH&T

C. E. ECHOLS, Asst. Prof. of Civil Engineering, U. Va.

R. V. FIELDING, Materials Engineer, VDH&T

C. S. HUGHES III, Highway Research Senior Scientist, VH&TRC

A. B. JOHNSON, Assistant Construction Engineer, VDH&T

J. T. LOVE, Materials Engineer, Materials Division, VDH&T

H. E. MARSHALL, District Engineer, FHWA

C. G. MCALLISTER, Chief Chemist, Materials Division, VDH&T

R. S. THOMAS, Bituminous Engineer — Maintenance Div., VDH&T

R. D. WALKER, Chairman, Dept. of Civil Engineering, VPI & SU

SUMMARY

Maintenance overlays that included a fabric underlayment were placed on three sections of interstate and primary highways in 1980. The fabric is intended to waterproof the old surface and strengthen the overlay. The report describes the installation and discusses the early performance of the overlaid sections.

INSTALLATION REPORT

USE OF FABRIC IN FLEXIBLE PAVEMENTS— 1980

by

C. S. Hughes
Senior Research Scientist

INTRODUCTION

The Research Council has investigated many methods and materials for minimizing reflection cracks through pavement overlays. In the first attempts, the objective was to reduce the reflection of portland cement concrete joints through the overlay. These early attempts were, for the most part, unsuccessful.

In 1971, with the increased availability of high tensile strength fabrics and latex additives, efforts to minimize the reflection cracks were renewed and redirected to flexible base pavements. Experimental installations of the newly available materials were begun in 1971 and these were followed by installations in 1972, 1973, and 1976.[1,2,3,4] All sections chosen for installations were badly cracked.

In 1977, a final report summarizing the results of all the installations was issued.[5] The conclusion was that the latex additives on the market at that time were not effective in minimizing reflection cracks. Since that time, both latex materials used have been taken off the market. It was further concluded that fabric treatments may extend the pavement life an average of about two years. It was emphasized that this conclusion was based on relatively few test installations.

Based on this information, in 1980 installations were made on sections of roadway that had exhibited some rather early cracking. This installation report has been prepared primarily to document the installations for future evaluations. In other words, in the author's opinion, the use of fabrics should not be considered to be a cure-all and such use should be looked at critically with cost and the potential for improved performance being primary considerations.

ROUTE 81 PULASKI COUNTY

One installation was made on a section of I-81 in Pulaski County that had been overlaid in 1976 with 125 psy of S-5. The overlay did not perform well and, as shown in the attached Figures 1 and 2, was breaking away from the original surface, apparently because the tack coat had been insufficient.

In an attempt to waterproof the 1976 overlay and give additional strength to the proposed overlay, a fabric was specified for a 1-mile section of the northbound traffic lane (Figure 3).

The fabric (Petromat) was placed on June 2, 1980, and immediately overlaid. A tack coat of AC-20 was applied at the rate of 0.20 gpy; however, the extension on the right side of the distributor got cold and the tack was not as heavy or as uniform as desired. This was a minor problem and the only one that was noted.

After about three months, small areas in the fabric started showing distress in the form of disbonding of the overlay from the fabric (Figures 4 and 5). The distress was confined to the section with fabric, which appeared to be pushing and raveling. Several of the distressed areas showed the 1980 overlay to be less than 1-in. thick although the application rate was 130 psy of S-5.

Investigation of cores from the failed areas by Phillips Petroleum Company and the Research Council indicated that the recovered asphalt was much softer than would have been expected of an AC-20. Penetrations on the recovered material were about 80 and the viscosities were (140°F) 2930 poises and (275°F) 540 cs. Since the failed areas were in the fabric section, it is speculated that the tack coat may have been contaminated with a fuel oil or kerosene.

Roughness tests run prior to and after the 1980 overlay indicated that the overlay improved the rideability, giving a roughness in the neighborhood of about 75 inches/mile.

The cost of the fabric for this installation was $0.67/yd.[2]

ROUTE 460 DINWIDDIE COUNTY

A section of Route 460 immediately west of Route 627 was showing severe deterioration in the inside wheel path of the westbound traffic lane (Figure 6). The existing S-5 surface,

placed in new construction in 1974, was constructed by scratching with about 65 psy and then applying a final lift of 100 psy. The two courses were not well bonded and once again the top course could be lifted away from the underlying course (Figure 7).

