

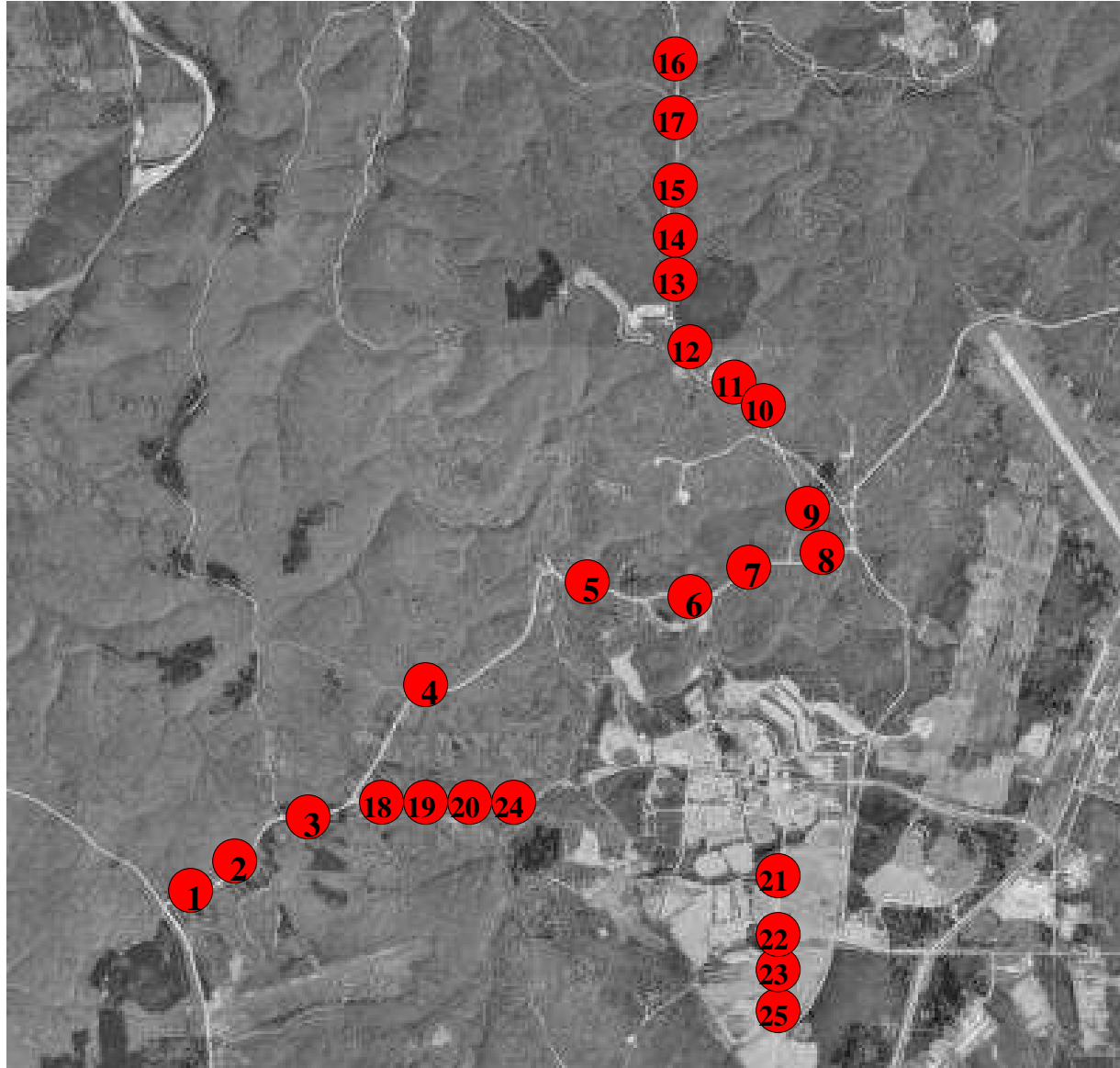
Dust Mitigation in Temperate Climates

**Fort Leonard Wood, MO
September 2004**



**Mr. John F. Rushing
ERDC**

TEST LOCATION



TEST SECTION LAYOUT

- **Twenty-Five Sections Constructed on Straight, Level Locations Along Convoy Routes**
- **Sections 600 ft Long by 25 ft Wide**
- **Marked with Traffic Delineators for Identification**



SOIL PROPERTY MEASUREMENTS

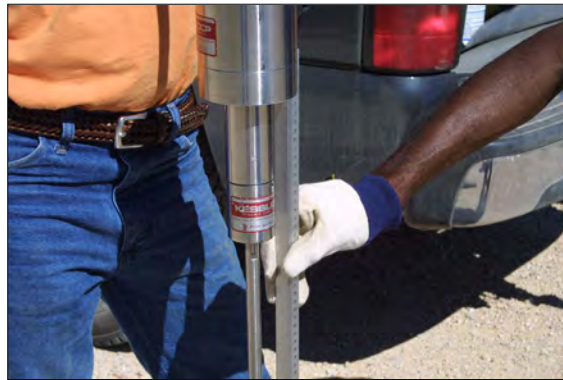


Troxler 3430 Nuclear Density Gauge

- Cesium-137 for Density Measurement
- Americium-241:Beryllium for Moisture Content

