

FINAL REPORT
STABILIZATION TECHNIQUES FOR UNPAVED ROADS

William H. Bushman, P.E.
Research Scientist

Thomas E. Freeman, P.E.
Senior Research Scientist

Edward J. Hoppe, Ph.D., P.E.
Senior Research Scientist

Virginia Transportation Research Council
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ABSTRACT

This study presents the basis for evaluating promising soil stabilization products using the relatively new technique of deeply mixing chemical additives into unpaved roadbeds. The work is in response to an amendment to House Bill 1400, Item 490, No. 1h, passed by Virginia's 2003 General Assembly, that called for the Virginia Transportation Research Council to "continue its evaluation of soil stabilizers as an alternative to paving low-volume secondary roads."

This work is based on the construction of a 1.75-mile-long trial installation on Old Wheatland Road in Loudoun County wherein seven different commercially available stabilization products were applied to the unpaved road. A rigorous evaluation of treatment performance will provide the basis for recommendations to VDOT's operating divisions regarding improvements to the maintenance practices for gravel roads. Results thus far indicate that the introduction of soil stabilizers through deep mixing is promising.

The life cycle cost analysis indicates that constructing a standard bituminous surface-treated roadway and maintaining it as such is much more cost-effective than using any of the products in this trial. Further, the analysis indicates the bituminous surface treatment alternative is also much more cost-effective than maintaining an unpaved road.

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INTRODUCTION

An amendment to House Bill 1400, Item 490, No. 1h, calls for the Virginia Transportation Research Council to “continue its evaluation of soil stabilizers as an alternative to paving low-volume secondary roads.” The work presented herein was performed to address the expectations set forth in the legislation. The Appendix contains the complete amendment.

The Virginia Department of Transportation (VDOT) is sensitive to the public’s desire to preserve the appealing, rustic character of our rural areas. One contribution to preserving this character could include leaving particular low-volume roads in an unpaved state. Unfortunately, unstabilized gravel roads inherently require frequent and aggressive maintenance to offset damage caused by the mechanical displacement of coarse and fine aggregate particles beneath tire traffic. Such maintenance, which tends to be rather disruptive to motorists, typically includes (1) placing additional aggregate to replace lost material, and (2) restoring shape with a motor grader to distribute aggregate uniformly across the section, improve surface drainage, and smooth out distortions in the roadbed, thus improving ride quality. The frequency of required maintenance activities increases proportionally with traffic volume. A reduction in the frequency of unpaved road maintenance would serve the traveling public well by lessening motorist delays through work zones while saving increasingly scarce maintenance funds.

PURPOSE AND SCOPE

Evidence suggests unpaved roads that are properly stabilized through deep mechanical manipulation can satisfactorily bear traffic for significantly longer periods of maintenance-free time than can unstabilized roads. Therefore, the purpose of this work was to ascertain the feasibility of deeply mixing particular soil stabilization materials into unpaved roadbeds with the intent of maximizing the intervals of time between required maintenance activities. The work reported here was conducted to establish the framework for a long-term assessment of the performance of deeply mixed stabilization products, the results of which will form the basis for future implementation recommendations to VDOT’s operating divisions.

METHODOLOGY

The approach taken to develop the framework to evaluate promising stabilization treatments was based on (1) a carefully conceived experimental design, (2) selection of a suitable in-service unpaved road site for the trial, and (3) construction of a trial installation using deep mechanical manipulation to introduce stabilization products into the roadbed in accordance with vendor recommendations.

Experimental Design

To enable an unbiased assessment of promising soil stabilizers, a trial installation was designed wherein objective measurements of the durability of test sections formed the primary basis for the future performance evaluations of different treatments. One objective indicator of the ability of a test section to retain its shape (durability) involves measuring the deterioration of ride quality, or roughness, over time. As an unpaved road is subjected to traffic, the surface profile changes with the manifestation of wheel path rutting, potholes, and surface distortions. Hence, the quantification of these changes in a longitudinal profile (i.e., deterioration) can facilitate a direct comparison of performance between treatments. Stated differently, treatments that undergo relatively little change in their longitudinal profile over a predetermined time period will be more durable than otherwise. This installation was designed in part to accommodate the measurement of roughness at regular time intervals with VDOT's inertial profiling device.