A heavy (0.8 psf) fabric-rubber membrane (Prepave) had been donated to the Department in 1979 for use over jointed concrete pavement on I-95, and almost 3,500 linear feet of this material had been left over. It was decided that this material might improve the performance of an overlay intended for Route 460, and it was used in the areas shown in Figure 8.

The membrane was placed on June 30, 1980. A tack coat of about 0.15 gpy of AC-20 was sprayed on the pavement with a hand hose connected to a tar kettle. The membrane, which came in 20-in. widths, was applied two strips wide with about a 2 in. overlap to provide a 38-in. wide patch. This material withstood traffic until September 17, 1980, when the overlay was applied, which gives an indication of its strength. The overlay was 130 psy of S-5 and was applied over a 1-mile section.

ROUTE 64 GOOCHLAND COUNTY

Starting on September 23, 1980, fabric was used on several sections of I-64 near Hadensville as shown in Figure 9. The four 0.5-mile sections were used for comparisons of the performance of overlays of heavy and medium thicknesses and no fabric with that of two overlays of medium thickness and fabric. The longer sections shown in Figure 9 were constructed under a separate contract and are shown only to document their location.

A slurry seal that had been applied in 1978 was badly cracked (Figure 10), and the results of deflection tests indicated that several inches of resurfacing were necessary. The recommended overlay thickness was not economically feasible so, as a practical solution to the high deflections, it was decided to try a heavy overlay of 250 psy of I-2 and two sections with a medium overlay of 160 psy of I-2 plus a fabric (Petromat) over the three weakest sections, and a control section of 160 psy of I-2 over the strongest section.

Deflection Tests

The deflection data taken before and after overlaying are shown in Table 1. It is realized that because of the relatively few sections treated, no broad conclusions are possible; however, the data do tend to indicate some generalizations. The thickness

index, T.I., is the predicted strength, in terms of equivalent inches of bituminous concrete, from deflection tests. The maximum deflection is combined with the deflection basin (spreadability) to predict the T.I. Table 1 shows that the traffic lanes in all four sections were brought up to about the same level of strength, which may still be insufficient to carry the traffic for the design period. The small amount of data and the variability in them do not allow for broad conclusions. Likewise, the relatively large variation in the small number of sections in the passing lane preclude any conclusions on strength at this time.

Table 1

DEFLECTIONS I-64

BEFORE AND AFTER TREATMENT

BEFORE

	Traffic Lane			Passing Lane		
Section	Max. Defl.	Spred.	T.I. (in.)	Max. Defl.	Spred.	T.I. (in.)
160 psy I-2 + Fabric	.0241	61	8.0	.0231	63	8.5
250 psy I-2	.0241	59	7.5	.0162	66	11.5
160 psy I-2	.0171	60	9.5	.0139	64	11.5
160 psy I-2 + Fabric	.0202	59	8.0	.0149	68	12.0

AFTER

				% Inc. T.I.				% Inc. T.I.
160 psy I-2 + Fabric	.0166	62	9.5	19	.0164	65	11.0	29
250 psy I-2	.0153	62	10.0	33	.0149	68	13.0	13
160 psy I-2	.0143	64	11.5	21	.0131	68	14.0	22
160 psy I-2 + Fabric	.0184	67	10.5	31	.0139	70	14.0	17

Construction and Performance

It is much too early to predict the long-term performance on these sections. However, a few problems noted during construction or relating to the early performance are worth mentioning.

In order to allow an overlap of the center and edge joints on the existing pavement, an extra wide (13 ft.-6 in.) fabric was ordered. This was probably a mistake, because the machine that applies the fabric is designed to handle a 12 ft.-6 in. width and the extra foot caused some problems in obtaining a smooth installation. Although this did not interfere with the plant mix application, it did give the inspectors a great deal of trouble in determining whether or not the application of the fabric met the specifications.

The I-2 wedge extended only 18 in. beyond the edge of the pavement and feathering this coarse a material in this short a distance was a problem. Furthermore, the feathered edge is sufficiently close to the edge of the pavement that traffic has raveled a great deal of the overlay and exposed the fabric.

