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# ROAD STABILIZER PRODUCT PERFORMANCE

## Buenos Aires National Wildlife Refuge

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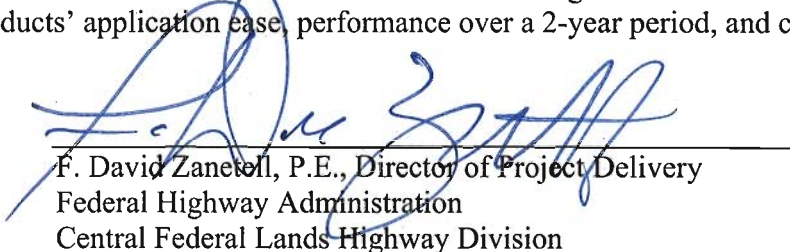
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Lakewood, CO 80228**

## FOREWORD

The Federal Lands Highway (FLH) of the Federal Highway Administration (FHWA) promotes development and deployment of applied research and technology applicable to solving transportation related issues on Federal Lands. The FLH provides technology delivery, innovative solutions, recommended best practices, and related information and knowledge sharing to Federal agencies, Tribal governments, and other offices within the FHWA.

The FLH designs, administers and oversees an increasing amount of aggregate surfacing roadwork for clients in remote locations with limited budgets. Federal Land's clients, such as the National Park Service, US Forest Service, and Fish and Wildlife Service, often have limited budgets for construction and maintenance of their low volume roads. Dust generated by traffic on these unpaved roadways is a major problem that affects the experience of many visitors. Not only is excessive dust an irritation, but also causes reduced visibility, which is a driver safety hazard. Excessive dust from loose roadway material is also an indication of and contributes to roadway surface deterioration.

The primary objective of this project was to evaluate a number of road stabilizer products for potential use on FLH projects for dust control and surface stabilization. The performance of six different products was documented at the Buenos Aires National Wildlife Refuge in Arizona. Each section was evaluated for the products' application ease, performance over a 2-year period, and cost effectiveness.