Selection and Segmentation of a Suitable In-Service Unpaved Road Site

In selecting the location of the trial installation site, consideration was given to the need to maintain uniformity of the test section in terms of traffic volume, roadway geometry, and roadbed material. A site subjected to a relatively heavy volume of traffic was preferred to enable a rigorous evaluation of treatment performance. Since it was desirable from an experimental standpoint to construct contiguous test sections of maximum uniform length, the total length of the trial installation was influenced by the greatest roadway distance within which traffic could be safely controlled in a one-lane work zone closure.

A 9,250-foot-long segment of Route 698 (Old Wheatland Road) between Route 9 and Route 681 north of Leesburg in Loudoun County, Virginia, was found to meet the requirements of the trial installation design. According to traffic count records maintained by VDOT, the site had an average annual daily traffic count in 1999 of approximately 800 vehicles per day.

The segment of Old Wheatland Road dedicated to this project was subdivided into nine test sections. Seven of the nine sections were 750 feet in length across the entire width (16 feet) of the two-lane road and were treated through deeply mixing different soil stabilizers into the roadbed. An eighth section, also 750 feet in length, was left untreated to provide a "control" section or baseline above which the degree of improvement attributable to stabilization additives could be quantified. The ninth test section, 3,250 feet in length, was included to enhance our understanding of the benefits of deeply mixing additives as compared to applying them topically.

Here, one of the products used in a manipulated section was applied by simply spraying it on the road surface with no mixing.

The installation was designed to include an array of chlorides, emulsions, and an ammonium lignosulfonate. Specifically, the additives are commercially known as calcium chloride, magnesium chloride, Centrophase AD, EC Cryl, Soil Sement, Soiltac, and TDS. VDOT environmental personnel provided guidance with product review and selection to evade undesirable environmental side effects.

The test sections were referenced in terms of alphabetically designated segments representing a section's beginning and end point as illustrated in Figure 1 (i.e., section A-B, section B-C, etc.).

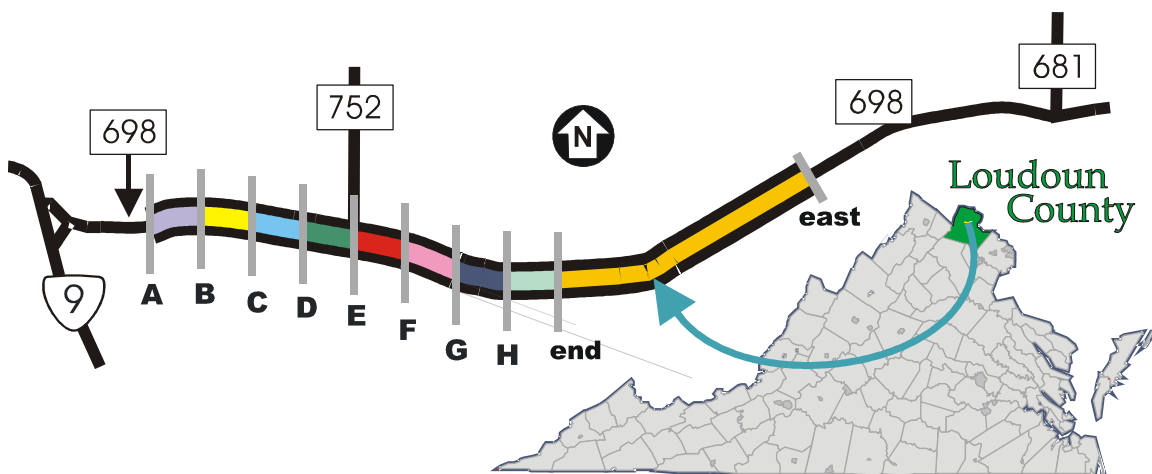


Figure 1. Trial Installation Site Location Plan and Test Section Layout

Construction of Test Section

A standardized construction technique was used to introduce stabilization products into the roadbed, as described here.