At one area in the westbound traffic lane at MP 155.1 where one overlay section was tapered to meet a previous section, a hole has formed. The overlay on this area is about 1/2 in. thick and it has raveled to expose the fabric, which has also become worn. The thickness of the overlay over a fabric appears to be fairly critical, because failures have occurred on Route 81 and Route 64 where the overlay is thin.

ACKNOWLEDGEMENTS

The author greatly appreciates the help of the Salem District materials and maintenance personnel in the work on I-81, including the follow-up work to try to determine the cause of the early failure.

The maintenance forces in the Petersburg Residency are acknowledged for installing the membrane on Route 460.

The Richmond District materials and Ashland Residency inspection personnel are thanked for their help in installing this material on I-64 under trying conditions with a minimum of background information.

Finally, Messrs. Maupin, McGhee, Wood, Leake, and Gunn from the Research Council are thanked for their advice and hard work in all of the applications.

VDOT Research Library

REFERENCES

1. Hughes, C. S., Petromat Installation Report, Virginia Highway and Transportation Research Council, VHTRC 71-R21, March 1972.

2. _____, Minimization of Reflection Cracks, Installation Report—Route 29 N. Charlottesville, Virginia Highway and Transportation Research Council, VHTRC 72-R17, December 1972.

3. _____, Minimization of Reflection Cracks, Installation Report—1973, Virginia Highway and Transportation Research Council, VHTRC 73-R16, October 1973.

4. _____, Minimization of Reflection Cracks, Route 17 Gloucester County Installation Report 1976, Virginia Highway and Transportation Research Council, VHTRC 77-R30, December 1976.

5. _____, Minimization of Reflection Cracks in Flexible Pavement, Virginia Highway and Transportation Research Council, VHTRC 78-R5, July 1977.

6. Maupin, G. W., Jr., "Recycling of Water Susceptible Pavements", Virginia Highway and Transportation Research Council, VHTRC 80-R45, May 1980.

Figure 1. Distress prior to fabric installation, Route 81, Pulaski County.

Figure 2. Disbonding prior to fabric installation, Route 81, Pulaski County.