Dynamic Cone Penetrometer

- Correlation to California Bearing Ratio
- Identifies Strength of Road



DUST COLLECTION SYSTEMS

Mobile

- Mounts to Receiver on Pickup
- Remote Controlled by Driver
- Continual Data Collection



Stationary

- Two Collectors Placed on Downwind Side of Road
- Collects Dust as Vehicle Passes



CONSTRUCTION EQUIPMENT

Etnyre Asphalt Emulsion Distributor

- Spray Bar Width – 12 ft.
- Flow Rate - 110 gal/min



TEREX Reclaimer/Stabilizer

- Carbide Teeth (175)
- Cutter Depth – 2 in.



Caterpillar CS-563D

- Single-Drum, Vibratory Roller
- Weight – 26,680 lbs
- Vibration – 3000 vpm



PRODUCTS

Polymer Emulsions

- Envirotac II
- M10 + 50
- Soil Sement
- TerraTac

Polysaccharides

Salts

- Calcium Chloride

Synthetic Fluids

- TerraLock
- Envirokleen



POLYMER EMULSIONS

- Typically Vinyl Acetate or Acrylic Copolymers
- Form Hard Film Upon Drying
- Binding Agents for Soil
- Water Resistant



Initial Condition

After 30 Days



POLYSACCHARIDE

- **Sugar/Starch Solution**
- **Forms Reworkable Binder**
- **Water Soluble**



Initial Condition

After 30 Days



SALTS

- **Deliquescent**
- **Reworkable**
- **Water Soluble**



Initial Condition

After 30 Days



SYNTHETIC FLUIDS

➤ **Clear, Viscous Fluid**

➤ **Reworkable**

➤ **Not Water Soluble**

➤ **Placed “Neat”**

➤ **Does Not Dry or Cure**



Initial Condition

After 30 Days



PRODUCT APPLICATION QUANTITIES

Section	Palliative	Additive Amounts (Gallons)			Application Rate (gsy)	Application Procedure
		Product	Water	Total ¹		
1	Envirotac II	350	1000	1350	0.8	Admix
2	TerraTac Polymer	350	1000	1350	0.8	Admix
3	M10 + 50	275	1075	1350	0.8	Admix
4	Soil Sement	350	1000	1350	0.8	Admix
6	Calcium Chloride	1350	0	1350	0.8	Admix
7	TerraLock	1350	0	1350	0.8	Admix
8	EnviroKleen	1350	0	1350	0.8	Admix
9	Water	0	1350	1350	0.8	Admix
10	TerraTac Polymer	175	525	700	0.4	Admix
11	Envirotac II	175	525	700	0.4	Admix
13	Calcium Chloride	675	0	675	0.4	Topical
14	TerraLock	675	0	675	0.4	Topical
15	Envirotac II	175	525	700	0.4	Topical
16	Water	0	675	675	0.4	Topical
17	TerraLock	175	525	700	0.4	Topical
19	TerraLock	1350	0	1350	0.8	Admix
20	Envirotac II	350	1000	1350	0.8	Admix
21	Calcium Chloride	675	0	675	0.4	Topical
22	TerraLock	675	0	675	0.4	Topical
24	Water	0	1350	1350	0.8	Admix
25	Envirotac II	175	525	700	0.4	Topical

1 Total product amount placed in distributor. Approximately 650 gal was used for 0.4 gsy application rate and 1300 gal for 0.8 gsy application rate

FLW 20

- **Eight Products**
- **0.8 gsy Application Rate**
- **Application Procedure**
 - **Spray**
 - **Till**
 - **Compact**
 - **Spray**
- **Traffic**
 - **Tracked**
 - **Wheeled**