Method of Stabilization

Perhaps the most thorough way of deeply mixing stabilizers into a roadbed is by way of a relatively new process known as full-depth reclamation (FDR). FDR is a pavement rehabilitation technique in which the full road section and a predetermined portion of the underlying materials are uniformly crushed, pulverized, or blended as a form of in-place recycling. Additional stabilization of the roadbed material can be achieved by mixing additives into the process. Liquid stabilizers can be blended into the soil/aggregate material through a reclaiming machine's integrated additive injection system during manipulation. Alternatively, pozzolanic additives in powder form may be spread on the road ahead of the reclaimer and blended accordingly. The FDR process was chosen for this project because of its relatively high production rate and the

completeness with which the additives are mixed into the roadbed. Slurry Pavers, Inc., of Richmond, Virginia, was awarded the contract for all stabilization work done in this project. Roadbed manipulation was accomplished with a Wirtgen WR 2500 Road Reclaimer and Soil Stabilizer, which incorporates a 690-horsepower, V-12, turbo-charged diesel engine to power a 96-inch-wide by 20-inch-deep cutting rotor. Figure 2 shows the Wirtgen Reclaimer preceded by the tanker truck.

For this application, all seven stabilization additives were blended individually into the soil/aggregate mixture in liquid form and were delivered into the test sections by way of a tanker truck connected by hose to the reclaimer. Liquid was introduced directly into the roadbed material as it was being pulverized by way of the reclaimer's computer-controlled liquid injection system, which is capable of accurately regulating additive delivery rates.



Figure 2. Gravel Road Stabilization with Wirtgen WR 2500 Full-Depth Reclaimer

Sequence of Work

Before the stabilization additives could be introduced, the test sections required preparation to remove potentially damaging boulders from the roadbed, restore shape to the road

surface, and distribute aggregate uniformly across the section. A motor grader outfitted with a grading blade and a ripper attachment for boulder extraction was used to prepare the test sections just ahead of the reclaiming/stabilization process. Figure 3 illustrates the preparation of one test section with a motor grader.



Figure 3. Roadbed Preparation Prior to Manipulation

After those test sections that were to comprise a given day's work were prepared, the sequence of activities for stabilization was as follows:

1. Dilute liquid stabilization product with water at the designated staging area in accordance with recommendations by the vendor's on-site technical representative.
2. Close one lane of a test section to traffic.
3. Blend stabilization additive into one 8-foot-wide lane to a depth of 6 inches with the reclaimer.
4. Compact the treated lane with at least five passes of a 13-ton vibratory roller compactor.

5. Close the opposing lane to traffic and reopen the treated lane.
6. Blend stabilization additive into the test section's second lane as described in task 3.
7. Compact the second lane with a minimum of five passes of the roller compactor.
8. Temporarily close the entire test section to traffic.
9. Re-grade both stabilized lanes with the motor grader to provide proper crown and shape to the road surface.
10. Perform final compaction of the test section with at least three additional passes of the roller compactor.
11. Apply liquid stabilization additive topically to the entire test section in accordance with the vendor's recommendations.
12. Reopen the test section to traffic.
13. Repeat the sequence for the day's next test section.

Figure 4 shows test section compaction just after manipulation with the reclaimer.



Figure 4. Material Compaction Following Roadbed Manipulation

Descriptions of Treatments

Products selected for inclusion in this trial have been used as dust suppressants, but they are also referred to as stabilizers because of their ability to alter material properties such as strength and permeability. Essentially, the function of these chemicals is to agglomerate fine particles and bind them together. This is commonly accomplished by attracting moisture, thus creating surface tension between particles (using salts); adhering to and cementing particles together (using emulsions and resins); or dispersing clay particles, thus making them more plastic (using lignosulfonates).

VDOT's Environmental Quality Division provided guidance with reviewing and selecting the stabilization products in keeping with our obligation to be sensitive to potential environmental side effects.

Technical representatives of each product vendor were on site during construction to observe the work and provide guidance on dilution and application rates and road surface finishing. All products were placed in accordance with their recommendations.