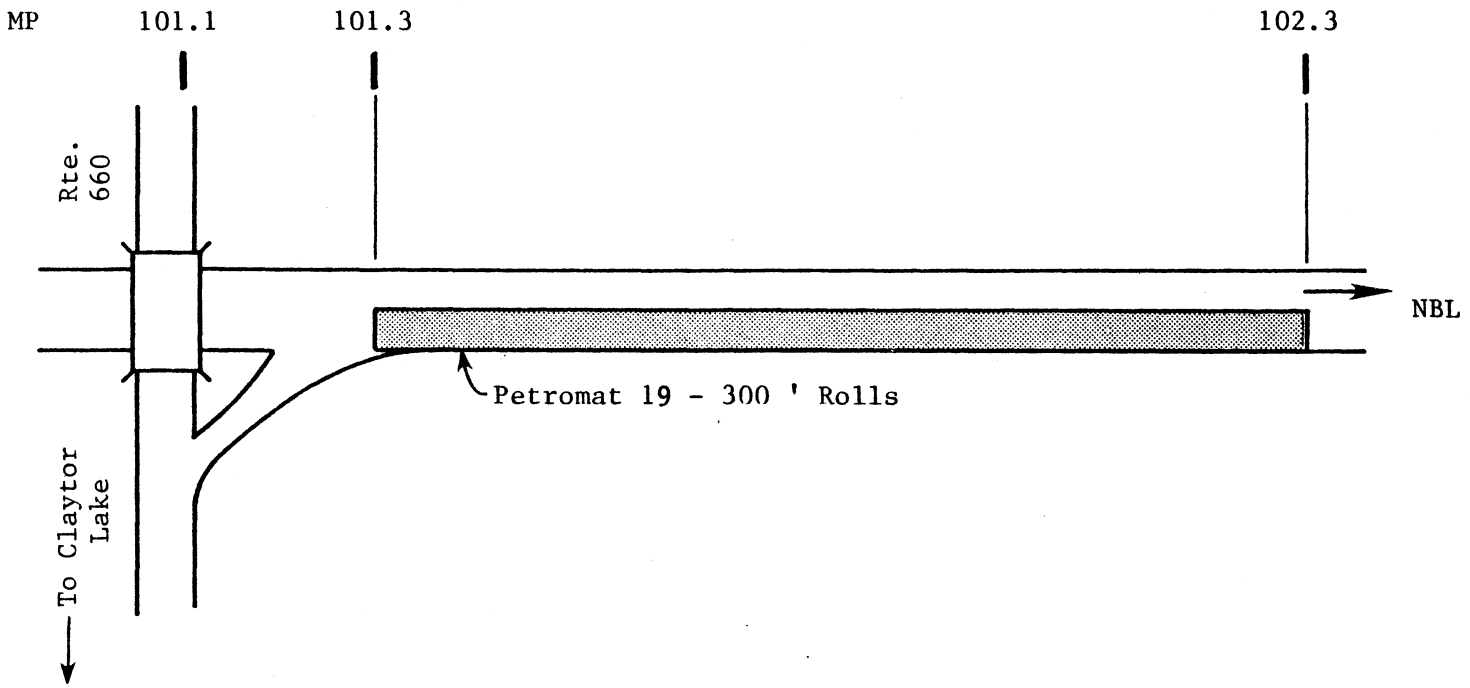

Figure 3. Location of Petromat fabric Route 81, Pulaski County.

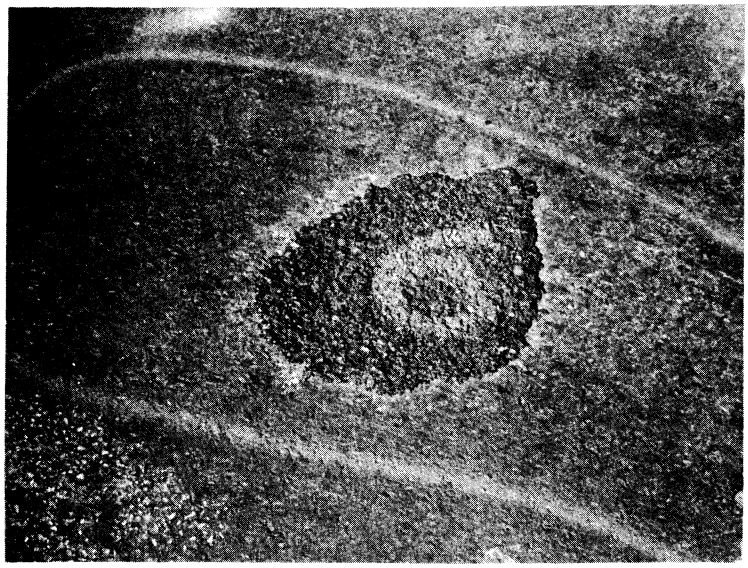

Figure 4. Distress 3 months after fabric installation, Route 81, Pulaski County.

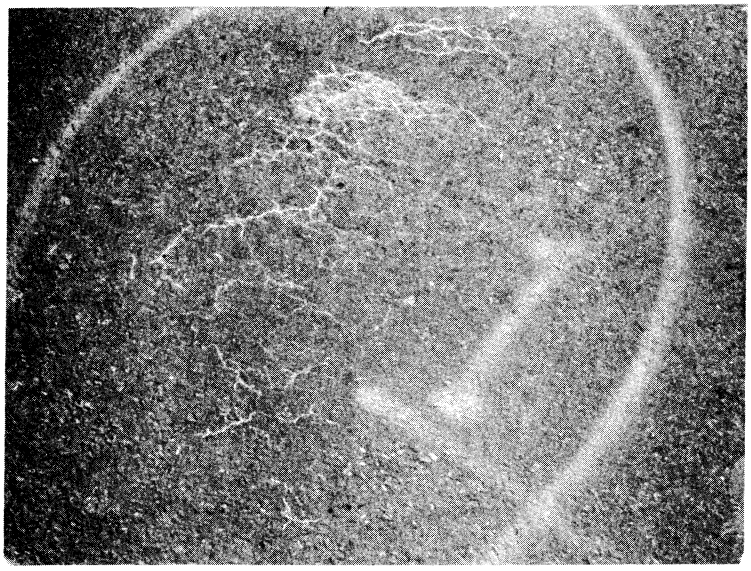

Figure 5. Distress 3 months after fabric installation, Route 81, Pulaski County.

