DUST CONTROL ON UNSURFACED ROADWAYS

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PROJECT DESCRIPTION AND APPROACH

- Develop Laboratory Index Tests:
 - Simulate Environmental Conditions
 - Sun Lamps for Curing in Desert
 - Air Impingement Test
 - Measure Weight Loss Due to Erosion of Sample
 - Qualitative Evaluation of Sample Stability
- Laboratory Evaluation of Commercial-Off-The-Shelf (COTS) Dust Palliatives:
 - Products: Polymer Emulsions, Lignosulfonates, Synthetic Oils, and Polyacrylamides
 - Compare Index Performance of Dust Palliatives Under Simulated Conditions
 - Use Laboratory Index Test to Differentiate Potential of Products
- > Develop Sustainment Palliative Distribution System:
 - Evaluate Commercial Technologies for Applying Dust Palliatives for Large Areas
 - Develop Process for Efficient Product Distribution and Sustained Effectiveness
- Evaluate Field Performance of COTS Dust Palliatives
 - Construct Test Sections Using Chosen Distribution Method
 - Compare Results of Mobile and Stationary Dust Collection Systems
 - Identify Most Effective Products to Meet Military Needs





FIELD DEMONSTRATION TEST PLAN

Douglas, AZ, March - 2004

. 1	100'	100'	100'	875'	100'	100'	100'	210'	100'
500'	500'	500'	500'	500'	500'	500'	500'	500'	500'
		<u> </u>				1			
Item 1	E Item 2	E Item 3	E Item 4	E Item 5	E Item 6	E Item 7	Item 8	E Item 9	E Item 10
Untreated	OII Topical w	7/ UII Topical	Windrov	Windrow	Spray	Spray			Spray
Control	a Prewet	Prewet	집 Spray 및 Grade	Grade	E Grade	Grade	Grade	문 Spray 및 Till	Compact
	E		E	Compact	Compact	Compac		Compact	E Spray
	500' 500' Item 1 Untreated Control	100' 500' 500' Item 1 Untreated Control Item 2 Topical w Prewet	100' 100' 500' 500' 500' 500' Item 1 Item 2 Untreated Topical w/ Prewet Item 3 Topical w/ Topical w/ Prewet Prewet	100' 100' 100' 500' 500' 500' Item 1 Item 2 Topical w/ Untreated Topical w/ Topical w/ Prewet Item 3 Topical w/ Untreated Topical w/ Spray Grade Grade	100' 100' 875' 500' 500' 500' 500' Item 1 Item 2 Item 3 Item 4 Untreated Item 4 Item 5 Vintreated Item 4 Vindrow Prewet Item 3 Topical Windrow Spray Grade Control Item 4 Compact	100' 100' 100' 875' 100' 500' 500' 500' 500' 500' 500' Item 1 Item 2 Topical w/ Item 3 Topical w/ Item 4 Item 5 Vindrow Untreated Item 2 Topical w/ Item 3 Topical w/ Topical w/ Item 4 Vindrow Spray Untreated Item 2 Topical w/ Item 3 Topical w/ Topical w/ Item 4 Vindrow Spray Grade Compact Item 6 Spray Spray Spray Spray	100' 100' 875' 100' 100' 500' 500' 500' 500' 500' 500' Item 1 Item 2 Item 3 Topical w/ Item 3 Topical w/ Item 4 Item 5 Item 5 Spray Untreated Item 4 Item 5 Item 5 Item 6 Spray Spray	100' 100' 100' 875' 100' 100' 100' 100' 500' 500' 500' 500' 500' 500' 500' 500' 500' Item 1 Item 2 Topical w/ Item 3 Topical w/ Item 4 Nindrow Item 5 Spray Spra	100' 100' 100' 875' 100' 100' 100' 210' 500'

CONSTRUCTION PROCESSES PLAN

1170'	. 1	100	r 1	00'		10()' 20	65	,	14(ľ	10()'	10)' i	308	3" (622	22
	500'		√ 500'		<u>, 500'</u>		500'		500'		500'		500'		500'		500'		500'
20'	Item 11 Blue Goo 12 lb/900 gal 0.8 gsy	Transition	Item 12 Hydrostik 20 lb/900gal 0.8 gsy	Transition	Item 13 NRL 3:1 0.8 gsy	Transition	Item 14 Dust Fyghter 0.75:1 0.8 gsy	Iransuon	Item 15 Road Oyl 3:1 0.8 gsy	Transition	Item 16 Dustex 3:1 0.8 gsy	Transition	Item 17 Polytac 3:1 0.8 gsy	Transition	Item 18 Envirotac II 3:1 0.8 gsy	Transition	Item 19 TerraTac 3:1 0.8 gsy	Transition	Item 20 Soil Sement 3:1 0.8 gsy



PALLIATIVE EVALUATION PLAN

Not To Scale



GENERAL ROAD CONDITION



All sections were freshly graded prior to construction and product application









SITE LAYOUT

•500 ft x 20 ft test sections

- •Marked with traffic delineators
- Untreated transition areas separating sections