The nine test section treatments (as illustrated in Figure 1) were as follows:

1. *Segment A-B (Calcium Chloride)*. Segment A-B was stabilized with calcium chloride (salt) on 9/16/2003. The concentrated solution was diluted with water at a rate of 1 part concentrate to 2.6 parts water by volume. The application rate of the diluted solution was 0.5 gallon per square yard throughout the 6-inch depth. Following manipulation, dilute calcium chloride solution was applied topically at the rate of 0.1 gallon per square yard.
2. *Segment B-C (Magnesium Chloride)*. This test section was treated on 9/16/2003 by deeply mixing existing roadbed material with magnesium chloride (salt). Mixing 1 part magnesium chloride concentrate with 3.8 parts water diluted the solution to the recommended concentration. The liquid was applied at a rate of 0.7 gallon per square yard throughout the 6-inch depth. The topical application of the diluted magnesium chloride here followed manipulation at a rate of 0.1 gallon per square yard.
3. *Segment C-D (Centrophase AD)*. The treatment of Segment C-D consisted of stabilizing roadbed material with Centrophase AD (soy/lecithin emulsion) on 9/17/2003. Upon arrival at the site's staging area, the emulsion was diluted with water at a rate of 1 part concentrate to 3 parts water by volume. After the prepared solution was manipulated into the roadbed with an application of 0.7 gallon of liquid per square yard, an application of the dilute emulsion was sprayed topically at a rate of 0.1 gallon per square yard.
4. *Segment D-E (EC Cryl)*. Segment D-E was stabilized on 10/7/2003 with a vinyl-acrylic emulsion known as EC Cryl. The product was diluted by mixing 1 part concentrate to 3 parts water prior to applying 0.8 gallon of the solution per square yard and mixing throughout the 6-inch depth. A separate solution was prepared for

the topical application by mixing 1 part of the concentrate with 10 parts water. This mixture was then applied to the surface by spraying 0.1 gallon per square yard.

5. *Segment E-F (Soil Sement)*. An acrylic-polyvinyl acetate emulsion known as Soil Sement was deeply manipulated into Segment E-F on 10/8/2003. Upon arrival at the jobsite, the Soil Sement was diluted by mixing 1 part concentrate with 1.8 parts water. The liquid was then blended with the pulverized roadbed material at a rate of 0.7 gallon per square yard throughout the 6-inch depth. Deep stabilization was followed by the topical spray application of 0.1 gallon per square yard.
6. *Segment F-G (Soiltac)*. Segment F-G was deeply stabilized with Soiltac (vinyl acetate copolymer emulsion) on 10/7/2003. The application rate used here was 0.74 gallon per square yard throughout the 6-inch depth. A dilute solution of this product was applied topically on 10/8/2003 by spraying 0.63 gallon per square yard to the surface. The Soiltac-to-water dilution ratio for deep stabilization was 1:1.38. The topical solution was prepared by mixing 1 part Soiltac with 3 parts water.
7. *Segment G-H (TDS)*. Segment G-H was stabilized on 10/8/2003 with an ammonium lignosulfonate known commercially as TDS. The product was diluted by mixing 1 part TDS with 1 part water before mixing 0.8 gallon per square yard throughout the 6-inch depth. Following deep stabilization, the solution was sprayed topically at a rate of 0.2 gallon per square yard.
8. *Segment H-end (Control)*. The test section designated Segment H-End was included as the control section. Preparation here was limited to shaping the surface with a motor grader to simulate standard unpaved road maintenance practice elsewhere in the state. Segment H-End was neither manipulated nor stabilized with additives.
9. *Segment End-East (Soiltac Topical)*. Segment End-East was treated only with a topical spray application of Soiltac on 10/8/2003. The topical application was prepared by mixing 1 part Soiltac with 1.4 parts water. It was then applied at a rate of 0.58 gallon per square yard.

Table 1 summarizes the application specifics of each test section.

PERFORMANCE EVALUATION

The performance of each treatment will be visually monitored on a monthly basis by documenting the condition of road surfaces using videography. In addition, the longitudinal profiles of test sections will be measured monthly and used to quantify the extents and rates of deterioration.

Table 1. Summary of Test Section Treatments

Rate	Test Section, Product, and Length of Segment								
	A-B	B-C	C-D	D-E	E-F	F-G	G-H	H-End	End-East
	Calcium Chloride	Magnesium Chloride	Centrophase AD	EC Cryl	Soil Sement	Soiltac	TDS	Control	Soiltac Topical
	750 ft	750 ft	750 ft	750 ft	750 ft	750 ft	750 ft	750 ft	3,250 ft
Manipulated dilution rate, gal product/ gal H ₂ O	1:2.6	1:3.8	1:3	1:3	1:1.8	1:1.4	1:1	N/A	N/A
Topical dilution rate, gal product/ gal H ₂ O	1:2.6	1:3.8	1:3	1:10	1:1.8	1:3	1:1	N/A	1:1.4
Manipulated application rate, gal/yd ²	0.5	0.7	0.7	0.8	0.7	0.74	0.8	None	None
Topical application rate, gal/yd ²	0.1	0.1	0.1	0.1	0.1	0.63	0.2	None	0.58

