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# DUST CONTROL ON UNSURFACED ROADWAYS



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**ERDC**

**SPONSORED BY**  
**U.S. MARINE CORPS SYSTEMS COMMAND**

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# PROJECT DESCRIPTION AND APPROACH

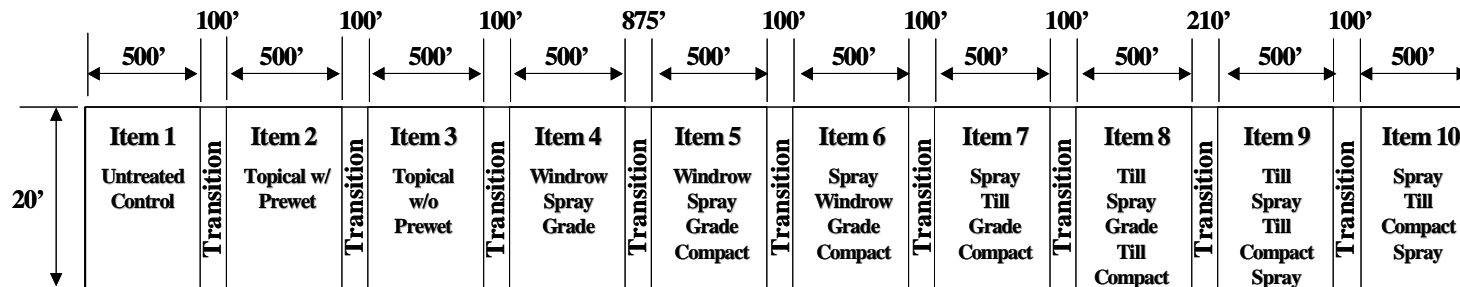
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- **Develop Laboratory Index Tests:**
  - Simulate Environmental Conditions
  - Sun Lamps for Curing in Desert
  - Air Impingement Test
  - Measure Weight Loss Due to Erosion of Sample
  - Qualitative Evaluation of Sample Stability
  
- **Laboratory 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

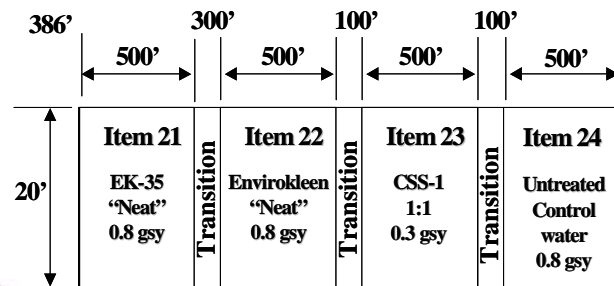
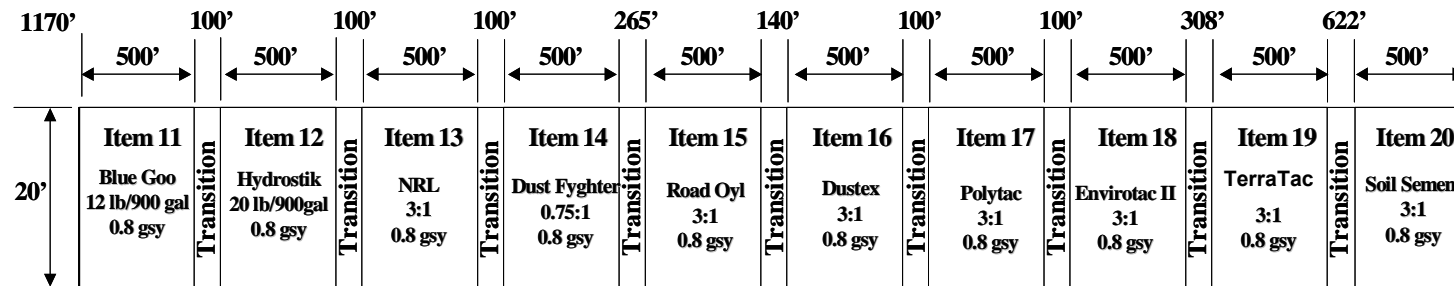