Figure 6. Distress prior to installation of membrane, Route 460, Dinwiddie County.

Figure 7. Disbonding of surface prior to installation of membrane, Route 460, Dinwiddie County.

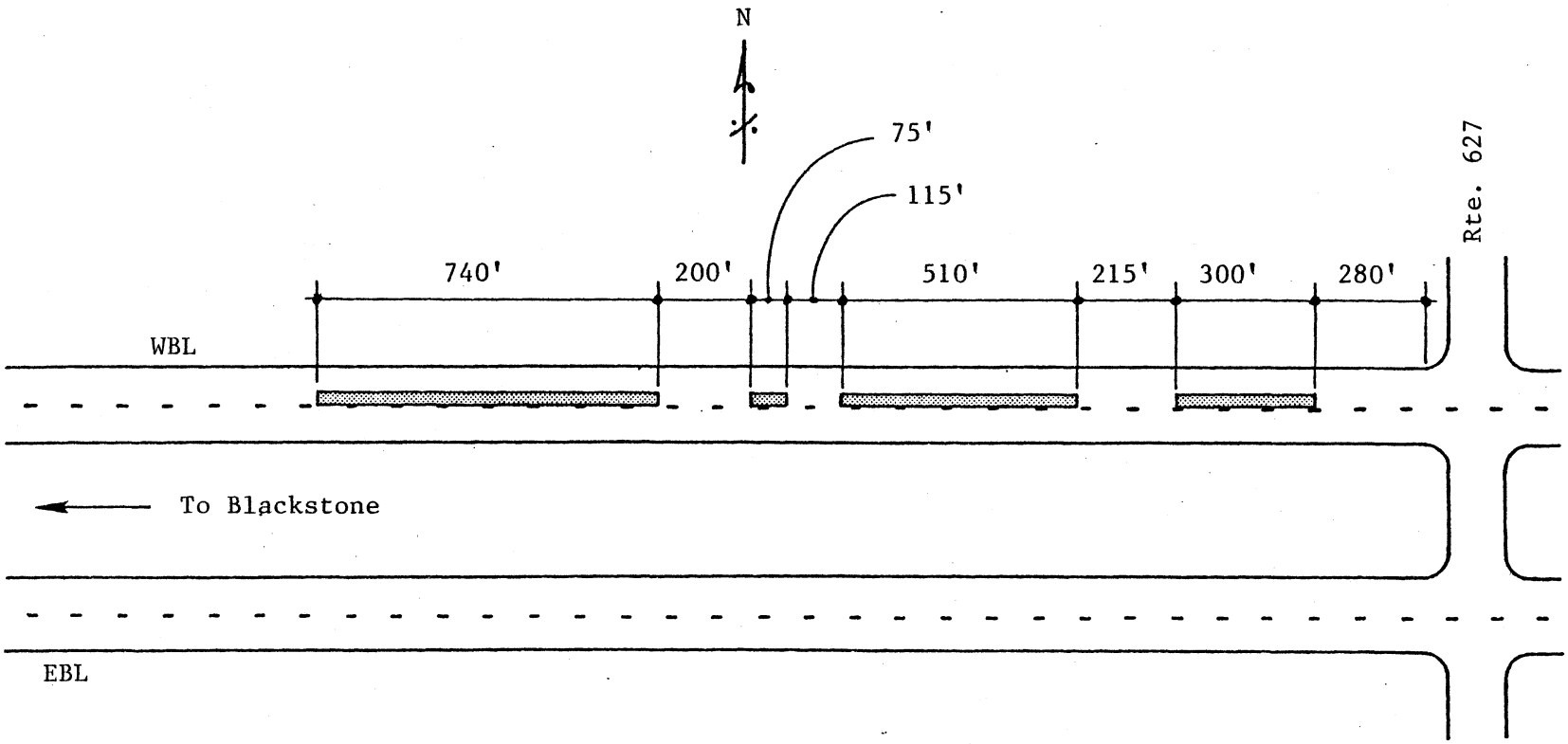

Figure 8. Prepave section Route 460, Dinwiddie County.