Visual/Video Surveys

Permanent records of the visible conditions of all test sections, beginning immediately after completion of the trial installation, are being captured with VDOT's video survey van on a monthly basis. The van was specifically designed to record road surface images as part of VDOT's regular roadway condition survey, which is used to establish maintenance and rehabilitation funding allocations based on statewide needs. The vehicle is equipped with two downward-facing video cameras to capture full-lane-width surface images at close range. A forward-facing third camera mounted at the front of the vehicle records wider video images from a right-of-way perspective. The resulting videotapes are synchronized and digitally encoded with time, date, and chainage for accurate location referencing along a road segment. The severity and extent of observed distress will be noted and recorded by test section for each monthly survey to permit an objective documentation of deterioration over time.

Longitudinal Profile (Roughness) Measurements

The rate of change in the longitudinal profile of an unpaved road surface can provide an indication of surface durability. Longitudinal profile is well correlated with pavement roughness, or ride quality, which is a widely used indicator of pavement condition. Road roughness can be defined as irregularities in the surface that adversely affect ride quality, safety, and vehicle maintenance costs. In terms of profile, roughness can be defined as the summation of variations in the surface profile of the road from a fixed datum. The summation of these variations, in turn, can be used to calculate a standard measure of surface roughness, which is known as the International Roughness Index (IRI). The profiles of each test section are being measured once per month with VDOT's non-contact inertial profiler, which is a vehicle equipped with accelerometers, laser displacement transducers, and a data acquisition computer.

Three consecutive tests are being made during each monthly survey with the profiler in general accordance with VDOT's standard test method for ride quality testing. The average IRI of the three consecutive tests is then used to represent the section's roughness for that month. Comparisons of rates of change in IRI between test sections will yield meaningful, objective data with regard to treatment durability and performance.

EVALUATION SUMMARY

Change in IRI

As indicated earlier in the section entitled "Performance Evaluation," the various roadway sections were evaluated using VDOT's inertial road profiler, shown in Figure 5.



Figure 5. Inertial Road Profiler Van

This specially instrumented vehicle performed similar tests on each product road section represented in the study, including the control section. The testing protocol conformed to the requirements of ASTM E-950.

Essentially, two test runs were used to make the evaluation. The first was done in mid-September 2003, just prior to product installation. The second test run was made in February 2004. The data were reduced and are summarized in Figure 6.

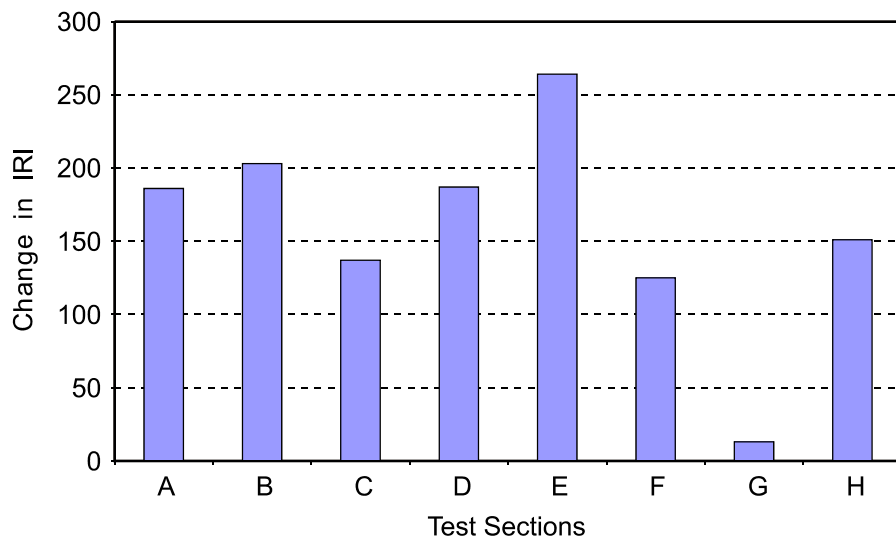


Figure 6. Change in IRI for Test Sections and Control (H)

Figure 6 reflects the change in IRI from the initial reading before product installation and the second run in February 2004. Based on the results of this data criterion, three sections, C, F, and G, reflected roughness readings that were less than that of the control section (H). Whether, therefore, they could be concluded to be more *stable* than unpaved roadways without product is open to conjecture. The single criterion of IRI change is limiting, as it does not address the varying physical conditions (shade, drainage, grade, etc.) along the test area. These other factors could have influenced the IRI irrespective of product type.