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16. Abstract Six different soil stabilizers were individually applied each on a 1.6 km (1mi) section to a depth of 150 mm (6 in) at the Buenos Aires National Wildlife Refuge in south central Arizona. These six products were monitored at 6-month intervals for a period of 2 years.  Visual evaluation included effectiveness in controlling dust, washboarding, and raveling. Materials tests and evaluation included Moisture/Density, Gradation, Liquid Limit, Plastic Limit, R-Value, CBR, and silt loading. Final analysis included an overall ranking of the six materials and their performance.  Roadway stabilization or dust abatement products are classified into the following seven basic categories:  <table border="0" style="width: 100%;"> <tr> <td style="width: 50%;">1. Water</td> <td style="width: 50%;">5. Electrochemical</td> </tr> <tr> <td>2. Water absorbing</td> <td>6. Synthetic Polymer</td> </tr> <tr> <td>3. Organic Petroleum</td> <td>7. Clay Additives</td> </tr> <tr> <td>4. Organic Non-petroleum</td> <td></td> </tr> </table> For this specific semi-arid desert location and non-plastic roadway material, the best performing product was a formulation of an organic non-petroleum plus water absorbing material.						1. Water	5. Electrochemical	2. Water absorbing	6. Synthetic Polymer	3. Organic Petroleum	7. Clay Additives	4. Organic Non-petroleum	
1. Water	5. Electrochemical												
2. Water absorbing	6. Synthetic Polymer												
3. Organic Petroleum	7. Clay Additives												
4. Organic Non-petroleum													
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<b>SI* (MODERN METRIC) CONVERSION FACTORS</b>				
<b>APPROXIMATE CONVERSIONS TO SI UNITS</b>				
<b>Symbol</b>	<b>When You Know</b>	<b>Multiply By</b>	<b>To Find</b>	<b>Symbol</b>
<b>LENGTH</b>				
in	inches	25.4	Millimeters	mm
ft	feet	0.305	Meters	m
yd	yards	0.914	Meters	m
mi	miles	1.61	Kilometers	km
<b>AREA</b>				
in <sup>2</sup>	square inches	645.2	Square millimeters	mm <sup>2</sup>
ft <sup>2</sup>	square feet	0.093	Square meters	m <sup>2</sup>
yd <sup>2</sup>	square yard	0.836	Square meters	m <sup>2</sup>
ac	acres	0.405	Hectares	ha
mi <sup>2</sup>	square miles	2.59	Square kilometers	km <sup>2</sup>
<b>VOLUME</b>				
fl oz	fluid ounces	29.57	Milliliters	mL
gal	gallons	3.785	Liters	L
ft <sup>3</sup>	cubic feet	0.028	cubic meters	m <sup>3</sup>
yd <sup>3</sup>	cubic yards	0.765	cubic meters	m <sup>3</sup>
NOTE: volumes greater than 1000 L shall be shown in m <sup>3</sup>				
<b>MASS</b>				
oz	ounces	28.35	Grams	g
lb	pounds	0.454	Kilograms	kg
T	short tons (2000 lb)	0.907	megagrams (or "metric ton")	Mg (or "t")
<b>TEMPERATURE (exact degrees)</b>				
°F	Fahrenheit	5 (F-32)/9 or (F-32)/1.8	Celsius	°C
<b>ILLUMINATION</b>				
fc	foot-candles	10.76	Lux	lx
fl	foot-Lamberts	3.426	candela/m <sup>2</sup>	cd/m <sup>2</sup>
<b>FORCE and PRESSURE or STRESS</b>				
lbf	poundforce	4.45	Newtons	N
lbf/in <sup>2</sup>	poundforce per square inch	6.89	Kilopascals	kPa
<b>APPROXIMATE CONVERSIONS FROM SI UNITS</b>				
<b>Symbol</b>	<b>When You Know</b>	<b>Multiply By</b>	<b>To Find</b>	<b>Symbol</b>
<b>LENGTH</b>				
mm	millimeters	0.039	Inches	in
m	meters	3.28	Feet	ft
m	meters	1.09	Yards	yd
km	kilometers	0.621	Miles	mi
<b>AREA</b>				
mm <sup>2</sup>	square millimeters	0.0016	square inches	in <sup>2</sup>
m <sup>2</sup>	square meters	10.764	square feet	ft <sup>2</sup>
m <sup>2</sup>	square meters	1.195	square yards	yd <sup>2</sup>
ha	hectares	2.47	Acres	ac
km <sup>2</sup>	square kilometers	0.386	square miles	mi <sup>2</sup>
<b>VOLUME</b>				
mL	milliliters	0.034	fluid ounces	fl oz
L	liters	0.264	Gallons	gal
m <sup>3</sup>	cubic meters	35.314	cubic feet	ft <sup>3</sup>
m <sup>3</sup>	cubic meters	1.307	cubic yards	yd <sup>3</sup>
<b>MASS</b>				
g	grams	0.035	Ounces	oz
kg	kilograms	2.202	Pounds	lb
Mg (or "t")	megagrams (or "metric ton")	1.103	short tons (2000 lb)	T
<b>TEMPERATURE (exact degrees)</b>				
°C	Celsius	1.8C+32	Fahrenheit	°F
<b>ILLUMINATION</b>				
lx	lux	0.0929	foot-candles	fc
cd/m <sup>2</sup>	candela/m <sup>2</sup>	0.2919	foot-Lamberts	fl
<b>FORCE and PRESSURE or STRESS</b>				
N	newtons	0.225	Poundforce	lbf
kPa	kilopascals	0.145	poundforce per square inch	lbf/in <sup>2</sup>

\*SI is the symbol for the International System of Units. Appropriate rounding should be made to comply with Section 4 of ASTM E380. (Revised March 2003)

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**LIST OF ABBREVIATIONS AND SYMBOLS**

AASHTO	American Association of State Highway and Transportation Officials
ASTM	American Society for Testing and Materials
C	Celsius
CFLHD	Central Federal Lands Highway Division
CBR	California Bearing Ratio
CTIP	Coordinated Technology Implementation Program
DCP	Dynamic Cone Penetrometer
DOT	Department of Transportation
F	Fahrenheit
F&WS	Fish and Wildlife Service
FHWA	Federal Highway Administration
FLH	Federal Lands Highway
FP	Federal Projects
HITEC	Highway Innovative Technology Evaluation Center
LTAP	Local Technical Assistance Program
MSDS	Material Safety Data Sheet
NWR	National Wildlife Refuge
SCR	Special Contract Requirement
TDIPP	Technology Deployment Initiatives and Partnership Program
US	United States
USFS	US Forest Service