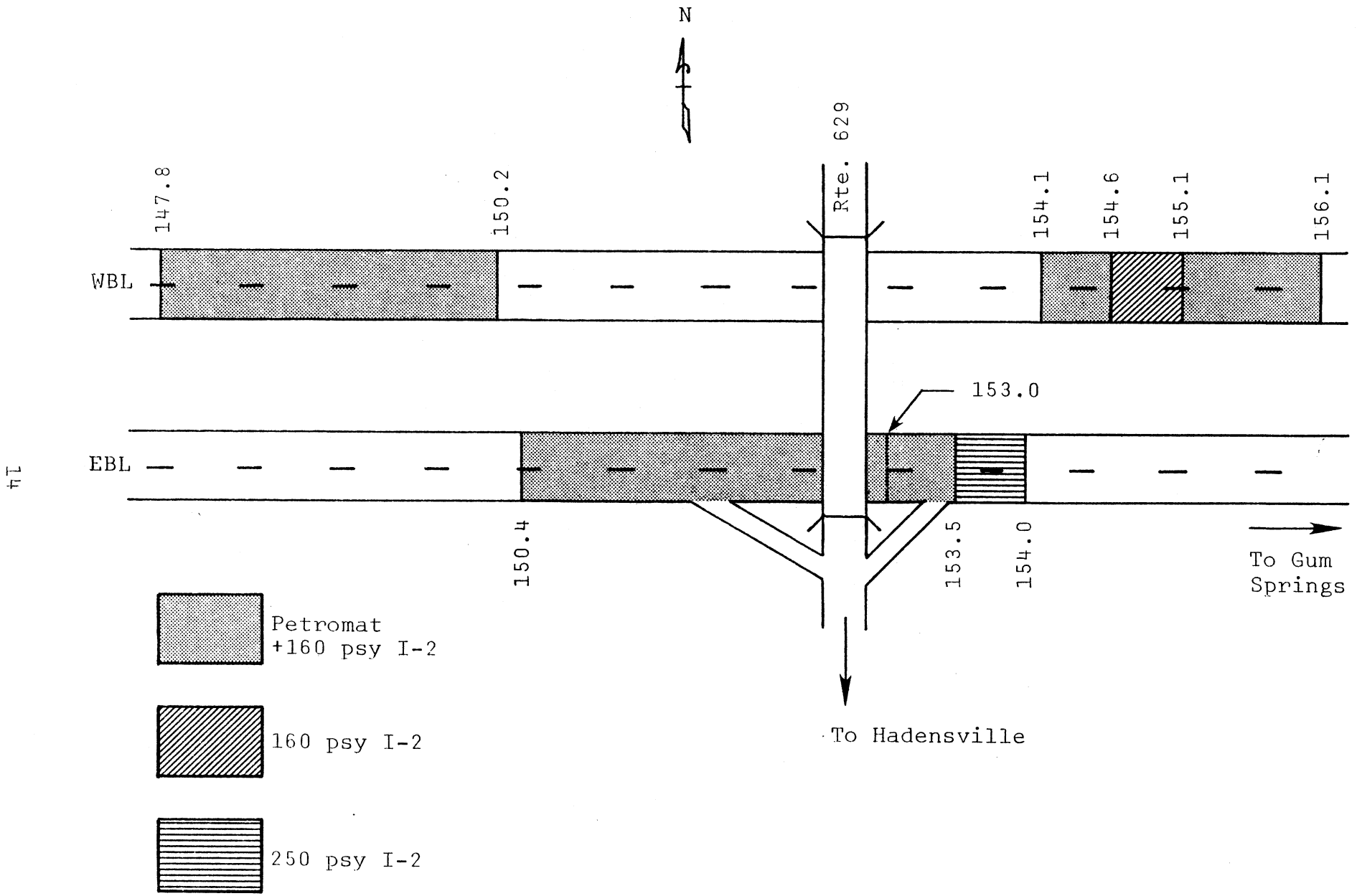

Figure 9. Fabric section Route 64, Goochland County.

Figure 9. Fabric section Route 64, Goochland County.

Figure 10. Cracked and patched areas prior to fabric installation, Route 64, Goochland County.