Life-Cycle Cost Analysis

In addition to the on-site data collection, a life-cycle cost analysis (LCCA) was made based upon the assumptions listed here, cost data from the installation of the various test sections, and historic cost data from VDOT.

Assumptions

1. Analysis Period = 6 years = one full cycle of a bituminous surface treatment (BST) service life for this route. Statewide average for BST life on all secondaries is ± 5 yrs. However, Route 698 is assumed to have relatively light traffic in comparison to average hard-surfaced secondaries.
2. Discount Rate = 3%.
3. Salvage value is neglected because all alternatives yield similar pavement condition at the end of the analysis period (i.e., all alternatives need treatment at the end of the period).
4. Net Present Worth Analysis (NPW) method is used. (Reference Pub. No. FHWA-SA-98-040, LCCA in Pavement Design, FHWA Demo Project No. 115.)
5. Stabilization products are applied by full-depth reclamation to a depth of 6 inches at time 0, and topically at 6-month intervals thereafter, in accordance with experimental findings.
6. Stabilized alternative requires additional stone, shaping, and topical application every 6 months.
7. BST alternative has no additional maintenance costs throughout the analysis period.
8. Maintaining the road in an unstabilized gravel state requires some degree of corrective action at least three times per year in accordance with historic records.
9. N represents the number of maintenance intervals associated with each alternative throughout the six-year analysis period. Therefore, I is the annual discount rate divided by the number of maintenance intervals (i.e., number of interest periods).
10. Traffic control costs for future maintenance activities for alternatives 1 and 3 is estimated to be \$400 per day. Traffic control costs at time 0 for all alternatives are assumed equal, and therefore are not included in the analysis.

Alternatives

Alternative 1. Activity Costs for Stabilization

1. Reclamation – 2 passes at 8 feet wide each. Includes mobilization, boulder extraction, preparatory shaping and final shaping and compacting after reclamation: \$6,500/mile.

2. Grade, shape and add stone as needed at 6-month intervals (assume 10 truckloads of stone plus labor and equipment): \$2,500/mile.
3. Stabilization product – assume \$0.10/square yard = \$940/mile.
4. Traffic control for maintenance activities = \$400 per interval.

Alternative 1 initial investment: \$6,500/mile.

Alternative 1 semi-annual maintenance costs: \$2,500 + \$940 + \$400 = \$3,840/mile.

Alternative 2. Activity Costs for Prime and Double Seal

1. Grade, shape, and add stone – 21A or 21B, 3 inches deep @ 95 pcf compacted, \$9 per ton plus \$1 per ton for placement = \$10/ton
 $5,280 \text{ ft} \times 0.25 \text{ ft} \times 16 \text{ ft} = 21,120 \text{ cf}$
 $95 \text{ pcf} \times 21,120 \text{ cf} = 1,000 \text{ tons @ } \$10/\text{ton} = 10,000/\text{mile}.$
2. Prime and double seal - @ \$2.00 per square yard = \$18,762/mile.

Alternative 2 initial investment: \$28,762/mile.

Alternative 2 annual maintenance cost: \$0.00.

Alternative 3. Activity Costs for Maintaining as Gravel Road Only

1. Grade, shape, and add stone as needed at 4-month intervals: \$2,000/mile.
2. Traffic control at 4-month intervals: \$400 per interval.

Alternative 3 initial investment: \$2,000/mile.

Alternative 3 maintenance costs at three-month intervals: \$2,000/mile + \$400 = \$2,400/mile.