FLW 5

➤ **Nine Sections**

➤ **Two Application Procedures**

- **Admix Using 0.4 gsy Application Rate**

- **Topical Using 0.4 gsy Application Rate**

➤ **Convoy Traffic**



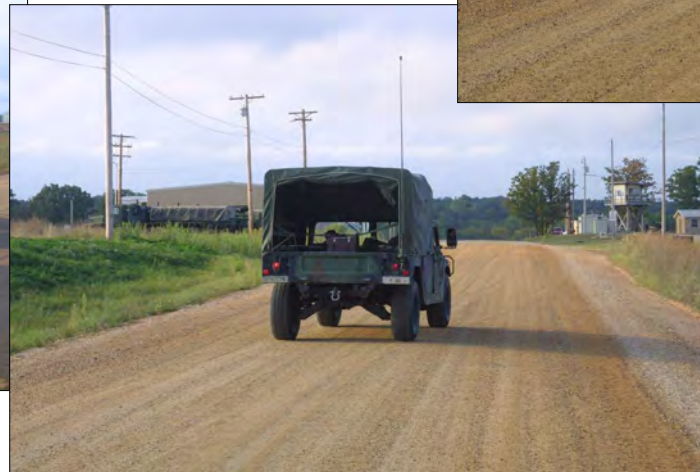
FLW 28

- Four Sections
- Admix Procedure
- 0.8 gsy Application Rate
- Mixed Traffic



WASHRACK

- Four Sections
- Topical Applications
- 0.4 gsy Application Rate
- Heavy Traffic



30-DAY TESTING



FLW 20

30-DAY DATA

Section	Palliative	Stationary Collection Data		Mobile Collection Data		Visual Rating
		Dust Collected (g)	Reduction from Pretreatment Data (%)	Dust Collected (g)	Reduction from Pretreatment Data (%)	
FLW 20 0.8 gsy Admix						
6	Calcium Chloride	0.033	97	0.034	86	10
2	TerraTac	0.100	90	0.048	80	9
8	Envirokleen	0.161	84	0.031	87	9
7	TerraLock	0.198	81	0.038	84	9
4	Soil Sement	0.580	44	0.102	58	7
1	Envirotac II					
3	M10 + 50	0.732	29	0.076	68	6

FLW 5

30-Day Data

Section	Palliative	Stationary Collection Data		Mobile Collection Data		Visual Rating
		Dust Collected (g)	Reduction from Pretreatment Data (%)	Dust Collected (g)	Reduction from Pretreatment Data (%)	
FLW 5 0.4 gsy Admix						
11	Envirotac II	0.079	92	0.052	78	9
10	TerraTac Polymer	0.456	56	0.055	77	7
FLW 5 0.4 gsy Topical						
14	TerraLock	0.165	84	0.052	78	9
13	Calcium Chloride	0.326	68	0.148	39	7
17	TerraTac Polymer	0.431	58	0.121	50	6
16	Water	0.724	30	0.085	65	5
15	Envirotac II	0.764	26	0.066	73	5

FLW 28

30-Day Data

Section	Palliative	Stationary Collection Data		Mobile Collection Data		Visual Rating
		Dust Collected (g)	Reduction from Pretreatment Data (%)	Dust Collected (g)	Reduction from Pretreatment Data (%)	
FLW 28 0.8 gsy Admix						
19	TerraLock	0.055	95	0.020	92	10
20	Envirotac II	0.409	60	0.092	62	6
24	Water	0.634	38	0.175	27	3

WASHRACK

30-Day Data

Section	Palliative	Stationary Collection Data		Mobile Collection Data		Visual Rating
		Dust Collected (g)	Reduction from Pretreatment Data (%)	Dust Collected (g)	Reduction from Pretreatment Data (%)	
Washrack 0.4 gsy Topical						
21	Calcium Chloride	0.047	95	0.027	89	10
22	TerraLock	0.181	82	0.055	77	9
25	Envirotac II	0.486	53	0.092	62	4

PALLIATIVE RANKING

Section	Palliative	Application Method	Stationary Dust Collection Data		Mobile Dust Collection Data		Visual Rating
			Dust Collected (g)	Reduction from Pretreatment Data (%)	Dust Collected (g)	Reduction from Pretreatment Data (%)	
6	Calcium Chloride	Admix	0.033	97	0.034	86	10
21	Calcium Chloride	Topical	0.047	95	0.027	89	10
19	TerraLock	Admix	0.055	95	0.020	92	10
11	Envirotac II	Admix	0.079	92	0.052	78	9
2	TerraTac	Admix	0.100	90	0.048	80	9
8	Envirokleen	Admix	0.161	84	0.031	87	9
14	TerraLock	Topical	0.165	84	0.052	78	9
22	TerraLock	Topical	0.181	82	0.055	77	9
7	TerraLock	Admix	0.198	81	0.038	84	9
4	Soil Sement	Admix	0.319	69	0.066	73	7
13	Calcium Chloride	Topical	0.326	68	0.148	39	7
10	TerraTac	Admix	0.456	56	0.055	77	7
1	Envirotac II	Admix	0.580	44	0.102	58	7
20	Envirotac II	Topical	0.409	60	0.092	62	6
17	TerraTac	Topical	0.431	58	0.121	50	6
3	M10 + 50	Admix	0.732	29	0.076	68	6
16	Water	Topical	0.724	30	0.085	65	5
15	Envirotac II	Topical	0.764	26	0.066	73	5
25	Envirotac II	Topical	0.486	53	0.092	62	4
24	Water	Topical	0.634	38	0.175	27	3