EVALUATION OF CONSTRUCTION PROCEDURES

Section	Palliative	Method	Manpower	Time (min)
1	Water	Spray/Compact	4	60
2	Envirotac II	Prewet/Spray/Compact	4	180
3	Envirotac II	Spray/Compact	4	105
4	Envirotac II	Windrow/Spray/Grade	4	42
5	Envirotac II	Windrow/Spray/Grade/Compact	5	48
6	Envirotac II	Spray/Windrow/Grade/Compact	5	48
7	Envirotac II	Spray/Till/Grade/Compact	6	78
8	Envirotac II	Till/Spray/Grade/Till/Compact	6	136
9	Envirotac II	Till/Spray/Till/Compact/Spray	5	125
10	Envirotac II	Spray/Till/Compact/Spray	5	46
		4 to 6	42 to 180	











TOPICAL APPLICATIONS

Surface peeling

- •High concentration of product on surface
- Product runoff











WINDROWING WITH MOTOR GRADER

- •Product does not penetrate core of windrow
- •Difficult to achieve uniform distribution
- •Final road surface easily disturbed









TILLING WITH ROTARY MIXER

- More even product dispersion
- •Unnecessary to till before spraying surface
- •Grading can expose untreated areas
- •Excess surface moisture can lead to peeling during compaction











RECOMMENDED CONSTRUCTION PROCESS

Spray half of product onto surface
Immediately till to a depth of 3 in. with a rotary mixer
Follow with compactor
Spray remaining product









DUST PALLIATIVES

Section	Product	Contact	Company	Dilution Ratio	Application Rate
11	Blue Goo	Bob Lisle	Easy Lawn	12 lb/900 gal	0.8 gsy
12	Hydrostik	John Imm	Finn	20 lb/900gal	0.8 gsy
13	NRL	Dr. James Wynne	NRL	3:1	0.8 gsy
14	Dust Fyghter	Todd Hawkins	Midwest Industrial Supply	0.75:1	0.8 gsy
15	Road Oyl	Bob Randolph	Soil Stabilization Products Company, Inc.	3:1	0.8 gsy
16	Dustex	Lou Snow	Dust Pro, Inc.	3:1	0.8 gsy
17	Polytac	Lou Snow	Dust Pro, Inc.	3:1	0.8 gsy
18	Envirotac II	John Vermillon	Enviromental Products & Applications	3:1	0.8 gsy
19	<u>TerraT</u> ac	David Neubauer	GeoCHEM, Inc.	3:1	0.8 gsy
20	Soil Sement	Todd Hawkins	Midwest Industrial Supply	3:1	0.8 gsy
21	EK-35	Todd Hawkins	Midwest Industrial Supply	Neat	0.8 gsy
22	Envirokleen	Todd Hawkins	Midwest Industrial Supply	Neat	0.8 gsy
23	CSS-1		Western Emulsions	1:1	0.3 gsy
24	Water			-	0.8 gsy









MIDWEST RESEARCH INSTITUTE DATA COLLECTION

- •State of the art dust collection system
- Remote controlled
- •25 mph travel speed
- •Universal mounting system









MRI DUST COLLECTION RESULTS







ERDC DATA COLLECTION

•Stationary dust collectors positioned on the downwind side of test section

•Ten passes with test vehicle traveling at 30 mph

•In-situ soil property measurements











ERDC DUST COLLECTION RESULTS







RELATIVE PRODUCT EFFECTIVENESS

Control



Envirotac II

Envirokleen



TerraTac







ERDC VISUAL RATING







DUST PALLIATIVE EFFECTIVENESS RATING

Product	Surface Ravelling (20%)	Visual Dust Rating (30%)	ERDC Dust Reduction (25%)	MRI Dust Reduction (25%)	Total
Envirotac II	9	10	10	10	98
<u>TerraTac</u>	5	8	9	9	79
Calcium Chloride	5	8	8	9	77
	4	7	9	9	74
Envirokleen	2	8	7	9	68
Dustex	0	6	3	7	43
CSS-1	1	5	4	6	42
Soil Sement	1	4	5	5	39
EK-35	2	4	4	4	36
Polytac	1	5	3	4	35
Blue Goo	0	4	0	4	22
Road Oyl	0	2	6	0	21
Hydrostik	0	3	0	0	9
Control	0	2	0	0	6





CONCLUSIONS

≻Adequate mixing could not be achieved using motor grader.

>Compaction was necessary for optimum performance but caused problems with wet surfaces.

➢Rotary tiller provided means to incorporate product to desired depth.

>Final surface application after compaction provided sealed wearing surface.





CONCLUSIONS

>Water soluble polymers are limited to low concentrations due to large viscosity increase.

>Starch/sugar and chloride salt based products performed well during dry periods.

>Lignosulfonate products provided little soil cohesion and were not as effective as other products for dust abatement.

>Oil based products provided little soil cohesion but performed well in preventing dust.

>Polymer emulsions show increased strength of surface and exhibited excellent to good dust abatement.





QUESTIONS?