# FIELD DEMONSTRATION TEST PLAN

## Douglas, AZ, March - 2004



### CONSTRUCTION PROCESSES PLAN



### 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
<b>Range of Values:</b>			<b>4 to 6</b>	<b>42 to 180</b>



# 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	<a href="#">TerraTac</a>	David Neubauer	<a href="#">GeoCHEM, Inc.</a>	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

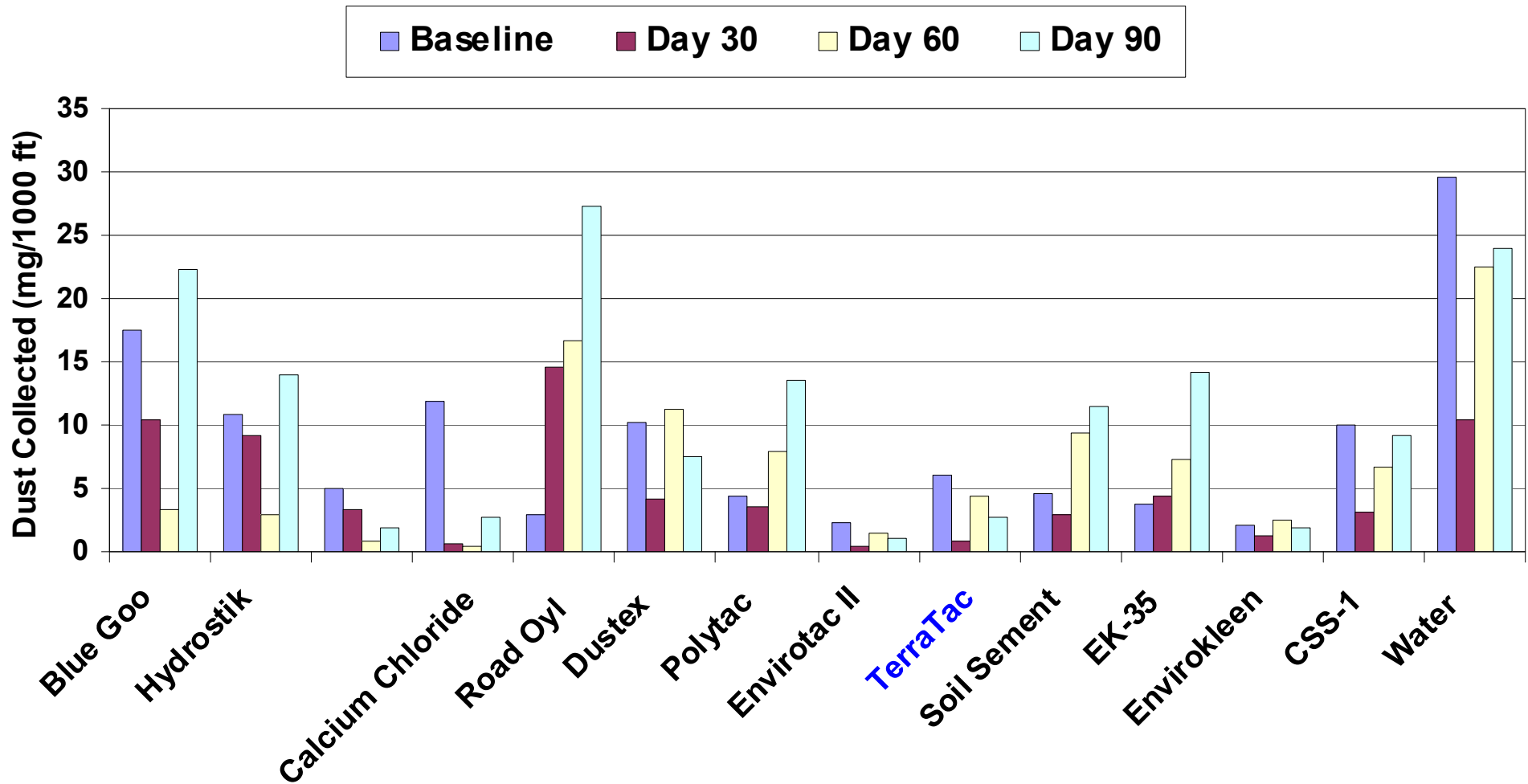