Calculation of Net Present Worth for Entire Six-Year Analysis Period

NPW Alternative 1 (Chemical Stabilization)

$$N = 12 - 1 = 11, I = 1.5\%$$

$$NPW1 = 6,500 + 3,840(P/A, 1.5\%, 11)$$

$$NPW1 = 6,500 + 3,840(10.071)$$

$$NPW1 = \$45,173/\text{mile}$$

NPW Alternative 2 (Bituminous Surface Treatment)

$$N = 6, I = 3\%$$

$$NPW2 = 10,000 + 18,762$$

$$NPW2 = \$28,762/\text{mile}$$

NPW Alternative 3 (Maintain as a Gravel Road)

$$N = 18 - 1 = 17, I = 1\%$$

$$NPW3 = 2,000 + 2,400(P/A, 1\%, 17)$$

$$NPW3 = 2,000 + 2,400(15.562)$$

$$NPW3 = \$39,348/\text{mile}$$

A calculation was made to determine the number of maintenance intervals required for the NPW of Alternative 1 to be equal to the NPW of Alternative 2. Only six maintenance intervals would be required over the 6-year analysis period for the NPWs to be equal. Observations made during this project indicate that a greater number of intervals would be required to maintain a chemically stabilized road.

CONCLUSIONS

- Based on IRI data only, three test sections had statistically less change in IRI than the control test section.
- Because of to physical factors that were not consistent from test section to test section, using IRI data alone may not suffice to allow a judgment as to whether some stabilization products are more effective than others or whether chemical stabilizers should be used at all.
- The LCCA indicates constructing a standard bituminous surface treated roadway and maintaining it as such is much more cost-effective than using any of the products in this trial.
- The LCCA indicates the bituminous surface treatment alternative is also much more cost-effective than maintaining an unpaved road.

RECOMMENDATIONS

Because of the limitations of the single data evaluation criterion (Δ IRI), further testing should be performed that would more fairly and realistically provide a comparison between the product and the test section:

1. Multiple test criteria should be identified and devised to provide better comparison of test sections and products.
2. Selected test sections should be longer and have similar features (percent of grade, amount of shade).
3. Preparation should be tightly controlled and specified (crown, ditch depth, cross and side drainage, etc.).

ONGOING WORK

Results of the ongoing monitoring and analysis effort will be updated and posted for public review online at http://matrix.vtrc.virginia.edu/698/Road_Stabilization.html. Readers are encouraged to visit the project website to review up-to-date product performance results and to view current photographs of individual test sections.

Assessments of product performance based on the observed rates of deterioration over a sufficient time period will be used to establish the maintenance requirements associated with each treatment. This, in turn, will permit a subsequent, broader comparison between individual products based on actual life cycle costs.

Results of this field evaluation will form the basis for recommendations to VDOT's operating divisions regarding rehabilitation and maintenance practices for unpaved roads. In addition to providing an objective procedure for evaluating the products installed in this project, it is anticipated that the framework outlined herein will be adopted for future evaluations as stabilization products are developed.

ACKNOWLEDGMENTS

The authors gratefully acknowledge the valuable assistance and unwavering support provided by the following members of VDOT's Leesburg Residency staff: Michael P. Hamilton, Transportation Operations Manager II; James A. Hereford, Transportation Operations Manager Supervisor; and Glen A. Kinney, Assistant Resident Engineer for Maintenance.

Special thanks are also extended to those VDOT Area Headquarters employees who expertly provided construction support and reliably provided traffic control through safe and secure work zones without incident.

The authors also acknowledge the hard work and long hours contributed by Arthur Wagner, Engineering Technician, to the laboratory and field work that was critical to the successful completion of this project.

APPENDIX

BUDGET AMENDMENT TO HOUSE BILL 1400 (Item 490, No. 1h)

2003 House Committee Report

Transportation

Department of Transportation

Language:

Page 455, after line 33, insert:

“Out of the amounts provided for Ground Transportation System Planning and Research, the Department of Transportation, through the Virginia Transportation Research Council, shall allocate such amounts as may be required to continue its evaluation of the use of soil stabilizers as an alternative to paving low-volume secondary roads. The evaluation shall include the analysis of sufficient road samples for the Department to establish a policy facilitating the use of soil stabilizers wherever cost-effective. Findings of the evaluation shall be reported to the Chairmen of the House Appropriations and Senate Finance Committees no later than December 1, 2003.”

Explanation:

(This amendment directs VDOT’s Virginia Transportation Research Council to continue its evaluation of the use of soil stabilizers as an alternate to paving low-volume secondary roads.)