# MIDWEST RESEARCH INSTITUTE DATA COLLECTION

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



# MRI DUST COLLECTION RESULTS

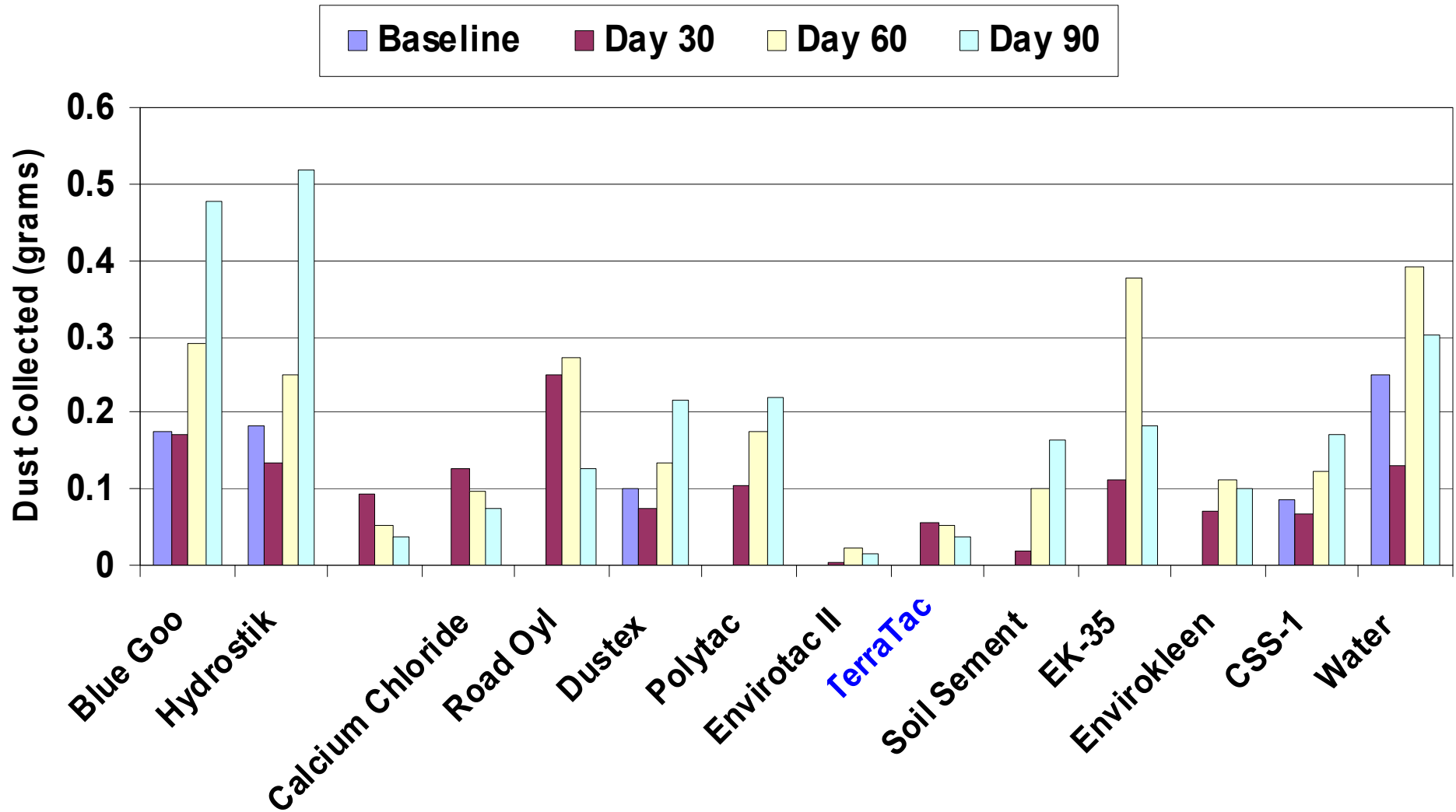


# ERDC DATA COLLECTION

- **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

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**Control**



**Envirokleen**



**Envirotac II**

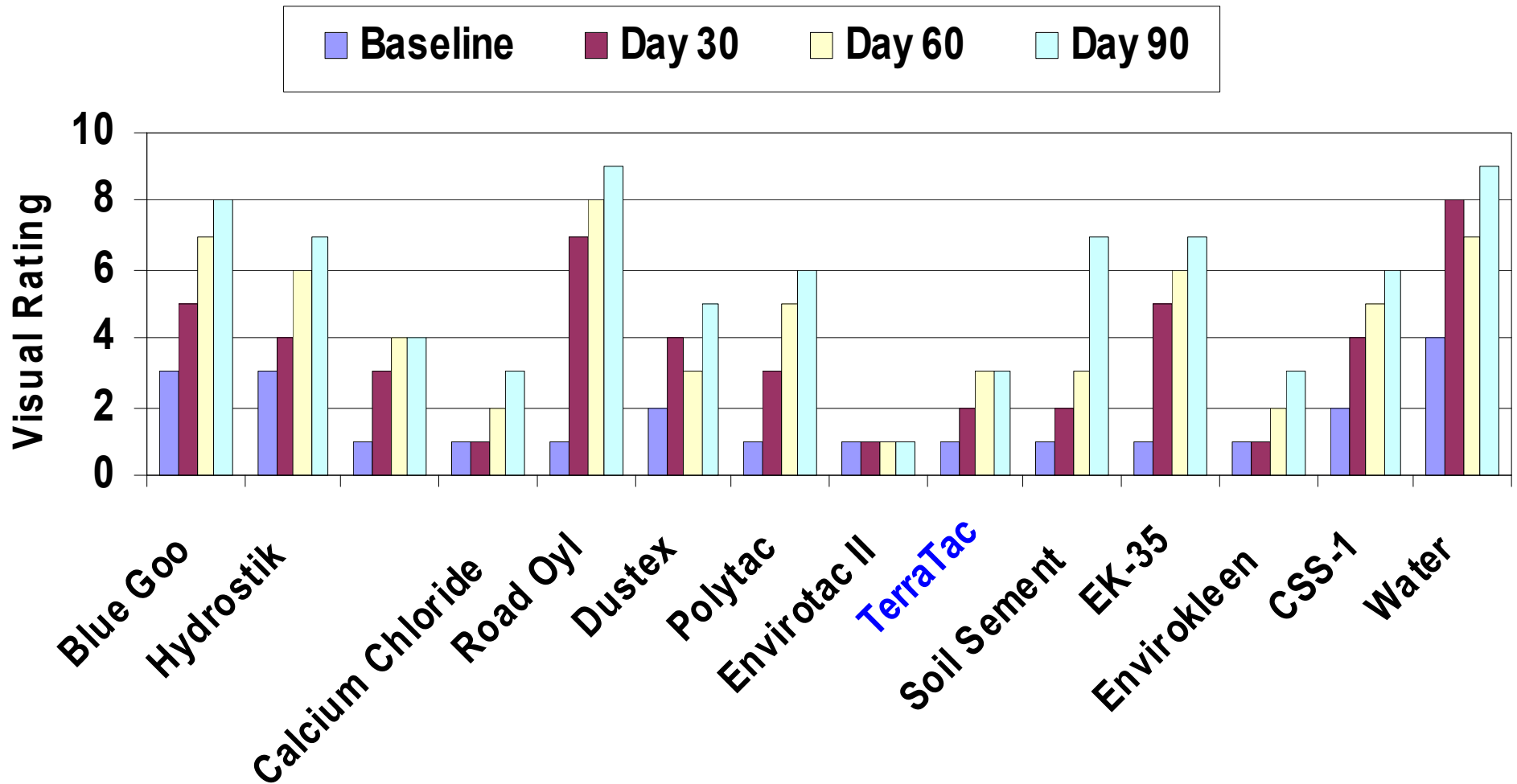


**TerraTac**





# ERDC VISUAL RATING



# DUST PALLIATIVE EFFECTIVENESS RATING

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

# CONCLUSIONS

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- 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

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- **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?

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